Introduction to E-commerce

Zheng Qin

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With 98 figures

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Preface

E-commerce is a subject which researches how to use electronic and information technology to promote the traditional business process to change profoundly. The subject is still at its infant age and is fast developing. Its theoretical system is still being constructed and perfected. Under such circumstance, this book tries to choose the contents that are fixed, and closely related with E-commerce as the subject system of E-commerce. The architecture of E-commerce is as follows (Fig. 0.1).

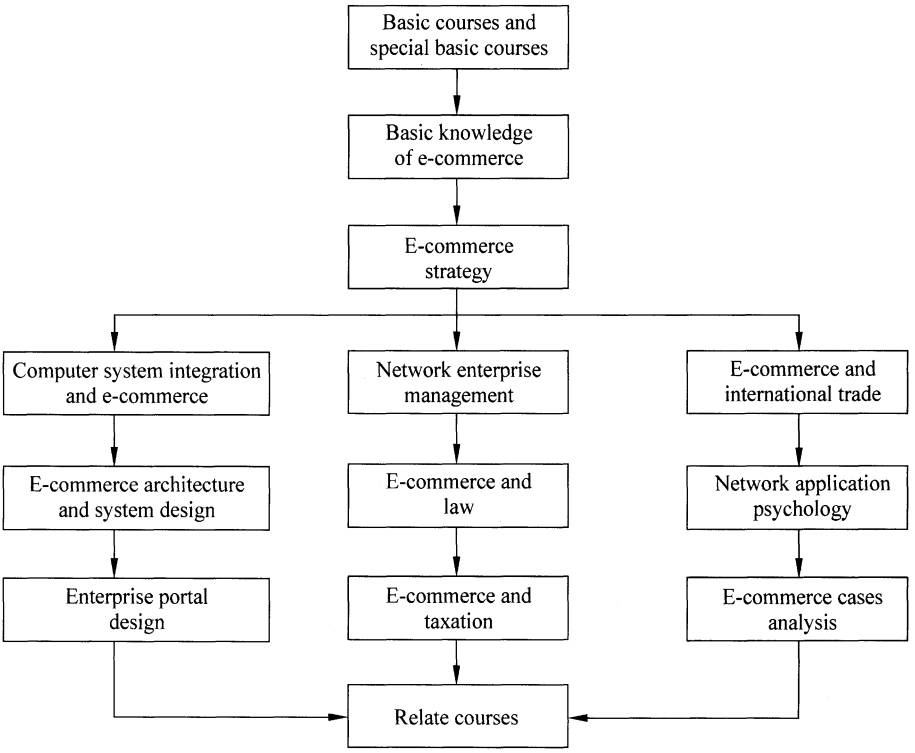

Figure 0.1

Prerequisite courses of E-commerce include some basic courses such as *Advanced Mathematics*, *Discrete Mathematics*, etc.; and some specialized courses such as *Computer Networks*, *Programming*, *Operating System*, *Database Management System*, *Management Engineering*, etc. With all these courses, one can study the subjects such as *Guide to Electronic Commerce*, *Introduction to Electronic Commerce*, *Electronic Commerce Strategies,* etc. The students with different study purposes and requirements can choose different courses respectively: the students majoring in electronic information, whose main goal of learning E-commerce is to design and implement E-commerce systems, can choose the courses such as *Computer System Integration and E-commerce*, *Systematic Structure and System Design of E-commerce and Enterprise Portal Website Design* etc to learn; the administrators aiming at enterprise administration should choose the courses such as *E-Commerce and Law, E-commerce and Tax Revenue*, *Network Business Administration* etc. to learn; while the students that take the E-commerce applications as their target should learn *E-commerce and International Trade*, *Network Application Psychology*, *E-commerce Case Study* etc. The knowledge they learn form these courses together with related knowledge can help them can help them to achieve their goal of learning E-commerce.

There are narrow-sense E-commerce concept and wide-sense E-commerce concept which is also called as e-business. E-commerce researches how to use electronic and information technology to promote the traditional business process to change profoundly, while e-business researches how to use electronic and information technology to promote various social activities of human-beings to deeply change. E-commerce originated from EDI in the 1960's, and its concept formed in the 1990's. E-business originated even earlier, but its concept formed in about 2000. This book focuses on E-commerce, and the interrelationship of its main contents is illustrated as in Fig. 0.2.

This book assumes that most of the readers have no related experience or knowledge of E-commerce, so some basic knowledge of E-commerce will be introduced in chapter 1. E-commerce security plays an important role and is one of the crucial factors that affect the development of E-commerce. E-commerce security follows the basic knowledge. After having learnt former two chapters, readers with different goals can choose different contents to study according to their own goal. The students that want to master E-commerce technologies and want to use these technologies to establish E-commerce websites can go along the mainstream in the figure ignoring the branches at two sides. The students that are majoring in business administration can choose the left side branch to learn, while the students that focus on E-commerce applications should choose the right side branch to learn.

The first edition of this book, is chosen as textbook by universities such as Tsinghua University, Xi'an Jiaotong University, Beijing Normal University etc., and has established a good reputation among the teachers and students of these universities. It was republished for several times. Since the first edition was sent

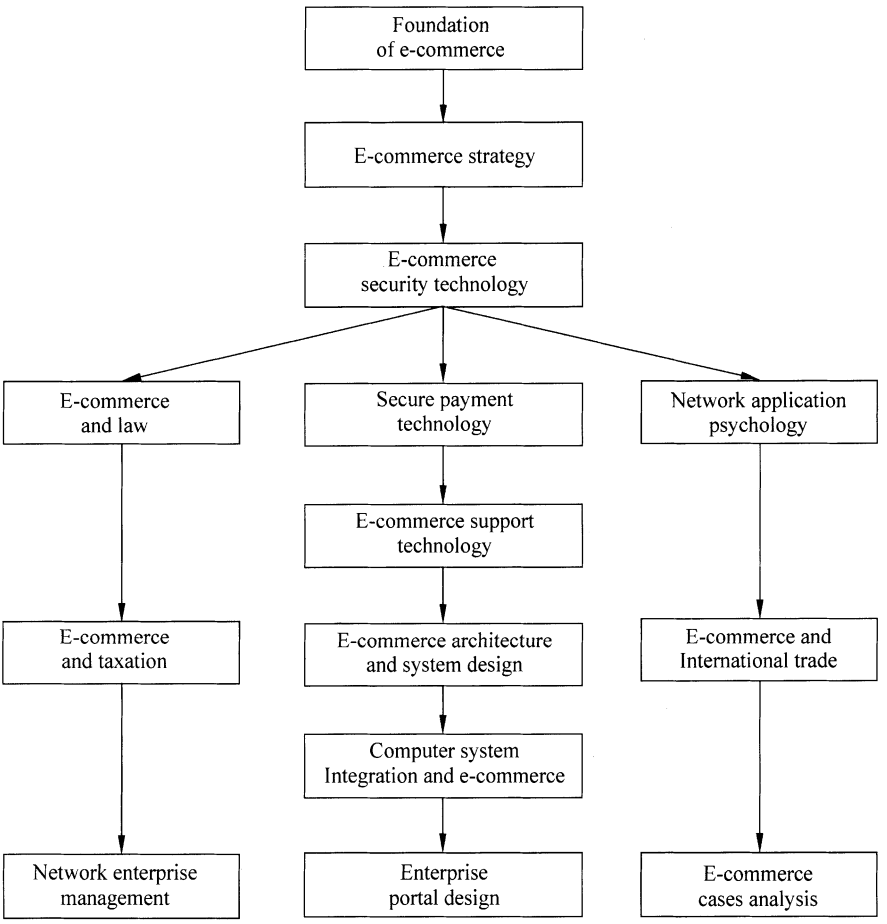

Figure 0.2

to press, E-commerce technologies have been rapidly developing, and the authors have been deepening their understanding of E-commerce. Some valuable feedbacks are also obtained from the teachers and students. To promptly reflect the technology development, our new understanding of E-commerce, taking into account of valuable feedback information, we greatly modify and update the content of the first edition forming the second edition. This edition consists of five parts which are basis, technology, management, practice and applications.

The first part includes two chapters. The first chapter largely expands and updates the corresponding content of the first edition, and adds the introduction to mobile E-commerce. The first chapter is a sketch of this book, which provides the readers a complete picture of E-commerce. In the second part, introduction to fundamental technologies that are related to E-commerce security is added, and in order to enhance the requirements of E-commerce security, E-commerce security technologies are also added. Part three adds the E-commerce tax revenue

administration and the brief introduction of *The Electronic Signature Law of PRC*. The *network application psychology* is added in part five. Meanwhile, most contents of the first edition are updated so that they can reflect the development of E-commerce technologies.

The content of this book is chosen and organized by Professor Qin Zheng. Qin Zheng, Li Shundong, Han Yi write some parts of this book respectively. Yan Lixiang and Dong Jinchun read the manuscript and propose some valuable suggestions. Qin Jun reads the manuscript and polishes the text. Li Shundong finishes the total book.

This book can be used either as a textbook or reference book for four-year and three-year college students that are specialized in E-commerce, electronic information, information management and business administration, and postgraduates. The whole book can be used for teaching postgraduates. Some chapters with an asterisk can be excluded for four-year college students and some with two asterisks can also be excluded for three-year college students. Any opinions from readers about this book are appreciated.

The authors

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Part 1 Fundamentals

1 Fundamentals of E-commerce

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Abstract E-commerce is the core technology of knowledge economy. Developing e-commerce is an inevitable choice for Chinese economy to enter into the world market, participate in and ultimately penetrate the global market, and bring about a great rejuvenation of the Chinese nation. We must grasp this business opportunity and further extend its strength by consciously studying, applying and developing e-commerce; allowing e-commerce to serve better in society's economic development. Before we can start developing e-commerce, we have to understand the background, the basic principle and the evolution and development history of e-commerce. This enables us to have a thoughtful understanding on this new technology, hence, helping to predict the trend of e-commerce in the near future. This chapter introduces some basic knowledge regarding to e-commerce, which includes, the needs of society, development of e-commerce, basic e-commerce concepts, and couples of other information which closely related to the development of e-commerce.

Key Words e-commerce, m-commerce, electronic data interchange (EDI), Internet, business to business (B2B), business to consumer (B2C), business to governments (B2G), consumers to consumers (C2C), governments to governments (G2G), international trade.

This chapter is an outline of e-commerce, which contains the origin and development of e-commerce, the impact of relevant disciplines on e-commerce, the basic concepts, the platforms, fundamental patterns and the major compositions of e-commerce.

1.1 The Origin and Development of E-commerce

Internet has created a new world beyond the real world—a "virtual network world" or "The sixth continent" called by Lu Yongxiang, the academician of Chinese Academy of Science. E-commerce brought about by Internet is one of the most significant scientific accomplishments. In business, the prosperous e-commerce technology gives rise to a revolution in the circulation system. It breaks the boundary of time and space, alters the trade pattern, improves the circulation of merchandize, capital and information, and makes enterprises have an edge over others as well by reducing the cost of production effectively. In short, e-commerce has enabled the traditional business to achieve greater, faster, better and more economical results. The influence of the e-commerce will go beyond the business activity. It will make a profound impact on each aspect of human society, such as production and employment, government function, working talent, law systems and education etc. It permeates into every profile: industries, logistics, finance, media, governments, enterprises, research organizations and even traditional agricultures. With the development of the e-commerce, it will influence and impact to a larger extent every aspect of our society with each passing day. A new economic revolution on the basis of digitalization and Internet has set in. We can say without exaggeration that the electronic commerce is the most significant industrial revolution since Industrial Revolution, with deeper influence on mankind than the former two industrial revolutions, because it not only can raise greatly productivity, efficiency of economic operations, lower the economy operation cost, and make many originally impossible things possible, but also influence people's life styles and every social aspect and therefore change their world outlook and methodology. In the new century, participation of the third revolution exerts the influence, to a large degree, on economy in China, especially in shortening the gap between the western developed countries and catching up with and surpassing them. Therefore, it is inevitable for us to develop e-commerce, to join the world market, participate in the globalization competition and rejuvenate China. So the book will cover the following aspects of e-commerce: its coming into being development, its composition, its nature, the guidelines for e-commerce system design, difficulties and respective solutions in e-commerce, methods of designing a good website, the relation between e-commerce and international trade, the legal problems brought by e-commerce, the methods of dealing with and analyzing how to deal with and analyze e-commerce cases. In conclusion, all the above will be touched upon in this book, relevant philosophy problems about social overall influence on mankind are beyond the scope of this book.

1.1.1 The Origin and Development of E-commerce

E-commerce is the necessity of international business, vice verse, international

business boosts e-commerce. The development of computer science and communications sciences has laid a solid foundation for e-commerce. The development of information security makes e-commerce proceed in a secure way; the laws concerning this field also provide legal guarantees for e-commerce. The origin and development of e-commerce is illustrated in Fig. 1.1. It has been through three phases.

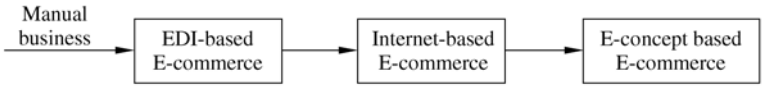

Figure 1.1 The development of e-commerce

Phase One: E-commerce based on EDI (Electronic Data Interchange)

EDI (Electronic Data Interchange): The EDI originated in the 60s of the 20th century. The large-scaled business enterprise in the developed countries carried out the EDI basically in the 80s. The EDI of our country began from the 80s in 20 centuries. EDI is a kind of teleportation method to transmit business documents from one computer to another. Because EDI reduces the paper note greatly, people vividly call it as "trade without paper" or "bargain without paper". From the perspective of technology, the EDI includes both hardware (mainly the network) and software (mainly software and standard of EDI). For the sake of safety, most EDI were not transmitted by network until the 90s of 20c, but by VAN (the value-Added Network) of exclusive use. What EDI needs is a standard software to translate information in the customer databases into the EDI-standard so as to deliver. Because the business enterprise of different professions adopt different format on the basis of their own business characteristics, therefore when transmitting documents, they must be translated into the EDI standard format. Before EDI, the primary stage of e-commerce, becomes universal in China, electronic commerce has developed quickly to the second stage.

Phase Two: E-commerce based on Internet

EDI enjoys advantages and tremendous strength in decreasing enormously the intensity, mistakes and cost to make and handle documents on the one hand, and in improving efficiency to a large extent on the other hand. Therefore, it speeds up the development of international business. However, the high cost of VAN and EDI communication system hinder the expansion of e-commerce based on EDI. Moreover, EDI is only suitable for large-scaled transnational corporation rather than medium and small-sized ones, for it does not take information share into account. Since both the increasing large-scaled transnational corporations and many a medium and small-sized enterprise thirst for information sharing, the establishment of a new electronic information exchange system of low cost is on the agenda to realize the information sharing.

In the middle and late 90s of the 20th Century, owing to the prompt popularity of Internet, from universities to enterprises, and then even to common people's

families, Internet functions from the information sharing to a popular mass media. After 1991, business that has always been outside of Internet came into the realm and made e-commerce a big hit in Internet, which gives impetus to the rapid development of Internet. Many enterprises made a big success by online direct marketing such as Dell Company, distinguished for direct online selling, online book store Amazon, Yahoo Internet search engine, Baidu Internet search engine, Sina, Sohu, and Ebay. Such websites are up to 424,000 in 1998, comparatively only 2,000 in 1995. By 2001, Internet has become the largest network in the world and covered up to 150 areas and countries, linking more than 25,000 networks and 520,000 mainframe computers. Vint Cerf, "Father of Intel" predicted in 1996 that there would be a hundred million Internet users by 2003. However, he was shocked by the flourisher of Internet, with 150,000,000 Internet users by the end of 1999, trice than that of 1997. According to the latest statistic reports released by CNNIC in July, 2007, there has been over 10,000,000 Internet users, 622,000 registered domain names and 677,000 websites in China. The flourishing of Internet makes flood of enterprises unable to resist the temptation to start e-commerce. The reason why e-commerce based on Internet is so attractive to enterprises is that e-commerce enjoys several evident advantages over e-commerce based on EDI: 1) low in cost. The expense of Internet is low, no more than 1/10 of VAN in general. 2) wide in overlaying. Internet spreads all over the world, by which trade partners can conveniently send commercial information and documents with common telephone wires. 3) complete in function. Internet can help different users to carry out their targets of different levels, such as issuing electronic commercial information negotiating on line and setting up virtual department stores and online banks etc. 4) flexible in use. E-commerce based on Internet is not confined to agreement of special data exchange. Any commercial document can be formed by filing the screen documents that are identical with the current paper documents. Such documents can be understood and used directly by anyone without any translation.

Internet meets the demands of medium and small-sized enterprises to exchange electronic data by overcoming the shortage of EDI. Internet, lower in cost, wider in coverage and better in service, will certainly replace VAN as the hardware carrier of EDI. Electronic information exchange system with the characteristics of being both lower in cost and able to share information makes itself popular among all enterprises. EDI based on Internet enjoys the advantages of both EDI and Internet, therefore, EDI realized by means of Internet is directly called as "Internet EDI".

In e-commerce based on Internet, at first, people mainly make daily "business correspondences" by e-mails, and then release information by Internet. Since 1995, enterprises have gradually turned to Internet to release information. Therefore, the public can directly access to the enterprise information, goods and services by Internet, which leads to the exploration of information issuing system represented by the technology of Web and becomes the principal application of Internet. *E-commerce Demonstration Law*, passed by United Nations Commission

on International Trade Law on June 14, 1996, symbolized the beginning of real e-commerce. And the sonorous advertisement of IBM in 1998 *Are You Ready for e-commerce* set up the upsurge of e-commerce all over the world.

Phase Three: E-concept e-commerce

Since early 2000, people's understanding has developed from e-commerce to higher e-concept e-commerce, and it is realized that e-commerce is in fact the combination of information technology and commerce applications. Apart from business, electronic information technology can be applied in many other fields, such as medical treatment, education, hygiene, military, administration and so on, to form e-concept in the fields. For instance, electronic education—remote education, the combination of electronic information technology and education; electronic treatment—remote treatment, the combination of technology and treatment; electronic administration, the combination of technology and administration; electronic command, the combination of technology and command; online banks, the combination of technology and finance; virtual enterprises, the combination of technology and business organizations and so forth. Various patterns of e-commerce such as E-B, E-C, E-G etc., have come into being by applying e-conept. With the development of electronic information technology and the increasing need of the society, more and more e-concepts will emerge and the genuine e-times will advene.

1.1.2 The Definitions of E-commerce

As the term suggests, e-commerce refers to various online commercial activities focusing on commodity exchanges by electronic means, Internet in particular, by companies, factories, enterprises, industrial undertakings and consumers. A large number of well-known organizations and corporations also have their own definitions on e-commerce. For example, ISO defines e-commerce as: it is the general term for exchange of information among enterprise and between enterprise and customers; the Global Information Infrastructure Committee defines it as the economical activities using electrical communications, with which people can purchase products, advertise goods and settle.

The following are definitions given by transnational corporations Intel, IBM and HP respectively.

Intel: E-commerce = electronic market + electronic trade + electronic service

IBM: E-commerce = information technology + web + business

HP: E-commerce is to accomplish commercial business by electronic means.

Since e-commerce is a brand new science, it is not at all surprising that there are various definitions about it. In addition, a premature uniform definition of e-commerce may slow the development of e-commerce. E-commerce shall be social, economic activities between social principal parts by taking advantages of computers and network.

The implication of e-commerce: it refers to commercial trade activities carried out by electronic methods, the electronicization of traditional trades. The electronic means refer to electronic technologys, tools, equipments and systems, including telephone, telegram, television, facsimile, E-mail, electronic data interchange, computer, the communication network, credit card, electronic money and Internets. Commercial activities comprise inquiry, offer, negotiation, contract signing, contract fulfillment, payment. In a narrow sense, e-commerce refers to various online commercial activities focusing on commodity exchanges by electronic methods, computer network in particular, by companies, factories, enterprises, industrial undertaking and consumers. In a broad sense, electronic business (EB) refers to the electronicization of all business among all industries (including governments, enterprises, and institutional units), such as electronic government, electronic command, electronic education, electronic public business, electronic household etc.

Components of e-commerce are illustrated in Fig. 1.2.

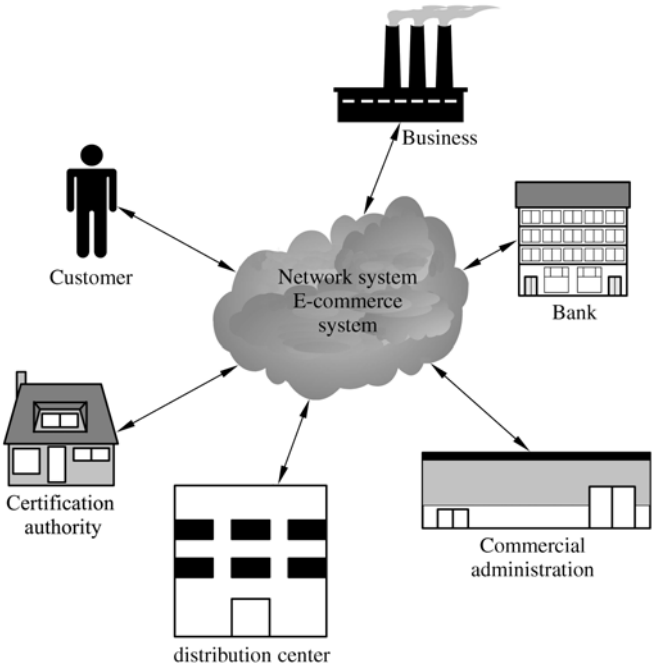

Figure 1.2 Components of e-commerce

(1) Network: It includes Internet, Intranet, and Extranet. Internet is the foundation of e-commerce and the carrier of commercial business information. As to Intranet, it means for enterprises to carry out internal affairs. With regard to Extranet, it is the link between enterprises and users to carry out commercial activities.

(2) E-commerce user. It includes personal consumers and business consumers. The business consumer scientifically manages staff, wealth, goods, production,

supply and sales by Intranet, Extranet and MIS. Personal consumer has access to information and purchases goods by connecting Internet with browsers, set-top boxes, PDA (the personal digital assistance), Visual TV etc.

(3) Authentication Authority: The authentication Authority (CA), the authority recognized by law, is responsible for issuing, managing digital certificates and facilitating parties involved in online sales to identify each other.

(4) Distribution center. It is in charge of sending goods that cannot be delivered on line to consumers and keeping track of goods flow.

(5) Online bank. It provides the sellers and buyers the traditional bank business, such as settlement, and round-the-clock service.

(6) The administration of the commercial activity. It consists mainly of departments of industry, customs, tax and trade.

The Significance of e-concept

E-mail, called the Internet Killer User, attracts people to pay attention to the existence of the network, and sparks the rush of network gradually. E-mail transforms from receiving and sending e-mails to commercial use and becomes one of the principal tools for people to communicate on line. The e-wallet and e-cash etc. basically make it possible for people transfer fund on line and accordingly makes network and real life fuse further. The e-commerce has on a large scale began to impact the traditional pattern of trade and brought about intense changes of life style. It can be predicted that in future new concepts will spring up and the combination of electronic technologys and other ideas will give rise to new things, because electronic technology based on Internet is advancing continuously. “e-concept”, proposed in early 2000, is accepted and spreads quickly. That is to say, e-concept is a new thing taking electronic and network technology as foundation, other technologies and ideas as platform of upper level. After double integration with other technologies and ideas, e-concept will exert a great impact on social life style. In this sense, e-commerce is just a subset of e-concept.

E-commerce gives impetus to the development of society and provides broad space for future, though it is merely a subset of e-concept. The development of e-commerce may transform the whole social operation regulations, so the e-concept will exert much more influence on the society, no matter in depth or in scope.

The significance of e-concept lies in that it makes people grasp not only radical changes of new things but also the root of all changes brought by e-concept in e-times so as to promote greater social changes.

1.1.3 E-commerce in China

Though computers have been widely used in our country over the past 50 years, e-commerce is only with a history of 10 years. The first e-mail sent in Sep., 20, 1987 crossed the Great Wall to the world marked the prelude to Internet in China.

E-commerce in China can be divided into 4 phases:

1. E-commerce based on EDI (1990—1993)

The application of EDI has been carried out in China since the 1990's Since then, State Planning Commission and National Science and Technology Commission of China have put the application of EDI into the list of "the 8th Five" national science and technology promotion project. As the result, a series of EDI systems come into application, such as the import and export license EDI system of original Ministry of Foreign Trade and Economic Cooperation, PRC, Ocean/ Airway shipment management EDI system of China National Foreign Trade Transportation (Group) Corporation, the EDI system of financial affairs, petroleum, and rubber trade of China National Chemical Import and Export Corporation, the EDI system of Shandong Artex Import and Export Corporation et al. In September, 1991. The Electronic Information System Promotion and Application Office of State Council leads and coordinates original State Planning Commission, National Science and Technology Commission of China, Ministry of Foreign Trade and Economic Cooperation, PRC, Ministry of Communication of the PRC, Ministry of Post and Telecommunication of the PRC, Ministry of Electronic Industry of the PRC, The State Bureau of Quality and Technical Supervision, State Administration of Foreign Exchange, China Commodity Inspection Bureau, China Customs, Bank of China, Industrial Commercial Bank of China, People's Insurance Company of China, State Administration of Taxation, China Council for the Promotion of International Trade etc, originating to establish the Coordination Group of EDI Application and Promotion. Meanwhile, the EDI/FACT Commission of China established in October 1991 became the member of Asia EDI/FACT Council. EDI has been widely used in sectors such as trade, communication, bank etc.

2. "Three Golden Projects" carried out by governments in 1993—1997 establish, the foundation of e-commerce

The National Economy Informationization Joint Conference and its office coming into being in 1993 with the vice premier of the State Council as president, carried out "Three Goldens"(Golden Customs, Golden Card, and Golden Bridge) project and made great progress. "Beijing E-commerce International Forum" hosted by People's Bank of China, Ministry of Electronics and Global Information Infrastructure Committee (GIIC) in Beijing in May. 1994 attracted up to 700 participators from the United States, Great Britain, France, Germany, Japan, Australia, Egypt, and Canada etc. The "Asian and Pacific E-commerce Seminar" in Beijing in Sep., 1994 brought about the spread of e-concept in China. In 1995, China Internet became commercialized and network companies began to rise.

State Council National Informationization Team was set up in Jan. 1996 with the vice president as the group leader and more than 20 ministries as its members

to lead the construction of information. And it is in 1996 that China got Internet connected.

National Information Office organized some departments involved to draft and draw up the program of China informationization. National informationization working conference was held in Shenzhen in Apr., 1997 and soon after informationization executives of different provinces, cities and areas began to come into being and carried out informationization construction programs, including construction of e-commerce. Advertising companies began to make advertisement on line. China Goods Ordering System (CGOS) has been put into practice since Apr., 1997.

3. E-commerce based on Internet since 1998

The first Internet transaction in China succeeded in Mar., 1998. China Commodity Trading Market was declared to come into being in Jul., 1998, which was called "Never Closed China Export Commodities Fair (Guangzhou Fair)". China Commodity Spot Transaction Market was the first spot transaction market for e-commerce with transaction volume up to ¥200 billion in 1999. China's first e-commerce application system based on SET security standard was released by Bank of China and Teledata Bureau with the Bank of China in Hunan Province as its experimental unit. Committee of Economy and Trade and Ministry of Information Industry declared to start the "Golden Trade Project" centering on e-commerce, a large-scale experimental project to popularize the application of Internet and to carry out e-commerce in commercial and trade circulation domain. Beijing, Shanghai and many other cities have started to e-commerce Engineering, opened the experimental units of electronic shopping center, electronic shopping market, online shopping and transaction, built up financial and non-financial certification authority, made corresponding laws and regulations to lay a foundation for future e-commerce. Medical e-commerce network was put into operation in 1998, in which ten thousand enterprises and public institutions in medical and health industry got connected and information of over thousands of Chinese Traditional medicine and Western medicine was provided. National reconciling inventory network, national online construction and real state online promotion and many others have opened up.

The B2C websites such as 8848 formally opened in Mar., 1999, which shows that online shopping has come into application stage, such as the presence of online governments, online enterprises, online taxation, online education (online universities of Hunan University and Zhejiang University), and remote diagnosis (many large hospitals in Beijing and Shanghai).

4. The pragmatic development phase in 2000

E-commerce focuses on the traditional B2B. E-commerce service providers have turned to reality market from venture capital market and some successful businesses

have emerged. E-commerce software and solutions developed by domestic enterprises or domestic enterprise-oriented have dominated the market with the perfection of exterior environments such as infrastructures; the perfection of application methods of e-commerce; the maturity of market for e-commerce; and the rapid localization of e-commerce software and solutions. The e-commerce in China has taken its initial shape.

E-government has come into the overall implementation stage in 2002. National government procurement investment of 35 billion (hardware 25 bilion, software 4.5 billion, and information service 5.5 billion) has increased by 25% compared with the corresponding period of the former year. *Instructional Advice on China's e-government* given out by National Information Office in Jul., 2002 proposed the following three measures: ① Construct two universal e-government network platforms, the interior for official business and the exterior for different business enterprise sectors, enterprises and public. ② forge ahead the "12 Golden projects" construction (golden taxation, golden customs, golden financial affairs, golden audit etc.). ③ speed up strategic data base construction (information data bases of population and agriculture etc.). Domain names applied by government departments at all levels in China increased to over 7796 in Dec., 2002 from 4615 Jan., 2001. In the developed coastal provinces, the rural governments have got Internet connected. Governments at all levels have released governmental information in the Internet and opened channels for public communication and service. Many a local government has set up the masses-oriented information release inquiry systems and "Mayor Mailbox" and "Government Mailbox" to facilitate the public's participating in the management of state affairs. The overall implementation of e-government forcefully speeds up the development of e-commerce. The gradual perfection of the e-commerce environments (network infrastructure construction, legal environment, market environment, online payment, information security, certification authority construction etc.) and the constitution of national corresponding polices, laws and regulations on e-commerce have provided the fundamental conditions for the development of e-commerce. Network bandwidth has increased. The international export gross aggregate bandwidth reached 82.6G in Jun., 2005; the number of wide band access users has reached 53,000,000, exceeding the number of user surfing the net by dialing-up for the first time. National modern credit system has made material progress. Real-time payment system for a large amount of cash in Beijing, Wuhan was successfully put into practice on Oct. 8, 2002, which have been popularized in economically advanced cities such as Shanghai, Tianjin, Jinan, Shenyang, Chengdu, Xi'an, Shenzhen, and Haikou etc. Moreover, a national cross-banks, cross-areas information exchange network of credit cards had taken its initial shape by the end of Feb., 2003. Great achievements have been made in distribution. For example, China Post, the most powerful network transfer in China, joined the e-commerce, and some professional distribution enterprises for e-commerce projects came into existence one after another.

China government attaches much importance to the security related the application and development of e-commerce. For example, industry security CA has been organized with Telecom, Customs, and People's Bank of China as initiators. CA'S have come into existence in Shanghai, Guangzhou, and many other cities. Much attention has been paid to the development of corresponding core technologies of security standard, electronic signature and password system, and investment in such fields has been intensified. Corresponding laws and regulations have driven to maturity stage and many laws are in embryo. For example, in 2005 electronic signature law was put into practice.

Current situation of e-commerce in China is as the following:

(1) E-commerce in China is still in its initial stage.

(2) The application of e-commerce in China is still of its primary level. Most e-commerce is non-payable, that is, online sales and offline payment; a small part is paying, that is online sales and online payment; some even make cooperated-commerce.

(3) Minority of ten million enterprises in China has got Internet connected, carried out online marketing, to say nothing of online procurement. Majority of medium and small enterprises and a small fraction of large and medium enterprises have not carried e-commerce. In other words, enterprises are less information-based and have not become the main force of e-commerce.

(4) Most e-commerce websites in China are making electronic information research, making e-advertising, e-catalog, e-inquiry, exchanging commodity information on line; minor enterprises make such e-transaction on line (e-bargain and ordering), as making business negotiation, signing contracts, exchanging documents on line; few enterprises complete e-shopping and e-payment.

(5) Owing to the disparate development of different industries and areas, there are great differences in e-commerce between southeast coastal areas and the central and western areas. For the moment, metropolises in southeast coastal areas have carried out e-commerce while most cities and countryside in the central and western areas have not. However, it is likely that the new arrivals will surpass the old-timers.

(6) Various, multiple and multimodal strategies for e-commerce development shall be adopted for the following factors: the weakness of information foundation of national economy, the low-level business automation, the coexistence of traditional business and modern e-commerce, and the coexistence of traditional market and online market.

Open questions in the development of e-commerce in China:

(1) There are no clear development strategies and forceful technical and economic policies for e-commerce development. There is no specific programs for e-commerce development. Though policy frameworks for e-commerce have been drawn up for many years, no one has come into existence.

(2) Laws and regulations, standards, specifications of e-commerce seriously lag behind current situations and shall urgently be strengthened, and the unsuitable

parts in the current administrative laws have not been revised timely. For example, there are no specific laws on electronic contract, the protection of online knowledge property and privacy, online information supervision etc. What is more, there are no enforcement regulations of network crime convictions and penalization.

(3) Because of the low level of computer application, there are not many enterprises and families connected with network. In addition, information technology has not become popular in both enterprises and families. Though netizens in China has been up to 210 million by the end of 2007, it only took up 15.6% of the total population, which is relative low comparing with 19.1% of average global popularization rate. In addition, the netizens are mainly in metropolises such as Beijing, Shanghai, Guangzhou and many other eastern cites. Only not more than 15% of enterprises in China do e-commerce, which is rather low compared with other countries. For instance, 60% of the small enterprises, 80% of medium enterprises and 90% of large enterprises in developed countries do e-commerce by means of the Internet.

(4) Economy and operation environments for the development of e-commerce are not complete. For example, social credit system has not been established; the network bandwidth cannot meet the requirement of e-commerce; e-payment methods are not mature; logistics distribution system does not match its own development.

(5) The technological level and occupancy of market of home-made products in China's information industry are comparatively low. Hardware and software in significant applied engineering and systems of e-commerce are mainly from foreign companies. System integration and information service shall be improved. Corresponding standards and specifications of computer application are not universal and shall urgently be enforced. Standards of e-commerce lag behind the current conditions and apparently there is not adequate investment in it. Enterprise management systems, mechanisms, concepts and organization structure cannot meet the requirements of market economy. Apart from what have been mentioned, some leaders have not thoroughly realized the importance and urgency of e-commerce application. There are no internal force, labor force, financial and physical resources for an enterprise to adopt e-commerce. There are no adequate talents, especially inter-disciplinary for information technology and professional experts.

1.2 Influence of Related Basic Sciences on E-commerce

The development of e-commerce, a systematic engineering, basically bases on the development of many other related sciences and technologies. Sciences of mathematics, computer, communications, and management have great influence

on the development of e-commerce soft environment. The development of logistics distribution, postal service, communications, electronic technology exert great influence on the development of e-commerce hard environment. The above disciplines and e-commerce are interdependent and interactive. In this chapter, the influence of computer science, communication science, and management science on e-commerce will briefly be dealt with. As for other corresponding contents, it will be expounded in the following chapters.

1.2.1 Influence of Mathematics on E-commerce

Many branches of mathematics and mathematical models are involved in e-commerce, the multidisciplinary science. Common mathematical models involved in e-commerce will briefly be introduced in relevant sections, such as probability model, queuing theory model, nonlinear dynamic model, graph theory model and many other equally important models such as Petri Net and commercial patterns.

1. Probability model

(1) Random event and probability

In given condition, the thing that is likely to happen or not is called a Random event ("event", for short), usually represented by the capitalized letters such as A, B, C, etc. For instance, suppose tossing a coin in the homogeneous condition, heads occuring is a random event. In given condition, the thing that is sure to happen is called a certain event, represented by U. In given condition, the thing that is impossible to happen is called an impossible event, represented by ϕ .

(2) Probability model

Probability theory is a science to study quantitative law of random phenomenon in nature. Random events in probability theory can be abstracted into three models: classical probability model, geometric probability model, and conditional probability model.

(3) Probability property

① The probability(P, for short) of all random events(A, for example) shall be $0 \leqslant P(A) \leqslant 1$.

② The probability of a certain event is 1, and the probability of an impossible event is 0. That is to say, $P(U) = 1, P(\phi) = 0$.

③ If events A and B satisfy $A \cap B = \phi$, then $P(A \cup B) = P(A) + P(B)$.

(4) Relations between random events

To accurately work out probability, closely related to events, it is necessary to master the relations between probablility and events.

① inclusion and equality of events

② sum of events

③ product of events
④ incompatible events
⑤ contrary events
⑥ subtraction of events
(5) random events relations and probability calculation
① addition formula of contrary events probability

If event A is incompatible with event B, that is $A \cap B = \phi$, $P(A \cup B) = P(A) + P(B)$. For example, the calculation of the probability of "three-spot or five-spot" after throwing the dice falls into the category of incompatible events. Therefore, its probability shall be:

$$P(\text{three-spot or five-spot}) = P(\text{three-spot}) + P(\text{five-spot}) = 1/6 + 1/6 = 1/3.$$

② addition formula

The following is the formula for any random event A and B:

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

③ In dependence of events. If event A and event B satisfy $P(AB) = P(A)P(B)$, they are independent.

If event A and event B are independent, then $P(B \mid A) = P(B)$, $P(A \mid B) = P(A)$

To accurately calculate probability, it is necessary to have knowledge of the relationship between random events and several common probability models. After that, it is just needed to calculate.

2. Queuing theory model

The information flow in e-commerce runs in global Internet. When the information arrives at the computer's intelligence node, it will flow to the next node, which needs processing by processors (called "service" in queuing theory). If information to be processed at the node is beyond the processing capacity of the processor, the information has to queue for processing. How long will the information has to wait for service? What is the length of the queue? How to arrange the queue to ensure the shortest queue, the lowest cost and the best service? All above problems will be studied in queuing theory.

The model of queuing theory is shown in Fig. 1.3.

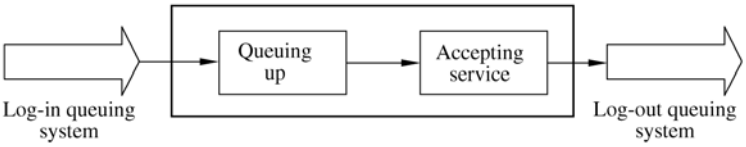

Figure 1.3 Queuing Theory Model

That is, the information arrives at the service window according to some law, queues for service in terms of some laws and leaves after getting service.

The following factors in queuing theory influence greatly on the whole process: F (laws of event arrival), S (service regulations), and M (numbers of service windows), by which we can express the mathematical models of queuing with the F/S/M in queuing theory. If a model with poisson's distribution as the event arrival, exponential distribution as the queuing discipline, "first come, first served" regulation as the service regulation, and the service windows being 5, its queuing model can be expressed by M/M/5.

The queuing models in common use contain the M/M/S model (arrival and treatment are all exponential distribution, and the number of service windows is S), M/M/S (the arrival distribution is the exponential distribution, treatment distribution is random distribution, the number of service windows is S) and privileged M/M/S (Data are treated on a priority basis).

3. Nonlinear dynamic model

Nonlinear science, a front-line science, is to study nonlinear phenomena in various subjects. It is a multidisciplinary science based on branches characterized by nonlinear, and is called the third revolution of natural science in the 20th century. The birth of nonlinear science reveals that people's cognition of things always goes from the easy to the difficult and complicated, and will gradually be deepened. Achievements of sciences make people enamored of the natural harmony and perfection, and form the idea that any complicated natural phenomenon can be described by a simple law or a set of specific mathematical equations. It is almost agreed by all physical scientists that universal fundamental laws are decisive and reversible, among which Newton's Second Law, $m\frac{\mathrm{d}^2x}{\mathrm{d}t^2}=F$, is the representative (m for particle mass, x for position vector of particle motion, F for external force). Actually it is not always the case, for there are the coexistences of both reversible and irreversible evolutionary processes, both determinacy phenomenon and chance phenomenon, both future incorporated in the past and future unincorporated in the past. Prigogine's "Dissipative Structure" theory questioned the symmetry of time, supplied new theory for the study of complicated phenomena in nature and therefore won the Nobel Prize in 1997. Presently, dissipative structurology, chaos, bifurcation, mutation theory, fractal theory, synergetics, cellular automata complement with each other. Accordingly, the nonlinear dynamics, a multidisciplinary to study complicated phenomena, comes into being.

Mathematical models studied in nonlinear dynamics contain dissipative structurological model, chaos model, bifurcation model, mutation theory model, fractal model, synergetics model, cellular automata model.

It is difficult to describe chaos model, fractal mathematics model, synergetics model, and cellular automata model with specific mathematical equations. Much of nonlinear dynamics can be applied to e-commerce. For instance, chaos and

cellular automata have been used in e-commerce encryption, and fractal theory has been extensively applied in dada compression field, which meets the requirement of high data compression ratio of (100∶1) – (1000∶1). The mathematical formalisms of these models will not be listed here for they are so complicated that they cannot clearly be explained by general advanced mathematics. Readers who are interested in this can refer to pertinent literature. Various mathematical models shall be, without doubt, adopted to study Internet, an open and non linear system. For instance, cryptographic algorithm frequently used in e-commerce security is from the research of nonlinear dynamics.

4. Graph theory model

Graph theory model is a powerful tool to depict discrete topology. There are always diagrams composed of "node" and "edge" in computer network study and computer program flow analysis. In the computer network constituted by these "nodes" and "edges", the intelligent node are regarded as nodes and the closed path between node as "edge". The knowledge of graph theory will be used in the selection of the routes etc. in information transmission. A graph G is comprised of vertex set V and edge set E. The following are models in graph theory.

(1) Directed Graph Model: The connectivity of vertex is with aeolotrophy, that is, the connectivity from vertex A to vertex B does not mean the connectivity from vertex B to vertex A. Figure 1.4 is an instance of Directed graph model.

(2) Undirected graph Model: The connectivity from vertex A to vertex B means the connectivity from vertex B to vertex A. Figure 1.5 is an instance of undirected graph.

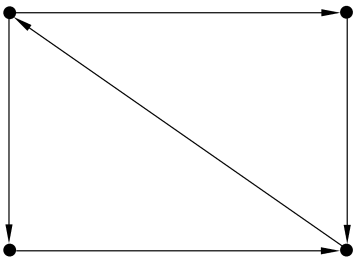

Figure 1.4 Directed Graph

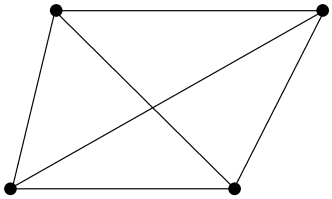

Figure 1.5 Undirected graph

(3) Complete Graph: Graph G is called a complete graph if there is always a edge to connect any two vertexs of the vertex set G. Figure 1.6 is an instance of a complete graph.

(4) Connected Graph Model: If there is a path from vertex U to vertex V, U is accessible to V. If any two vertexes in graph G are all mutually accessible, the graph is called strongly connected. Figure 1.7 is an instance of strongly connected graph.

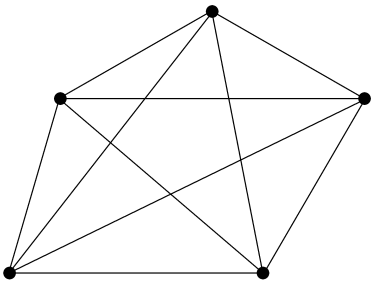

Figure 1.6 Complete Graph

Figure 1.7 Connected Graph

(5) Euler Graph Model: In graph G, Euler's circuit refers to the circuit which passes each edge once and only once. In the Euler's circuit, a vertex can be repeatedly passed. Figure 1.8 is an instance of Euler graph.

(6) Hamilton Graph Model: In graph G, the circuit that passes every vertex once and only once, is called the Hamilton circuit; if there is the Hamilton circuit in G, G is called the Hamiltonian graph. Figure 1.9 is an instance of Hamilton graph.

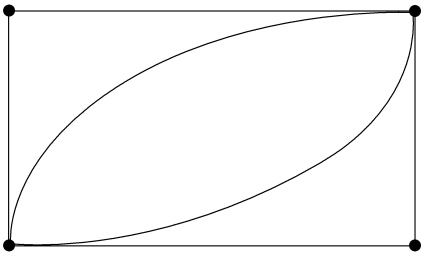

Figure 1.8 Eulerian Graph Model

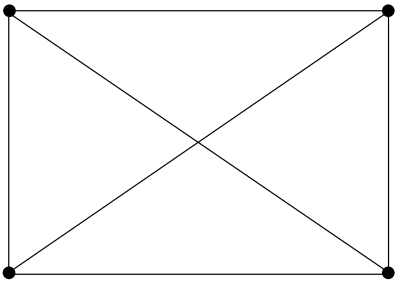

Figure 1.9 Hamiltonian Graph

(7) Matrix representation of graph: Though graph is intuitionistic, it is difficult to deal with by computers and brings inconvenience to the graph study. The representation of matrix, another representation of the graph, is introduced by scientists to overcome the shortcoming. Supposing the number of vertexes in graph G is m and the number of edges is n, the matrix of graph G, $m \times n$, can be expressed by $A = [a_{ij}]$, among which element a_{ij} can be determined by the follows:

$a_{ij} = 1$ if vertex i is connected with vertex j by a edge

$a_{ij} = 0$ if vertex i is not connected with vertex j by a edge

A, called the adjacency matrix, facilitates the analysis of a graph, by which the length of directed circuit, undirected circuit, unconnected circuit and connected circuit can expediently be researched.

1.2.2 The Impact of Computer Science Upon the E-commerce

E-commerce is based on electronic information technology, in which information storage, information exchange and information processing are all carried out by computers and Internet. Accordingly, the development of computer science and computer technology have a decisive effect on the development of e-commerce. Since the birth of the first computer with vacuum tubes, electronic devices have gone through the following steps: vacuum-tube circuit, transistor circuit, integrated circuit, large scale integrated circuit (LSI, for short) and very large scale integrated circuit (VLS1, for short). With the improvement of electronic device manufacturing technology, there emerge minicomputers, large computers and parallel computers. The computer technology, the core of information technology, has gradually become mature after the development of half a century. The computer system is developing to become intelligent, integrated and comprehensive. The birth of multimedia technology enables computers to process various information, such as graphs, texts, voice and images.

The success of specialized application software extends the application scope of computers from the single calculation to almost all application fields. The new technologys of computer network and data base a achieve the better share of software, hardware, and information resources within a shorter time, gathering and processing of information cooperatively within an extensive range. The global information revolution has been brought about by a series of breakthrough of digital technologies and the universality of computers and Internet. TCP (Transfer Control Protocol) / IP (Internet Protocol) translates the traditional network into the universal computer network. In addition, emergence and development of new technologies closely related to e-commerce, such as VPN (Virtual Private Protocol), Gigabyte Ethernet wiring system and modem, shape and urge the development of e-commerce.

The computer network has already become principal platform of e-commerce. The universality of TCP / IP greatly facilitates the transmission of information between the networks conveniently, lowers the cost of information acquisition; the emergence of routing technology and the continuous creative innovation of the routing algorithms give full play to network, thus comes the global outburst of Internet. At the same time, the rapid development of the intranet and extranet, based on IP, has turned into the foundation for enterprises to carry out e-commerce. The emergence of WWW technology leads to the boost in Internet users and makes online information more abundant, colorful, multimedialized and easy to accept. The wireless communication is heading for datamation and high bandwidth. For instance, the GPRS technology can realize the bandwidth of 115 kbps, the 3G mobile communication technology can realize the bandwidth of 2 Mbps and WAP has been widely approved and put into application.

Computer network system integrates the technologies of digitization, network and software, and makes telecommunication possible by computer network and computer intelligence node control technologys. It is the telecommunication that enables the rapid development of a series of long-distance applications, such as so called distance education and distance medical treatment etc. Therefore, the implementation of e-commerce is closely related to the development of computer network, and it is the development of information technology that speedups the development of e-commerce. Computer languages have developed, from machine language, to assembly language, advanced language and even to the intelligence language, and many operating system softwares (e.g. DOS, Windows, UNIX, and Linux), business softwares (Office series, Windows series, LOTUS-1-2-3 series), application softwares (Oracle, Sybase, SQL Server, DB2 data bank system software etc.), specialized application softwares (CAD / CAM, MatLab and financial software) and integrated development softwares (e.g. Power Builder, JBuilder, Delphi). All the above changes speedup software development, free people from the tiresome mental work of source code compiling to satisfy the basic need to assemble many basic software modules of excellent functions. The data base technology, the key technology of e-commerce, cannot only store all kinds of information (e.g. articles, transactions, and consumers) but also provide market information and decision-making basis by rearranging and analyzing data. The key factor to ensure the popularity of e-commerce is the security of information, for which various encryption technologys such as symmetric key encryption and public key encryption are developed to provide the basis of information privacy. In addition, technologys of firewall and intrusion detection keep information from being destroyed and stolen illegally.

If software design is compared to the construction of modern buildings, in the past it started by mixing pug, baking bricks, picking stones and burning concrete all by manual labors, while presently it is like the construction of a modern building with existing bricks, concrete, and a large number of prefabricated blocks by modern rooters, land scrapers, stirring mills and cranes. Accordingly, much energy can be concentrated on building design and construction management, which enables people to develop e-commerce software at their pleasure is the precondition for the popularity of e-commerce in all industries and work units of all sizes.

1.2.3 Impact of Communications Science upon the E-commerce

In e-commerce, communication system is the carrier of information flow and capital flow, and exchanges and transmission of information are both carried out through communication network consisting of transmission, switch, terminal equipments, signaling, protocol and corresponding operation support systems. It

is necessary to build up wide communication channels for information transmission and exchange of e-commerce network. The rapid development of contemporary communication technologies laid the foundation of e-commerce vomitorium.

The birth of digital computerized telephone switching technology lays the foundation for modern digital communication technology. Its popularization brings about the global development of communication network and becomes the significant support network for the rapid development of Internet. The maturity of optical communication technology, especially the rapid development of the wavelength division multiplex (WDM, for short) promotes the sharp rise of bandwidth of principal networks and provides the guarantee for the extension of network and the smooth transmission of the expanding information. Moreover, the progress of wireless communication technologies such as mobile technology and satellite communication technology supplies the new way to achieve the universal overlaying and flexible application of information network and lays the foundation for the extension of e-commerce to wireless application fields.

Telecommunication network is the key to informatization. Presently, it is no longer a single tool for transmission but the integration of many technologies. It is the presence of data information network that extends communication coverage promotes communication to enter into the service stage and leads to the birth of such business based on public data network as e-mails, e-data interchange, e-numbering book, e-bulletin board system and e-commerce. Strictly speaking, all above business belong to e-commerce in a broad sense. Computers of different places and functions, terminals, and various accessory equipments are connected by computer network, a large-scale, powerful network, with communication routes so as to achieve information share in communication process, thus achieving information transmission and share of hardware, software, and data information between enormous computers.

Thanks to the combination of computer network and communication network, enormous computers can simultaneously process texts, data, images and voice etc. The above information can be available everywhere and exchanged within China or the world. Network system provides necessary methods for information exchange and transmission, the core of e-commerce. e-commerce will be groundless without the development of communication technologys and information exchange and transmission. The development of e-commerce demands for higher and higher communication. Safe, high-speed network transmission and multimedia communication have been the inevitable factors to carry out e-commerce.

The mobile communication (the information transmission process in which both parties or at least one party involved carry out information exchange while moving) is the determining technology for information exchange, usage, processing, and releasing between any communication subjects all over the world anytime and anyplace and the core technology to realize Mobile-commerce.

Internet is the technical foundation and indispensable for e-commerce. The development of e-commerce will definitely make greater demands on the communication technology and boost the development of communication technologys; the development of communication technologys provides technical support for new applications of e-commerce. Vice versa, along with the extension of e-commerce applications, the communication infrastructure network can carry on larger-scale information flow and this requires continuous increasing of infrastructure network bandwidth.

At the same time, e-commerce requires data informatization and challenges the traditional communication mode, and data informatization will become mainstream direction for communication network development. For e-commerce clients, a high-speed route of entry is required for online shopping and online work, which proposes the request to bandwidth. E-commerce application, the mainstream application of information network in the future, will definitely exert great influence on current communication network structure and communication mode.

1.2.4 The Impact of Management Science upon E-commerce

Because management theories conforms the objective economic environment, management technologys vary in different development stages. At the classical management phase, the focus of management is to raise labor productivity by managing equipments and staff manually with strict regulations.

Because this phase falls into the category of the seller's market, a tight market, the main task of governors is to increase labor productivity and supply. In the behavior management phase, the focus of governors is to transform the volume-produce mode into small-lot versatile production mode. The competition has changed to the service of how to meet the customer's requirement from pure price competition. In this phase, supply has been guaranteed, customers began to push forward their claims for high-quality products. Products of low-quality are difficult to sell. Since the main task of the administrator is to sell out their commodity, commodity of high-quality, small lot and diverse types should be manufactured to satisfy various requirements of customers.

In the phase of strategic management, administrators have began to make and carry out decisions dynamically, continuously and adapt themselves quickly to changing internal and external conditions to balance stability, continuity, suitability, and innovation. In this phase, enterprises made use of internal resources and information comprehensively, and collecting and processing of information proposed higher quest to management measures. Therefore, computers entered traditional manual operation management fields that cannot adapt to the development. EDI has made full-grown development.

In the times of enterprise reforger, enterprises, facing the never-ending changes, improvements and fierce race, are crying for regrouping of operation flow to improve enterprise operation status and efficiency. Regrouping of operation flow is the effective path for enterprise to regain competitive power and vitality. The implementation of Business Process Reengineering (BPR, for short) needs two foundations, that is, modern information technology and high-caliber talents. The need of information processing facilitates the extension of computers in enterprises and the rapid development and popularity of management information system (MIS, for short) and decision support system (DSS, for short), thus accelerating the rapid development of computer hardware and software, computer information processing technology and message-switching technology as well as setting up the foundation for the development of e-commerce.

In the organizational management phase of globalization and knowledge economy age, the waves of informatization and globalization spread all over the world rapidly. Because of the arrival of the knowledge economy, information and knowledge become significant strategic resources. Only by organizing the global resources reasonably and winning the support of the global customers may enterprises exist and develop. To reasonably organize the global resources, apart from multinational corporations, virtual enterprises also come into being. Accordingly, an upsurge in “virtual organizations” is coming, which makes greater demands on information acquisition, information processing, and information utility than the former periods. It is this objective need that requires enterprises to connect the former systems of MIS and DSS, speedups enormous progress of Internet with the function of information communication and releasing, and perfects the infrastructure of e-commerce.

To sum up, because any technical progress is based on commercial demands, e-commerce technology, a technology to process, acquire, and make use of information, is no exception. Therefore, the demand of management pushes forward step by step the development and technological perfection of computers, information processing and information transmission to the greatest degree organic integration of e-information technology and management technology. Management promotes e-commerce development by this means.

1.3 Categories of the E-commerce

Advanced digital technologys, combined with enterprises and customers of these technologys, boost e-commerce. Similar to digital technologys, e-commerce cannot reach its goal in one move. As to enterprises and customers, e-commerce of different types and levels imply different opportunities.

In terms of transaction categories, e-commerce falls into five categories:

business to business (B2B), business to customers (B2C), business to governments (B2G), governments to governments (G2G), and customers to customers (C2C). B2B, the mainstream in e-commerce and the principal method to improve competition ability in the competitive market, has come into existence for many years with the characteristics of carrying out commercial activities by EDI via special networks or Value-Added Networks (VAN, for short). B2C takes place between business and customers, in which online sales are carried out by Internet, such as the online bookstore Amazon. In recent years, the increase of number of netizens and new transaction platforms created by Internet for enterprises and customers speedups the rapid development of e-commerce. With regard to customers, it is unnecessary to set an unified standard for document transmission because only credit cards, e-money or e-wallet are involved in online sales and payment. In addition, searching and browsing functions and multimedia interface supplied by Internet facilitate consumers to look for and give an insight into products wanted. B2C has enormous potential and will be the main drive for the development of e-commerce. B2G, the business between enterprises and governments, is still in its experimental phase, focusing on administrative management, governmental invitated tender, and the implementation of various economic policies etc. C2C, the individual consumption behaviors, has not yet taken shape, such as the second-hand market. But along with the development of B2C and B2G, all countries will perfect the personalized services in e-commerce. In the following sections, the above five basic e-commerce categories, the common ones in e-commerce, will be analyzed in detail.

1.3.1 B2B

In the five categories, B2B plays central part and will be the mainstream in the future, for the following reasons.

1. Volume of business transaction of B2B takes up the majority of the total trading volume in e-commerce

Data shows that B2B transaction volume reached $109 billion in 1999, taking up 78% of $139.6 billion of total e-commerce transaction volume, and reached $455.7 billion in 2000, taking up 83% of $496.2 billion of total e-commerce transaction volume. The above data show that the proportion of it is increasing with each passing year. Because the B2B transactions take up the dominative share in e-commerce market, more funds flow into B2B companies, and thus make them remain invincible position in the prospective market and go invariably from strength to strength. From the economic standpoint: capital usually flows to the fields where more profits can be obtained. Capital flow will definitely bring out the capital accumulation and gradual increase of the market

share of B2B companies, thus enabling B2B companies to become the main force of e-commerce.

2. The B2B e-commerce companies hold an advantage in lowering operation cost

The online business of B2B companies covers production, supply, sales, or purchase, transfer and storage, which are so extensive that it can provide many ways to reduce the cost: First, reducing procurement cost by purchasing multitudinous commodities of single kind. Second, reducing production cost by shortening production period. Third, reducing operation cost by efficient inventory control. Fourth, reducing sales cost by global batch sale. The advantages of above ways are incomparable to e-commerce company of other categories.

3. B2B e-commerce companies are more suitable for modern logistics management

The logistics distribution plays a prominent role in all the commercial activities of e-commerce companies. There will be no cycle of operations without logistics. Even though there is external logistics, its expense will directly influence the achievements of e-commerce companies. Compared with other e-commerce companies, the characteristics of B2B companies logistics are fewer in times and large in quantity, while logistics of other e-commerce companies are characterized as small in quantity, more in times and high in turnover speed. According to statistics, B2B e-commerce companies are more competitive than B2C e-commerce companies in reducing logistics dispatching by 20% – 60%.

4. B2B e-commerce companies are competitive in guaranteeing credit and capital security during operation course

Credit and security will ever hinder the rapid development of e-commerce whether in the past, at present or in the future, which will obsess e-commerce companies for a long term as long as the complete e-commerce activities are carried out on Internet. As for the credit issue, it is a hard nut to crack, because B2C companies have thousands of clients and it is difficult to explore the credit of clients. Additionally, the frequent less in quantity and more batch online payment make clients more worried about the security of online payment, which will seriously affect the B2C companies to seize commercial opportunities.

Contrary to B2C companies, it is easy for B2B companies to inspect and identify the credit of their trade partners, because of their operation methods, fewer in batch and larger in quantity. Moreover, payment categories of special-purpose communications link of bank networks is adopted to guarantee the safety of capital flow. This will speedup the development of B2B e-commerce companies with less batch and client stability.

5. E-commerce of B2B is more mature in both theory and practice

E-commerce of B2B involved here refers to e-commerce of B2B based on

Internet. Actually the e-commerce based on EDI at the beginning of the 70s of 20th c is typically B2B e-commerce. However the costly VAN at that time hindered the numbers of trading partnership of e-commerce based on EDI. In other words, e-commerce takes the form of B2B at the very beginning. Thanks to its history, long-term practical experience and mature theory and practice, B2B categories will lead the development of e-commerce operation, thus boosting positive shape of B2B categories.

From the above, B2B e-commerce companies will become more competitive in the fierce competition, and B2B categories will become the main categories of e-commerce in the future, to which great importance shall be attached. According to experts, global e-commerce has already entered the third stage. The first stage, attention economy presented by Yahoo. The second stage, professional network economies (B2C, C2C) with Amazon and eBay as representatives of. The third stage, integration economy, characterized by intermediary services supplied by ASP, facing the four elementary markets (e-market, e-channel, e-procurement, e-enterprise etc.) by Internet and B2B e-commerce to boost the interaction of new economy and old economy. The era of B2B e-commerce is coming.

1.3.2 B2C

In B2C (Business to Customer) e-commerce, Internet is resorted by businesses or enterprises to provide customers goods and services via websites. Presently, various types of B2C websites spread all over Internet to supply customer a variety of goods and services, varying from flowers and books, to computers and cars etc. Because of the restrictions of a variety of factors, e-commerce of this categories only takes up a small proportion whether at present or in the far future. Nevertheless, in the long run, B2C will rapidly develop and be a great part of e-commerce ultimately.

From the perspective of the business relations between enterprises and customers, B2C falls into two categories: seller (enterprises)—the personal buyers, and buyer (enterprises)—the personal sellers.

Seller (enterprise)-personal buyers, is the categories in which enterprises sell goods and commodities to individual customers. In this e-commerce categories, the sellers first open an online store, then release the information on variety, specification, price, and capability of the goods or on variety, price and measures of service, by which the individual customers choose goods, place an order and decide to make online or off-line payment, and last deliver goods to the customers. By this kind of online shopping, customers can acquire further information on goods, shop around, purchase goods at the lowest cost and save shopping time without going outside. Without doubt, this e-commerce categories requires the support of high-efficient, low-cost logistics, the representative of which is the global distinguished online bookstore Amazon (http://www.amazon.com).

Enterprise personal sellers, is the category in which business purchases goods or service from individuals. This categories is usually used for online job application. For example, many enterprises advertise various job offers in Shenzhen Human Resources Network (http://www.szhr.com.cn). By this categories, enterprises release information on needed talents at first and then appliers negotiate with enterprises online, which is very popular in this society with big talents flow for it offers a communication platform and bridges the enterprises and individuals, thus making full use of human resources.

E-commerce of B2C can be divided into tangible and intangible goods and services, of which the latter can be completed by network, while the former cannot unless the traditional methods are resorted to.

Thanks to the information transmission and processing abilities of computer network, intangible goods and services (e.g. e-information, computer software, digital audiovisual entertaiment products, etc.) in general can be presented to customers directly via network. E-commerce categories of intangible goods and services are mainly online subscription categories, advertisement-supported pattern and online domination categories.

1. Online subscription categories

Customers subscribe intangible goods and services provided by enterprises and can consume them directly on line. This categories is mainly used by some online enterprises to sell newspapers, magazines and programs of cable TV.

The online subscription categories are shown as follows:

- Online Publication. Publishers supply customers e-publications via Internet besides the traditional ones. Online publication merely releases e-journals, which can be downloaded by consumers by subscribing. This is not an ideal categories for information sales, because common users will give a wide berth to the charge information service in information era, though it is rather low in price, since information can be obtained from various channels. Thereby, some online publishers adopt double-track system (the combination of free reading and charge subscription) to maintain certain business return by attracting a quantity of consumers.
- Online Services. Online service providers provide multiform online information services by fixed monthly charges. The online service providers have their own specific client mass in general. For example, the client mass of American On Line (AOL, for short) is the household consumers, and that of Microsoft network is Windows users. The subscriber can enjoy various services of information by paying monthly. Online services generally aim at the definite social community to develop consumers' loyalty. In the United States, each computer sold preassembles free-trial software. The strong marketing offensive of the online service providers makes the steady upswing of their consumers.

- Online Entertainment. The service categories has achieved a measure of success and is greatly interested by people. Online amusement providers provide customers online games by charging certain subscription fee. At present, network games have become one of the network focuses, and Microsoft, Excite, and Infoseek etc. have made positive response to it. Actually, the network operators have already shown great foresight to obtain access frequency and loyalty of consumers by some free or cheap online amusement.

2. Advertisements-supported categories

Online service providers provide customers online information service freely and obtain income from advertisements published in the websites. This is the most successful categories, though it does not directly charge from customers. For example, many online search service websites such as Yahoo maintain operation by charge advertisements. From the standpoint of netizens, information search is the basis to locate information needed in the information sea of Internet. Therefore, businesses also are willing to release advertisements in information dragnet, which enables customers to login directly into the websites of enterprises. The success of these online service providers depend mainly on that their web pages can attract a large number of advertisements and the attention of a large number of customers.

3. Online donation categories

This categories is usually adopted by software companies to submit software to customers to improve its popularity and market share. Some software companies offer alpha-version products to Internet users freely. As for the users, they can try out the products by downloading or feedback their advice or suggestions to software companies. After a period of trial, if satisfied, the customers may purchase the formal-version software. Software companies can lower cost, expand trial community, and improve testing result and market share. The American Netscape Corporation adopted this method to popularize its browser, thus dominated the browser software market and made outstanding achievements.

E-commerce categories of tangible goods and services. Inquiry, ordering and payment etc. of tangible goods can be carried out online except the ultimate delivery carried out by traditional methods. This e-commerce categories is also called online sales. Currently, businesses adopt the following two types of online sales: One, set up independent online virtual shops. Two, participate in and join online shopping mall. This categories broadens the channel of online sales and offers more opportunities to the company. Compared with the traditional store retailing, even if the scale of the business is very small, online sales still can spread all over the world. Different from common tangible stores, online shops have no large stock. If it is a pure virtual shop, it can send orders directly to manufacturers or wholesalers, thus saving storage and cost inventory to a great extent.

In the eyes of the business administration, enterprises can adopt the following strategies to develop B2C:

(1) Appropriate strategies. Because of profound changes of relations between enterprises and customers, there came new value chain and value chance. The most important about e-commerce is to determine their goods. For example, when doing B2C e-commerce, the company is to develop new products or services or to extend the market of the current goods or services. Different strategies will bring about different performances.

(2) Coordinate market channels. The development of B2C e-commerce will undoubtedly bring about the extension of market channels and probably impact the existing channel relations, which needs the administrators' effective coordination. The online marketing channels of B2C with originally traditional marketing ones can mutually facilitate, thus bringing more benefits to business. For instance, the retail business can facilitate the communications between business and consumers, enhance the original market channels and improve market share by releasing wide-ranging, well-illustrated goods information on line and update it timely, or provide customers technical support via Internet.

(3) Strengthen the supervision of the information. In e-commerce of B2C, the business can release the exuberant information of background, products or services, and electronic advertisements via Internet at lower cost to extensive potential market. This kind of information publication is closely related to its market competitive position. Because the information released by enterprises must be beneficial to improve corporate image, brand popularity and reputation and go beyond the original market dealing barrier, the enterprise should carry out market investigation and filter information carefully. The information management (IM) operations of the business are at the request to pay attention to the interaction with consumers on Internet, customer acquaintance by information communication and service of more valuable information, thus forming the exclusive market competitive advantage.

(4) Reinforce transaction price supervision. Business of B2C should release real time price of products. When setting the prices of online products, enterprises have to take into account whether its price is in accordance with the product price structure of the traditional market. To be simple, the business can adopt standard pricing strategy in both the traditional market and network market. But this pattern can cause the conflict with the spatial pricing policy of the business. One of the solutions is to adopt differentiation pricing policy with the list of various dispatching cost so as to prevent unfavorable market feedback.

1.3.3 B2G

Governments, as national administrators, play a significant role in guiding, administrating and adjusting economy. The advent of e-commerce age put forward

the new request to the original functions of governments. Governments should administrate e-market effectively and render better service to enterprises and the public by e-government on the one hand. Governments, as the "big clients" in economy should take the lead to adopt e-commerce and offer efficient path through electronic tender invitation for government procurement on the other hand.

Following requirements to B2G are necessorry:

(1) Commodity spot market

Gather, classify, and summarize the information of the wholesale article and the retail article efficiently by making use of e-commerce form for macroanalysis in many aspects. Main aspects: ① Steer the structure of commodity production in case of "market being out of order". ② Control the capacity and circulation of ineffective articles. ③ Crack down the production and distribution of counterfeit and shoddy products.

(2) Second-hand market

As for the second-hand market, governments should learn the overall condition timely by electronic network: what kind of second hand are of high exchange rate, what kind of second hand are of the low exchange rate, what belong to the normal commodities trading range, what article should obey the special commodities trading policy, for example: when dealing with cultural relic, governments should play an active role in leading people to trade accurately, reasonably and legally because article condition of cultural relic is more complicated than stock-in-trade.

(3) Commodity market in the Future

It is necessary for governments to monitor commodity market in the future, because it is incomprehensive to consider commodity production only from the perspective of customers, manufactures and circulation. For instance, excessive consumption of raw materials and resources and environmental pollution have to be considered from the perspective of the national collective interests. Moreover, governments are responsible for putting forward requirements of commodity favorable for the interests of people and nationality.

(4) Commodity purchasing

Government, as a big client (community), should make use of e-commerce to purchase commodity, which is of high-efficiency and low-cost on the one hand, standard, open, just and fair on the other hand, thus lead enterprises in production and circulation fields to manufacture and sell commodities efficiently and economically by adopting e-commerce.

Governments undertake large numbers of social, economic, cultural and service functions, and as "visible hands" in particular, they play a significant role in coordinating market economy and keeping markets from being out of order. At the age of e-commerce, the governmental supervision is definitely to change when enterprises apply e-commerce to produce and operate, bank realize the finance electronicization, and customers carry out online shopping.

E-commerce age is an information-based and digital age. Governments always

play an important part in guiding, managing and adjusting economies. In the new age, it is required that governments adopt the modern means to manage the economies, and specify e-commerce market so as to sustain the healthy and continuous development of national economy. Governmental functions can be carried out online, that is the forming of e-government which will become an important component of e-commerce supporting environment.

1.3.4 G2G

Governmental e-commerce requirements in social production and commercial activities can be divided into the following categories: participation, statistics, service, leading of production, circulation, consumption etc. Original national information system is mostly made up of national, provincial (municipal), local (municipal) organic statistics systems or multilevel statistics bureaus. The statistics system is mainly to aim at serving state-owned economy and enterprises with urban and rural survey teams attached to statistics bureaus as organizational guarantee to set up the foundation for macro decision making by collecting, processing, disposing data of industrial and agricultural production.

But along with the advance of "two fundamental transformations" in our country, the intensifying of opening up to the outside world and reforms, the transfer of the initiative of market economy from manufacture to circulation, the original statistics system lag behind, because the methods of plan rather than actual measurement, part rather than whole, sampling rather than overall situation investigation are adopted. Therefore, data obtained are low in authenticity, high in error and hysteretic and it is difficult to obtain real time objective information and make real time adjustment, which becomes more and more prominent. Accordingly, it is necessary and extremely urgent to collect and process macro production data and help in macro pre-decision making by means of e-commerce.

E-commerce of administrations is to carry out the administration, service and internal administration etc. effectively on computer network by making use of the information and communication technology and to establish an assembly of organic service systems between administrations, society and the public. In general, the targets of the e-government mainly are embodied in the following five aspects:

(1) Computerization, network and information of each government sector are beneficial to improve governmental efficiency, service and supervision. The e-government positively boosts the streamline of government organs and business simplification with the help of information technologies.

(2) Administrations serve economy actively rather than passively, for which enterprises and citizens can have the knowledge of, and master governmental guideline and policies and services without the restriction of time and space.

(3) Supply the public with excellent and diversified services by making use of network and information system built up by governments. The network covers all government sectors. The e-government supplies simple diversified services by making use of the unified information resources and modern technology, such as voice and Internet etc.

(4) Advance the whole social informatization by government informatization. Display the application of the hi-tech to the community, enables the whole society to enjoy the facility of the information network, and practically boosts the social informatization.

(5) Create e-commerce supporting environments to suit the development of digital economy and to guide, layout and supervise e-commerce activities.

In e-government, online virtual administration is built up to carry out online e-government by means of Internet, a fast, cheap and vivid communication method. The establishment of e-government will boost its supervision and application functions and public service by making use of advanced electronic tools. To serve the public in a better way, government communicates with the public on line and listens to their vox populi. The polity steers the information exchange with public hearing the opinion and true feelings of the people, thus making polity serve for the community better. The functions of administrative electronicization are mainly as follows:

(1) Supervising electronicization: Because of online government, people, functions, constitution of the government sectors, working regulations and all kinds of documents are known by the public, which improves the openness of handling affairs and are subject to pubic supervision. Apart from this, online National People's Congress and online Chinese People's Political Consultative Committee make the public to have the knowledge of the procedures of legislation and proposals-making, speedups the perfection and rationality of all laws and the wide and rapid spread of all laws into the public. Actually, in Europe, there have already been the virtual congresses, by which people can participate in national affairs and evaluate laws without going outside to speedup the development and progress of social democracy.

(2) Data electronicization: Various data, files, data base that serve research and education departments and government sectors should get on Internet. Many data files of the government sectors are of great use to the community, and its potential shall be thoroughly tapped. For instance, if the conditions of all registered companies in each town are released online for reference by public, it will enable companies to know their trading partners' credit position conveniently and rapidly by means of Internet, thus effectively prevent commercial fraud to protect the merchants' interests.

The Ministry of Education can get conditions of national universities and colleges on Internet for inquiry during examination candidates registering etc., which are all listed in important public services. In addition, making various activities of the government sectors known by the public can make the public to supervise

governments, which is of great significance for exercising democracy and building incorruptible governments.

(3) Communication electronicization: Create a communication bridge between governments and the public, which will facilitate the contact between governments and the public, and people's supervision of governments on line. Governmental sectors should establish an electronic information processing center responsible for dealing with people's opinions, presenting proposals to sectors relevant and supervising the solution of the problems.

(4) Business electronicization: Another function of online government is to enable the public to deal with affairs on Internet. In the past, people had to go to different government sectors to deal with affairs. If different seals of various administrative sectors were needed, it would be troublesome and time-consuming. An electrical document data center should be set up to make all kinds of verifications and documents electronic except some procedures with physical evidence needed. If a document is involved in different sectors, it shall be kept on record. Hereafter, other sectors should all do according to the recorded one. At the same time, the public can also complete the government affairs such as tax payment and project examination and approval. Mutual communication of all sectors of government and the leaders can also contact mutually via Intranet.

(5) Market norms electronicization: Apart from online functions and contents, online governments shall build up professional trade market of corresponding sectors to promote economic advance. Particularly due to the limited capital and technology of every private enterprise, the government shall create a specialized online market, which is very important for enlivening economy and making the market flourishing. The national trade committee established by Ministry of Foreign Trade and Economic cooperation in June 1996 is an international e-commerce center which are called "Chinese commodities trading market" of "the commodity fair that never ends", where there are millions of manufacturers and products for consumers to check. This can save much more money than holding real commodity fairs, and has already sparked great interest of clients home and abroad, because it brings products to the market around the clock within the whole year. With it being an example, each ministry committee and office has already taken a lead and established various online markets, such as the capital e-commerce engineering and Shanghai commerce network. The practice "Governments set up the stage, enterprise put in the show" initiated by national departments is of authority and no duplication of similar projects on the one hand, and can attract much more participation of manufacturers on the other hand, thus bringing about tremendous benefits for social and economic development.

The government is much more than a national governor, and also a great consumer. The government purchases the public supplies each year, which accounts for 7% – 15% of GDP. Therefore, the government's purchasing necessarily involves online shopping, which includes supervision of e-commerce and the application. Currently, among the more mature e-commerce applications of

government are online tax-collection and government procurement.

1. Government procurement

The government procurement means the government at all levels, for the sake of the day-to-day affairs or providing public service for the community, purchase commodities and services for themselves and the relevant public departments according to legal procedures. In the past, when Chinese government purchased, the Ministry of Finance distributed the fund to each relevant department according to their annual expenses, then these departments purchased on their own. This practice made purchasing fund away from supervision, resulting in blind, repeated, even random purchase and unfair competition. Moreover, it often occurred that commodities of poor quality were bought at high price, even the buyers were cheated. All these not only led to waste of public fund and decrease in efficiency, but contributed to the occurrence of corruption.

Among the government procurements in the world, the procurement in developed countries takes up 5% – 15% of GDP. The procurement scale of the American federal government accounts for $200 billion annually, about 3% of GDP. The government procurement sum of all the EU countries has about 15% of the EU gross domestic product. Their common characteristic is to join WTO government procurement agreement, to open the government procurement market in order to promote the liberalization and globalization of commerce and government procurement market. The United States promulgated Buy American Act to manage the procurement market and protect domestic market while being active to tap foreign markets.

China has not yet joined the agreement on public procurement. but it has been a prominent trend that a well normalized system of government procurement is established. Generally speaking, these two things have to be done: changing the disperse government procurement into unified government procurement; procuring by open bidding. Birth of e-commerce, a new commercial method of “the electron invitation”, creates a fair environment for the government procurement.

2. The electronic taxation

The electronic taxation includes two links of electronic filing of returns and electrons settling accounts. The electron filing of returns means tax payer makes use of the calculating machine of the server to pass the telecommunication network systems, such as telephone toll, grouping exchange toll and Internet toll, etc., directly sending out the filing of returns data to the taxation department, thus realizing tax payer’s filing of returns without going personally to tax authority. The electronic settlement means a process that the national treasury directly receives the tax from the bank account of tax payers depending on the information on their tax bills. Link 1 serves the electron information exchange of the tax payer and taxation departments, carrying out the filing of returns to turn without the paper. The second link serves fund exchange among tax payer, taxation, bank

and national treasury information and the exchange of the capitals, finishing the reception and payment without paper bills.

Compared with traditional taxation, the electronic taxation raised the efficiency of the filing of returns, lowering the revenue cost. To tax payer, tax payment is free from the restraint of time and space, which is convenient and saves time and money; To tax authority, it not only cuts the manpower, the resource dissipation of the data entry hour, but lowers the bug frequency of the input, vouch. At the same time, adopting the modern computer net work technology makes it possible to transfer electronic information about the filing of returns, tax receipt, the scot strike between the tax payer, bank, national treasury, speed up data transmission, shorten the link and time for keeping scot, thus ensuring the national revenue stored in warehouse in time.

1.3.5 C2C

The C2C is a schema of trade of the consumers, sharing similar characteristics with agriculture trade market or flea market. What constitutes it are vendors and purchasers, electronic trade provider suppliers, similar to space suppliers and governors agriculture trade market in the real and the flea market. In the categories of C2C, the electronic trade provider suppliers play the prominent role.

Firstly, in such wide range of the network, if without a well-known supplier trusted by both vendors and purchasers, bunching both vendor and purchaser together, it is very difficult for buyers and sellers to find each other, and also will cause loss of chances.

Secondly, the electronic trade provider suppliers also take the responsibilities of supervision and management for honesty and creditability of vendors and purchasers monitoring their transactions and minimizing the occurrences of fraud in order to protect the interests of buyers and sellers.

Thirdly, electronic trade provider suppliers can offer the technology support to both vendors and purchasers, including helping sellers to create online shop, release product information, decide on pricing strategy etc., helping buyers to select products or electronic settlement etc. It is just because of the technology support that C2C categories has been accepted by a large group of users within a short period of time.

Lastly, along with the maturity of pattern C2C, the electronic trade provider supplier can still offer buyers and sellers the financial services like insurance, loans, thus better services for the both vendors and purchasers.

Therefore, in the categories of C2C, the electronic trade provider tenders play a significant role, because it directly affects the precondition and foundation of this commerce categories. When talking about C2C e-commerce categories, People analyze rationality and potential of the categories from the perspective of

auction, but usually neglect the status and the role of the electronic trade provider suppliers.

Simply in view of categories of C2C, both vendors and purchasers make profit as long as they do transactions, and accordingly this categories continues to exist and develop. But its premise is to ensure electronic trade provider tenders can earn money, otherwise this categories will forfeit the foundation of existence. Therefore, we should pay more attention to profits and capabilities of the electronic trade provider suppliers when analyzing the categories of C2C, which is the key point of the categories of C2C, and also important difference from other categories. Conversely, the electronic trade provider suppliers also have to rely on both vendors and purchasers. The platform suppliers make profits from nothing but advertising, commission, membership fee, service charge and finances services. Among them most profits come from the buyers and sellers, that is, the consumers of the services offered by the platform suppliers. Therefore, if the platform suppliers intend to survive, they have to offer best and different services to all members, maximize the loyalty of members, and develop new members. The buyers, sellers, the electronic trade provider suppliers depend on each other, constituting the basic elements of C2C together.

Theoretically, the categories of C2C can demonstrate the spirit and superiority of Internet best. Countless buyers and sellers in different places can hardly find appropriate counterpart on the platform in the traditional field. Compared to the traditional second-hand market, it is free from the restraints of time and space, and saves tremendous communication costs, which shows its value clearly.

In view of actual operation, the C2C pattern is maneuverable in two ways.

Firstly, the C2C can bring the real benefit to the consumers. E-commerce of C2C differs from the traditional consumption method. In the past, the sellers usually had the absolute power to decide the commodity price, while there was no margin for negotiation by consumers; the birth of the auction websites offers consumers the power to decide the product price, and makes the price even more flexible as the result of bidding price among consumers. Therefore, the consumers naturally benefit a lot since they have a say in negotiation of the prices by discussing prices online.

Secondly, the C2C can attract more consumers. Discount is forever a good method to attract consumers. Because there are usually products on sale in the auction websites, this kind of websites without doubt can spark the interest of the consumers for Chinese consumers concern prices very much. With great concern about their own interest, those with clear objectives go frequently to C2C websites. However, those consumers (consumer) without explicit objectives, would loiter in C2C for fun of shopping. Now there are such consumers in the C2C websites. They have no definite consumption objective, but they spend a great deal of time on the C2C websites just to see if there are unusual article or something pretty cheap. Therefore, in the aspect of attracting consumers' attention, C2C really is an eye-catching categories of e-commerce.

The success of eBay made C2C a hit at that time. Yahoo, Amazon etc. followed suit to do C2C business on their own portal websites. Though they cannot match eBay, they have been doing well, and also develop quickly. It is a month ago that Alibaba invested a huge amount of money to create Taobao website, at the same time eBay declared that it would add to Chinese eBay more investment, and pay ￥15,000,000 to buy the remaining share of American eBay in order to put eBay under full control. EBay has become the largest C2C company in China, with only $600,00 initial capital.

The success of eBay makes Alibaba realize that Chinese C2C market is also a big gold mine. Currently the monthly volume of business on eBay website is 60 millions or so, and increases by 20% per month. Though eBay charges commission that is only less than 1/10 of the whole business, and has made no profit, this categories of eBay proves that C2C categories is feasible in China. It is why eBay, the largest C2C website, paid tremendous fund to take full control of eachnet. The e-commerce market in China grows larger and larger while the volume of C2C business continues to increase, so it is just a matter of time that eBay makes profits.

Though the C2C categories has the great potential of development, it also faces many problems that will affect and even hind the development of C2C e-commerce if they are not delt with well.

Especially, the domestic e-commerce in China is at the start stage. There exist some places that need to be perfected in terms of system, technology, credibility, etc. Therefore, we have to take more efforts to solve them with active attitude.

(1) Perfection in laws: Online business and e-commerce are both new things that came up in recent years. All countries are active to study and draw up appropriate laws to standardize the behaviors in e-commerce. Currently, since the legal system needs to be improved, not only the interests of individuals and enterprises on line are not protected, but online auction become a new method to sell stolen goods.

(2) Trade reputation and risk control: The Internet cross over the regions, making the world an enormous “stall”. Additionally, the virtuality of Internet increases the difficulty to avoid the risks in e-commerce. Take eBay for an example, statistics shows there occurs a defraud in every 25,000 transactions. Deceit online has developed to a serious degree. At this time, the electronic trade provider suppliers have to play a dominant role while a set of goods trade mechanism that helps the online trade, wait to be established.

(3) Online payment: Currently, in view of online trade, less than 20% of B2C trade is done through online payment, while the ratio of online payment for C2C is much lower. It is currently the mainstream that buyer and seller make deals by face-to-face trade so that the electronic trade provider suppliers has no way at all to manage the trade. If there does not exist any obstacle to collect commission online when the deals is made by online payment, there is no big possibility that commission is collected from offline trade. This is mainly because that there are

no enough big groups of credit card holders in China so far. In addition, the domestic financial settlement system cannot satisfy the demand of e-commerce since it is not safe enough, and absence of a complete authentication system cannot eliminate consumers' concern about the security of trade.

(4) Improvement needed in technology: Because of the characteristics of Internet, the enterprises based on Internet must have strong technical ability. To C2C electronic trade provider, the technical strength is of top importance. Only with advanced technology can network services develop continuously, user's data be complete and accurate, safe and ideal trade environment be provided for the users.

(5) The people's consumption habits need to be changed and developed: It is only a few years since e-commerce appeared in China. Few people except educated white-collars and youngsters fond of trying new things are willing to accept online shopping. Moreover, people's skills and abilities to use computers also hinder the development of e-commerce. It takes time to train consumers and develop the market in all these aspects.

(6) People's economic strength: We cannot deny that the average economic level in China is yet not high, and there are not many second-hand products in people's hand that can be reused. Take a wide view at the website of eBay, a big part of business is that manufacturers use this website to promote their products, including new products, renovated ones and even fake ones. But the price presented online is still high, which cannot display the advantage in price of second-hand products because of the low economic level. The low ratio between performance and price causes the loss of people's interest in second-hand products.

E-commerce has not developed to a high degree in China so far. Influenced by legal environment, economic strength, consumption habits and so on, e-commerce has not developed in a smooth way. However, there is enough potential for profits in C2C e-commerce, which can bring the real benefits and profits to electronic trade provider tenders. It is for sure that C2C e-commerce will be applied to more fields.

1.4 The Constitution of the E-commerce

1.4.1 Portal of the Network

As the wikipedia defines, "So-called portal websites are applications systems that lead to some comprehensive Internet information sources and provide relevant information services". At the beginning, the portal websites offered search engine and the network access service. Later, due to the increasingly fierce competition in the market, the portal websites had no choice but to expand a variety of new

services in the hope that Internet users would be attracted and maintained by the business of different kinds, which causes a wide variety of services to come up in different portal websites currently, making the network a “department store” or “network supermarket”. Recently, the portal websites mainly provide such services as news, search engine, online access, chat room, e-board, free mailbox, movies and music information, e-commerce, online community, online game, free space in website, etc. Among the typical examples are www.sina.com, www.163.com, www.sohu.com, etc in China.

The portal websites evolves as is shown in Fig. 1.10.

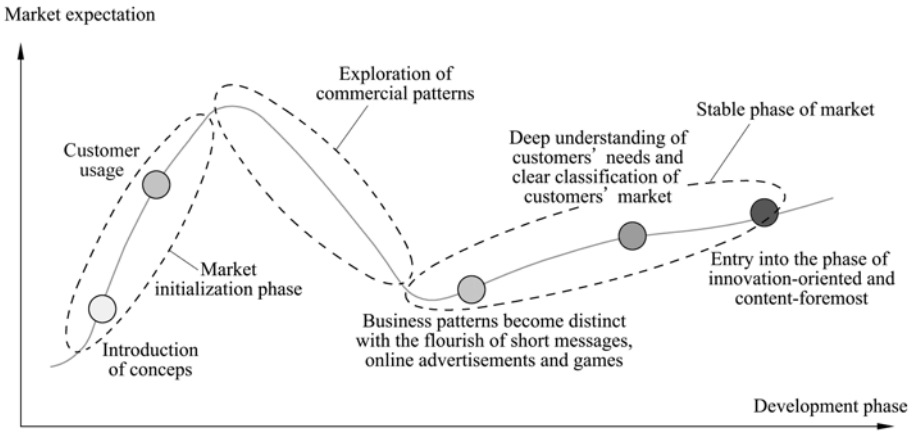

Figure 1.10 The progress curve of portal websites

This figure shows that it is the phase from 1997 to 1999 when the concept of portal website is introduced and people’s habit of accessing it is developed. On February 25, 1998, Sohu, the first large classification search engine in China, came to the front. It is then that stone rich sight declared to merge and acquisite “huayuan zixun”, the largest overseas Chinese website company, and set up www.sina.com, the largest Chinese website around the world.

On July 12, 1999, www.china.com was listed in for the first time, earning USD 86,000,000. In January, 2000 it was listed in the market by releasing new shares, making an amazing amount of USD 300 million. The fact www.china.com was warmly welcomed at NASDAQ mainly depended on then-popular concepts such as “China” and “Internet”. In November 1999, China and the US reached the agreement on access to WTO, the share price of www.china.com increased by 75% within only one day. In March 2000 when the aggregative index number of NASDAQ popped to 5000 points, the share price of china.com was also pushed high to USD 300 per share, and the market value of china.com Company was as high as more than USD 5 billions, equal to the then-market-value of Ericsson, the communication manufacture tycoon. On April 13, 2000, the sina.com company

declared its IPO, which makes the first real net share from China Mainland entering NASDAQ. On July 5, 2000, the 163.com company declared its IPO, and landed on NASDAQ. On July 12, 2000, sohu.com was listed on NASDAQ. By then, the portal websites entered the stage of "the exaggerated future value."

As the bubble of Internet broke, the share of sina.com once dropped down to USD 1.06 in October 2001, the share of sohu.com down to USD 0.60 in April 2001, the American depository receipt of www.163.com down to USD 0.53 in July 2001. Due to the mistakes in the financial reports, the NASDAQ stock market notified the trade of www.163.com was in temporary suspension from 8:52 A.M. on September 4, 2001 East Time (8:52 P.M. on September 4, 2001, Beijing Time). The portal websites enter "the low valley that melt into nothingness".

In July 2002, three largest portal websites in China released the financial reports of the second quarter of the year, and declared in different ways that Chinese website company had already moved from the money-burning era to the profitable phase. These largest websites found out the secret of success—short message service.

In 2003, the number of netizens in China made a record of 68,000,000. Three portal websites made outstanding accomplishment with an increase in their shares. The trash share worth of no less than USD 1 increased to USD 70 per share in 2003. The pattern that profits are made mainly through short message service, network games and network advertisements has become clear. In 2003, portal websites entered a phase of stable development.

The consumers' demand boosts the development of Internet. At the very beginning, it is the fact more information needs to be gathered that leads to the portal websites coming up. When users need to find out accurate information among the huge sundry information, the search engine accordingly came up. Soon later when users need to socialize with others, IM, the instant telecommunication device, become popular.

One-stop unified service, all kinds of advertisement, and homogeneous news reflect the current picture of Chinese portal websites. The websites and users are interactive, one is for recreation and the other for profits.

As the demand level theory proposed by Maslow defines, people have five needs: psychological needs, security needs, social needs, self-respect needs and needs of self-fulfillment, as is ordered from low to high by the intensity of needs. Users' needs of self-respect and self-fulfillment has not been fully exploited so far. There is neither geographically accessible (in terms of the end serving device) nor psychologically accessible (whether or not the websites are doing well has nothing to do with users) between websites and users. Accordingly, the portal websites will develop in the direction of personalized network portal from the unified network portal in the future.

By using the Web 2.0 technology, Google has already released personal portal. Users can subscribe to NYT or BBC news, weather forecast, finance and economic

information, etc. as long as they have a password and login in it. The combination of IM, blog and RSS is also a wonderful creation, because possibly in the near future, netizens will have their needs satisfied only by starting IM. It is when a real era of personal network portals comes.

1.4.2 Customer Relationship Management

Customer relationship management (CRM for short) is a new research filed of management which devolved rapidly to adapt to the strategic transfer from product-centered management to costumer-centered one. It considers satisfaction and loyalty of customers as the final goal. In recent years, more and more enterprises and software developers home and abroad study it as a hotspot. Being an integration of the front end application systems on the background, the CRM system is an applicable concept, resting itself on the increase and automation of sales, marketing, service and supporting application featuring customer-centered in the hope of bringing the enterprises long-term benefits by improving the customers' satisfaction and loyalty. This principle is broken when many enterprises carry out CRM that causes countless unsuccessful cases.

The articles on CRM mainly illustrate the impact on establishment of CRM system and procedures, with little concern about what should be done first: knowing who your customers are and what will influence their behaviors. Currently what the enterprises are able to do is to learn about their customers rather than understand the customers themselves. KPMG report shows that up to 70% of British enterprises admitted it difficult to identify who are their customers and what they want to buy most. It is quite difficult to find such valuable information related to CRM in daily reports and analyses.

According to Jim Berkowitz，a well-known management consultant, CRM has to rest on two solid foundations: reasonable organization structure and reasonable information structure. If the enterprises carry out CRM with the motive of separate interest of each department rather than the motive of adapting to philosophy, culture and strategy of customer-centered commerce, CRM will suffer a lack of reasonable organization foundation. This reasonable organization structure can substitute a more integrated and shared work flow and information flow for the original collective process among departments, thus the enterprises becomes a unified organization to effectively predict customers' needs, and value and simplify their work process.

On the other hand, under the keen competition atmosphere, competition for the limited clients will turn more fierce. Because the cost of obtaining a new client is far more than that of maintaining an original client, it has been a key problem what measures the enterprises must take to maintain the clients and improve the clients' loyalty. The answer lies in the record of dealing with the clients, that is,

the clients database, but the enterprises do not make effective use of it to discover valuable potential client-loyalty-related information. According to survey made by META, only 4% of the managers of 800 commercial IT enterprises think they make full use of clients' data to understand them, while 29% of the managers interviewed use the data to some extent and 67% of the managers do not use the data at all.

Client Intelligence (CI)

Some specialists mentioned the notion of client intelligence in research. They classified it into three categories: the first one is the research on function, contents and essence of client intelligence. Mark Allen Smith equals client intelligence to client analysis. Analyzing the relationship between client intelligence and CRM, Paul Clark in BO Company thinks that client intelligence is where the wisdom of CRM is. The second is the research on realization of client intelligence. Jim Berkowitz puts forward that business intelligence is the foundation of CRM. The other valuable point is that the analysis is made about the components of CRM, regarding OLAP, database, and data mining technology as the indispensable components for business intelligence. The third one is the research closely related to client intelligence. Emma Chablo points out that client knowledge is an important part of CRM while marketing data intelligence is the part to provide CRM the real client knowledge. He defines marketing data intelligence as using data-driven marketing metrics and technology to improve the understanding of clients and products, and to deal with the data and accordingly help CRM make strategic decisions.

Because different people do research on it from different perspectives, it is difficult to sum up a convincing definition. There is one thing in common below: few people have done research on client intelligence from the perspective of the role that knowledge plays in making client-related decisions. As a matter of fact, only by doing research on knowledge can people discover the essential contents of client intelligence. In this book, client intelligence is the creative use of clients information, an integration of concepts, methodology, process and software of decision-making and overall operation capacity to help enterprises improve clients relationship. Client intelligence system as shown in Fig. 1.11 comprises the following levels:

(1) Theoretical foundation

The theoretical foundation of client intelligence is guidance for enterprises to make decisions about clients. It includes not only the theories and measures by which enterprises analyze and treat clients, but client value analysis from the perspective of clients and enterprises respectively. Through analysis on consumption behaviors, satisfaction, interest rate, etc. enterprises reach the goal of scientific decision-making and rationality.

Analysis on clients value is tremendously supportive to client-related activities.

For example, such activities as customer identification, customer segmentation, customer differentiation, customer satisfaction and so on will be goal-oriented and guide a correct client relation with support of the analysis on client value.

(2) information system

It is the physical foundation for CI system, and is reflection in software which has strong capacity to make decision and analysis and in information system platform gearing to the special application field.

(3) data analysis

As a series of computation, devices or models, it intends to obtain high-quality data or information about the theme concerned, then involve in using analytical computation, devices or models automatically or by hand to help people analyse information, reach a conclusion, form a hypothesis and test a hypothesis.

(4) knowledge discovery

Same as level (3) above, it is also a series of computation, tools or models. It intends to transform data into information, then into knowledge through discovery, or directly transform data into knowledge.

(5) strategic level

It intends to apply information or knowledge to such aspects as improving decision-making, operational capacity, enterprises' construction model, etc. The strategic level is a combination of a series of concepts, methods and processes for improving the enterprises' capacity to make decisions by use of information from many sources and application experience and hypothesis. By obtaining, managing and analyzing information, it provides all the staffs the access to knowledge so as to improve the capacity of strategic decision-making and tactic decision-making.

The strategy for client development refers to the client-centered development strategy, taking into account the resources inside the enterprises and environmental elements outside enterprise and reaching the final goal of maximizing the life periodical value of the clients. The client development strategy must be supported by other strategies like aimed market, marketing combination, market competition, accounting, coordination, organization, talents and so on. Client-centered development strategy cannot substitute for the overall strategy of an enterprise, while it is the most valuable strategy for reference in the overall strategy.

As a system framework based on the controllability of CI theory, CI system includes information system, data analysis, knowledge discovery in CI series. Therefore, CI series can also be shown simply by basic CI theory and CI system based on CI theory. CRM system based on CI is one of the CI systems presented in this book.

All in all, CI aims at transforming the information in the enterprises to competitive advantage, improving its capacity to make decisions, the efficiency and accuracy of decision-making. To fulfill this aim, CI must have the computation, model and process for realizing the transfer from data analysis to knowledge discovery while the theme of decision-making has to be extremely general.

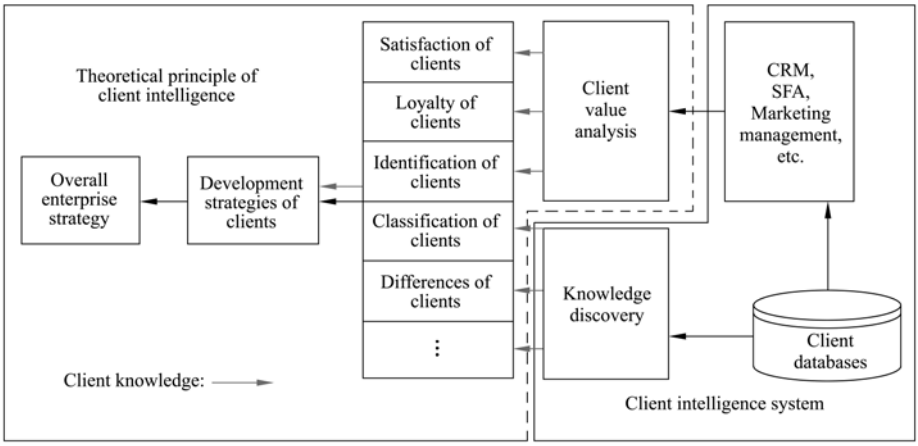

Figure 1.11 Expanding CI Series

1.4.3 Supply Chain Management

The supply chain is a functional net-link model integrated by suppliers, manufacturers, distributors, retailers and final users, a net-link model that, under the control of information, logistics and fund flow control, that start with procurement of raw materials, makes the intermediate products and final products, and then delivers the products to the consumers through the sales network.

Supply chain management (SCM for short) is an idea and method of integrated management, and performs functions like logistics plan and control from supplier to final users in the supply chain. SCM is an integrated process which aim at providing the best services. Simply speaking, SCM perfects the process of information and products, including reception of order, procurement of raw materials, and provision and consumption of goods. SCM not only plays an important role in management across departments and functions, but conforms suppliers and customers beyond the organizational limits.

Previously, SCM focused on stock management. As a cushion to balance limited production capacity and adapt to changes in clients' demands, it sought, by all means of coordination, to balance production, stock management and the fund needed for rapid and reliable delivery of products to the users, in order to decide the perfect volume of stock investment. Therefore, its main task is to manage stock and transport. Nowadays, SCM considers all enterprises in supply chain as an indiscerptible integrity, thus making all functions like procurement, production, distribution and sale an organic body of balanced development.

Guided by the plan of synchronous and integrated production, and supported by technologies of all kinds, particularly the computer network, SCM is carried out around supply, production, logistics and satisfaction of client's demand. SCM

mainly includes plan, coordination and control of the materials and information from suppliers and users, aiming at improving services for clients, reducing overall trade and seeking a balance between them.

The presence of e-commerce forces manufacturers and wholesalers to be active in responding toward retailers and clients, but the pressure of competition is compelling the manufacturers to reduce costs, shorten the time for ordering and raise the work efficiency. Therefore, manufacturers are under great pressure, and need to use computer technology to better management of SC, raise production efficiency and improve logistic work, while maintaining the active response to the changing market and client's demands.

The interactivities among suppliers, manufacturers, retailers and clients are developing toward more complex and global direction.

A dramatic progress has been made in applying the SC on new-tech platform, the capacity also being improved to organize the integrated process by sharing and planning coordinated information. Under the SCM pattern of e-commerce era, information is now substituting for storage, and accordingly the enterprises which are good at information management will not have valuable stock. When the competition changes from B2B to SC2SC, the enterprises that cannot figure out this trend will be dropped out. The use of advanced SCM devices will bring dramatic enterprises competitive advantages.

1. SCM Pattern

Enterprise integration is the core of SCM, which has two chief types as shown in Fig. 1.12: push and pull.

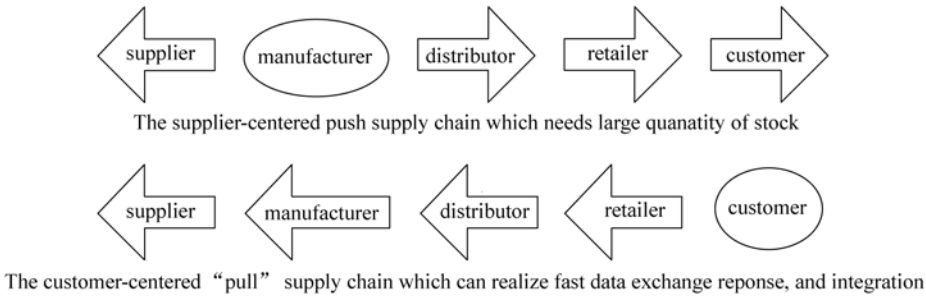

Figure 1.12 Change of supply chain from push pattern to pull pattern

In pull type, consumers are on the front of SC, also called demand-driven type. When client check on the counter, POS will record the details of each purchase; distribution center will add goods to shops according to record; after the data of each delivery center is gathered at the manufacture's office, manufactures will then accordingly add goods to distribution centers; the manufacture's production program will update according to distribution arrangement and also will adjust the procurement arrangement. Finally, suppliers of raw materials will also change the distribution plan.

Compared to push type, pull type boasts the following advantages:

① support the continuous changes in products

② shorten the time period for delivery

③ improve the service for clients, with the cost per unit down

④ improve the efficiency in business

⑤ be able to give an overall assessment on performance, which makes it much easier to control

2. Functions of SCM

There are mainly the following 4 functions:

Client relation management: fully understand and predict market and users' demands by managing the information of client's demands. By using client service, supporting sales or other functional systems, enterprises gather information, and collect the information gathered from the real business in order to pre-control.

Comprehensive logistics management: to manage the logistic work including production plan, procurement and stock from suppliers to clients.

Production process management: to manage the whole process of production, reducing production cost while raising the efficiency.

Accounting management: to co-manage fund flow with suppliers and clients by use of network accounting management system.

The thing in common among these functions above is the data integration and coordination in business procedure. The integration of these functions demands that all parties of SC agree on the key technology and the goal in business procedures, that is, eliminating wasting client's value. For this reason, enterprises must find out the link short of competitiveness and the unsatisfied demands of clients, and rapidly improve them.

3. Components of SCM

Implementation of SCM system includes 3 processes: planning, implementing and assessing performance. Among these processes, client's demands must be taken into account. At the same time, enterprises must perfect interior process, and transfer the traditional function-oriented viewpoint to process-oriented viewpoints.

(1) Plan system

It refers to obtaining the right products in the right place at the right time. The plan system facilitates enterprises to accept orders and honor the orders, speeds up gathering information of clients, thus making information flow in SC move smoothly.

The plan system needs to learn about client's demands, and makes it a key in SCM system. The pull type demands that the enterprises effectively gather information about client's need, including reasonable stock, stock circulation and the frequency of supplementing goods. The following systems need to be integrated:

- Placing orders and making plans, which demands the capacity to predict the client's needs.

- Receiving orders and inputting them, i.e. providing input for supplementing goods plan.

The plan system comprises distribution requirement plan (DRP for short), manufacture-managed stock and CRP.

(2) Implementation system

The implementation system promotes the movement of products in SC, including performance of client's orders, procurement, stock control, production and logistics systems. It aims finally at improving the efficiency of goods and services in SC by using them comprehensively.

The key for the system lies in the fact that enterprises can lift a singular business application of the implementation system up to an integrated system then can be operated in the whole process, in order to realize the across-department integration, strengthen the coordination of SC, and finally establish a set of e-commerce solution including implementation framework, perfection of business procedures, technical standards, communication technology, software, hardware etc.

(3) Performance assessment system

The performance assessment system is a follow-up of SC's operation that facilitates to make open strategy and serves as a basis of guaranteeing the normal operation of SC so as to be more effective in reflecting the demands of changing market. It mainly comprises accounting system and financial management system. Nowadays most of business system and traditional reports and formalities are all designed for affairs settlement, but cannot satisfy the demands of decision support for access to information. To solve this problem, a number of enterprises began to use integrated database to do auditing and analysis, enabling the administrators to analyze commercial information on the prerequisite of no influence on the operation of the system.

The other trend of performance assessment is to use Internet-based proxy program to do pre-analysis. The proxy program refers to the program substituting for users, which fits the environment with a sea of data. Due to the enormous data, the information noticed by the administrators need to be given the top consideration. Since users have different point views on the importance of things, the proxy program can let users set up their own standard selection. This program can make the administrators pre-monitor the operational situation, and respond quickly to the significant events.

1.4.4 Logistic Management

The concept "logistics" first appears in America, when American troops, revolving around wartime supply, set up the logistics theory, and applied it during the World War Ⅱ. The logistics refers to the unified arrangement of the goods production, procurement, transport, delivery during the war to seek better service,

faster speed and lower cost in terms of the supplies for war. Therefore, the logistics warranty system in the wartime was used in modern economic activities before today's logistics evolved. Probably because any behavior can be changed in the market economy, there is still no convincing definition of logistics, and related concept have been changing. Roger Oakden, project director of logistics team in Melbourne Royal University of Technology, surveyed the changes of the concept logistics from 1992 to 1997. During these years, logistics had changed from a movement of materials to an activity of providing low-cost services by using information technology.

So-called logistics management refers to the fact that according to the law of material entity movement, people plan, organize, direct, coordinate, control and supervise the logistic activities in social reproductions by the basic principle and scientific methods of management, in order to realize the perfect coordination of all logistic activities, lower logistic costs and gradually increase the efficiency and economic benefits. Logistic management comprises management of such aspects as elements of logistic activities; links like transport, stock, etc.; elements of logistic system, i.e., human, capital, material, equipment, methods and information; concrete roles in activities, mainly including plan, quality, technology, economy, etc. as shown in Fig. 1.13.

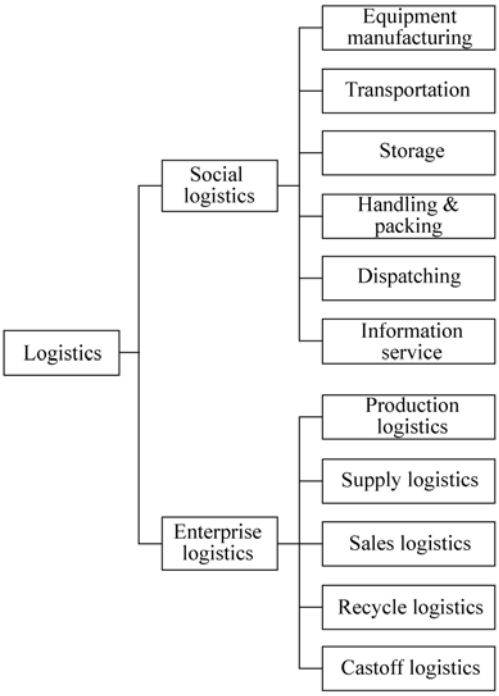

Figure 1.13 Logistic system

Logistics is the essential warranty for e-commerce development

Seen from the basic procedures of e-commerce in Fig. 1.14, the whole deal in e-commerce contains several fundamental "flows", i.e., information flow, capital flow, material flow. The information flow refers to supply of product's information, transfer of commercial documents, technical support, etc. the capital flow refers to the process of payment, money transferring between banks. The material flow (logistics) refers to the movement of material entity (products or services), such as delivery, transport, loading or unloading, information management, etc. The flow of materials is only a part of several links, but it is the essential embodiment of the value of products or services; if it's not solved well, the value of front link cannot be shown. In e-commerce, the former two "flows" can be realized through computers and network communications. However, as the most special logistics, only these products and services like e-publications, information inquiry, etc., can be carried on directly through network communication. Most products and services need to be transported by physical means. So the application of a series of mechanical and automatic device, accurate and prompt logistic information can quicken the speed of material movement, improve the accuracy, effectively decrease stock, and shorten the period of production.

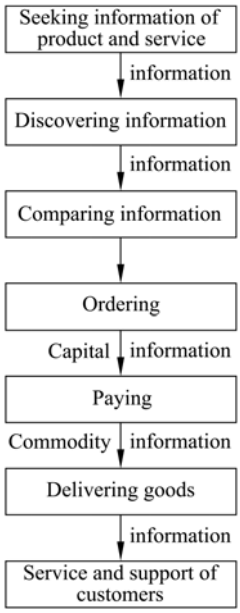

Figure 1.14 Basic flow of e-commerce

No matter in traditional trade or in e-commerce, production is the basis of logistics, while smooth production needs the support of all kinds of logistic activities. The whole process of production, starting with the procurement of raw materials, demands the corresponding activities of supplied materials in order to put the purchased materials at the assigned places, otherwise production cannot be carried on; in all procedures of production, the flow of raw materials and semi-finished products, i.e., the production logistics, realizes the mobility of production. It can be seen that the whole process of production is actually a series of logistic activities. The reasonable logistics guarantees the effective modern production by lowering cost, improving stock structure, reducing fund accumulated or used for other purposes and shortening the production time. On the contrary, without modern logistics, production will by no means carry forward; no matter how convenient the e-commerce is, there is nothing coming from nothing. Only when products and services are really provided to consumers will the business

activities come to an end; without modern logistics, whatever relaxing business activity will turn out to be a white paper.

The presence of e-commerce, to a great extent, facilitates the final consumers. They need not go to the crowded streets, selecting the products they want from one shop to another. Only by searching, checking and choosing on Internet at home can they complete their shopping. However, just imagine whether consumers will continue to shop on Internet if it has been a long time before the products they bought come or if the delivery is not what they bought. The logistics is the final warranty for realizing the customer-centered notion. Without modern logistics, e-commerce will bring consumers no convenience, and accordingly the consumers will inevitably turn to the traditional method of shopping that they think is more secure. Then is there any necessity that online shopping exists?

It has been proven that logistics is the final warranty for realizing e-commerce. As the applications of e-commerce develop, the logistics will have more obvious effect on e-commerce activities.

1.4.5 Decision Support

The key for management is decision-making. The economic globalization and development of information technology eliminates many barriers. The enterprises are facing more complex environment than ever, and it is much harder to form and maintain their competition barriers. The pressure from competition raises higher standard for the quality and speed of making decision.

As a newly-emerged direction of information technology, decision support system can provide enterprises various decision-making information and solutions to many commercial problems, thus freeing administrators from the burden of low-class handling and information analysis, while indulging them in the work that needs most wisdom and experience for decision-making. In this sense, the quality and efficiency in making decision are greatly improved.

There is no extensively acceptable definition of decision support system (DSS, for short). A typical definition is like:

DSS tends to improve the decision quality by combining individual's talent and computer's capacity. Based on the support system of computers, DSS is a decision-maker and administrator for handling semi-constructure problems.

Different people perceive DSS from different perspectives. In a broad sense, DSS can be regard as a terminology containing many things, in order to describe any computerized system of an organization. An organization generally has one management information system used by senior managers, a DSS for market, finance and accounting, a MRP system for production and a few expert system for maintenance and diagnosis.

After adopting DSS, enterprises can get such benefits as: higher quality of decision, improvement of communication, reduction in cost, improvement in

productivity, less time, and increase in satisfaction of clients and staff. These perceived benefits have so much to do with the competition among enterprises, size of enterprises and friendliness of clients. Due to these challenges faced by modern enterprise management, enterprises managers need urgently a computerized DSS. Although every enterprise differs in the real situation and demands of them, they have reasons in common for adopting computerized decision-making system.

(1) Speedy computation: Computers allow decision-makers to make a large amount of computation at a low cost (labor cost of high-level managers is extremely high). In many cases, timely decisions are crucial, such as for stock deal and marketing strategy etc.

(2) Overcoming the limits of handling and storage: Human intelligence is confined to the capability of information handling and storage. In addition, it is impossible for a person to recall accurately all the information in need.

(3) Perception limits: Personal ability of solving problems is limited when various knowledge and information are required. Though it is helpful to gather knowledge of different persons, it is difficult to coordinate and communicate between members of the work team. However, computer systems contribute to decrease the coordination and communication on the one hand, and facilitate people to have access to information and handle sea of information.

(4) Cutting down expense: It cost much to gather a group of decision-makers, especially experts. Owing to the technology, the size of team and expense of travel can be decreased (team members in different places can communicate), and productivity of relevant people (e.g. analysts of financial affairs or law people) can be improved, which is necessary for decision-making. The improved productivity means the decreased cost.

(5) Information supply: Managers can make decision by obtaining accurate, timely and latest information by means of computer technology. Thanks to computers, audio and video data can be transferred across a long distance, whether the data are stored in different databases within the organization or even outside the organization. That is to say, necessary data can be inquired, stored and transferred rapidly and economically.

(6) Quality supply: The quality of decision-making can be improved by means of computers. For example, alternative plans can be commented, risk analysis can rapidly be carried out, ideas of experts in different places can be gathered rapidly at a low cost and professional knowledge can directly be submitteded via Internet. Moreover, decision-makers can make complex simulation, check all cases and make comments rapidly and at a low cost. All above mentioned will contribute to a better decision.

(7) Contributing to business flow regrouping and staff assignment: It is difficult to make a decision because of the competitions not only in price, quality, time, product ordering but in services to customers. An organization must transform

operation patterns, regroup business flow and structure, and authorize the staff to make innovation rapidly and frequently. Decision support system (e.g. expert system) enables the people who are lack of knowledge to work out a good idea, for which an organization can make significative decision. The system can also be used in business flow regrouping, competitors' activities analysis, products ordering and production flowing etc.

Enterprises can adopt various DSS according to their own situation. The following are the most significant applications:

(1) Sales support: The system offers high-level managers the support on the basis of gathered reports on the salesman, production and sales in different areas, different departments. These reports present lost business, redemptive business and new business. If necessary, extra periodical reports can be made to enable the manager to make comparison and trend analysis, which contributes to problem solving and opportunity grasping. What is more, DSS can be used to analyze and comment on products sales to figure out factors of success or failure, and to predict the potential profits and incomes on the basis of the data of the company.

(2) Analysis of customers and study of market: Due to the application of DSS, transaction data gathered can be analyzed by means of statistic tools. Accordingly, different consumption patterns and corresponding market strategies can be worked out so as to achieve the optimal profits. For example, with regard to important customers, better services and more favorable prices shall be offered. As to potential customers, promotion shall be carried out. And as for the lost customers, reasons concerned shall be analyzed to retrieve them. Since the customers' relation management is very hot currently and there are enormous analyses on it, the author will expound it in the following chapters. Market study consists of the following aspects: analyze growth pattern of every product by making use of prediction model so as to make an appropriate decision: to terminate or to expand a certain product; study brand and image of the enterprise so as to improve its reputation; analyze the customers' satisfaction and study market size and potential size.

(3) Financial affairs analysis: Compare the expense daily, monthly, yearly, or on the basis of user-defined periods; check the trend of cash flow in the past and predict future cash requirements; make budget plans and circulation of cost of complicated projects; regroup financial affairs data of branches and form the accurate financial statements.

(4) Operational search and strategy plan: In terms of resources and time, work out the optimal schedule; work out everyday production plan; determine the establishment branches of large-scaled chain organizations, such as chain stores, service stations, and communication relay stations etc.; aid in working out large-sized investment plans and estimating the investment risks.

(5) Enterprises analysis: Critical Success Factors (CSF, for short) refer to the

factors that must be taken into account to reach the goal of the organization. CSF, strategic or operational, is the focus of enterprise performance analysis, and derives from the following three factors: organizational factors, industrial factors and environmental factors. And KPI (Key Performance Index) is the metrical unit for enterprise performance analysis. The typical KPI is as the following Table 1.1 shows.

Table 1.1 Typical KPI

Profitability	Profitability of every department, product and area; the comparison of departments, products and competitors
Financial affairs	Flow ratio, cash storage; balance sheet analysis; mercantile rate of return
Market	Market share, advertisement analysis, product analysis, weekly (daily) sales, consumers' sales potential
Human resources	Personnel liquidity, work satisfaction
Plan	Sales increase/market share analysis
Economic analysis	Market trend，foreign trade and exchange rate，industry trend，labor cost trend
Consumers trend	the grade of consumers' confidence, shopping habits,

A DSS comprises of the following typical components:

(1) Database management subsystem: Generally, DSS database is the compositive, subject-oriented data warehouse functioning as decision-making support, in which any data unit can be modified at any time. Data in data warehouse is generally taken from inward data (mainly from transaction processing system) and outward data (including industrial data, market survey data, census data and national economic data).

(2) Model management sub system: A software package including financial affairs statistics, operational search models and other quantitative models can offer people systematic analysis and appropriate software management. As for models in model database, they can be divided into strategic, political and operational ones.

(3) Knowledge management subsystem: Many a problem is so complicated that specialized knowledge provided by expert system and other intelligence system is required besides DSS when dealing with them. Therefore, advanced DSS need to include so-called knowledge management components.

(4) User interface subsystem: The communication between users and DSS, such as interactive interface, form print. In addition, intranet/Internet release should be included to realize information sharing within organizations.

(5) Users: Users can be regarded as one component of DSS. They mainly refer to the enterprise managers of different levels and business analysts.

1.5 Supporting Environments for E-commerce

1.5.1 Technical Environment

The presence of e-commerce not only influences the traditional trade process but changes the components of market to a large extent. Traditionally, market transaction chain is formed in the exchange process of commodity, service and currency. At present, owing to e-commerce, information is reinforced and brings about information of commodity, information service, electronic money etc. Though the essence of e-commerce remains unchanged, some links in the transaction process have changed because of the changes of e-commerce carriers. From the perspective of individual enterprise, trade method has taken some changes, while from the perspective of the whole business environment, the whole business has taken on a new look, for some business losing opportunities while some new one grasping the opportunities, and some industries decline while some flourishing.

Figure 1.15 briefly shows the framework and principal factors in the environment. As the figure shows that, e-commerce consists of four levels (Internet infrastructure, multimedia and online publishing infrastructure, newspaper and media infrastructure, newspaper and information communication infrastructure and business service infrastructure) and two mainstays (public policies, laws, privacy, and other standards of various technologies).

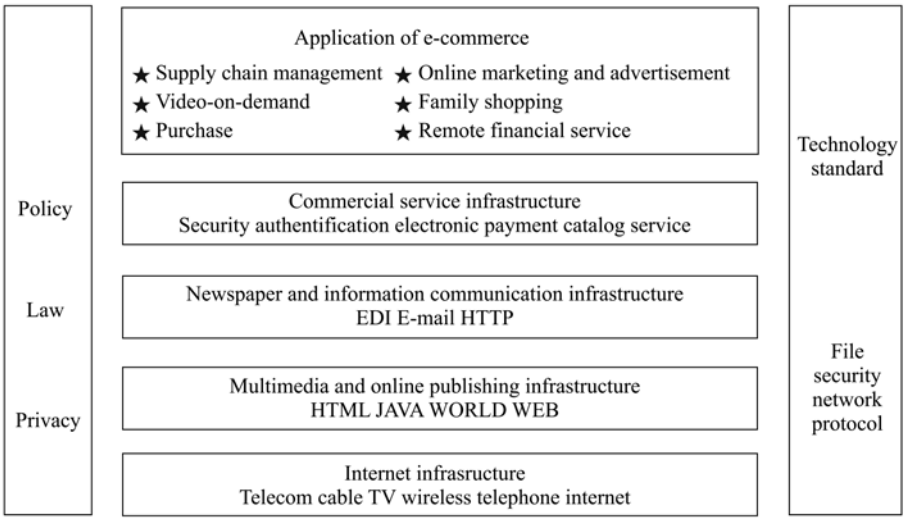

Figure 1.15 Application of e-commerce

1. Internet infrastructure

This level is made up of the basic hardware infrastructure to realize e-commerce. The infrastructures are systems for information transmission, including remote communication network, cable TV network, telecommunication network and Internet etc. The above mentioned networks provide the transmission line for e-commerce, while at present most applications of e-commerce are based on Internet consisted of telephones, modems, hubs, routers, SPC exchange and cable TV.

2. Multimedia and online publication

The increasing perfection of Internet infrastructure makes the transmission of information through network possible, such as texts, sounds and images etc. At present, the latest craze for publishing on WWW is by HTML, by which the multimedia contents can be easy to search and expressive. In this way can enterprises publish various commercial information on Internet by homepage and e-mails etc., and can clients obtain information needed by means of online search tools.

3. Newspapers and information communication infrastructure

This level mainly supplies tools and methods to transmit information. It is mainly in the following two ways:

① Non-formatted data communication. For example, information is transmitted to people by making use of fax and e-mails, in which man shall take part.

② Formatted data communication. For example, information is transmitted to machines automatically by EDI, in which man shall not take part.

4. Commercial service infrastructure

This level is mainly for realizing standard online commercial business service for the sake of convenience. The above service will be used by all enterprises and persons in doing business, including establishment of commodity catalog/price list, electronic payment, secure transmission of commercial information, authentification of legality of both sellers and buyers.

But for the e-commerce, the transmission of information shall meet the requirement of e-commerce and provide a secure authentification mechanism to guarantee the data are reliable and undeniable. When disputes arise, appropriate proof can be submitted. The sixty-four-dollar question is the safety of electronic payment that will be dealt with in details in latter chapters. Presently, many technologies are for this purpose, such as password, digital certificate, and SET protocol.

5. Public policies, laws and privacy

Public policies comprise the following policies centering on e-commerce, which

shall be worked out by government. They are taxation regulations, information pricing, information access fee, information transmission cost, and privacy etc.

Laws maintain the regular operation of e-commerce. Accordingly the irregular activities will suffer sanction of laws. From the perspective of law, authentification of e-commerce refers to the reliability and security of data and products involved in e-commerce. Because e-commerce is same as the traditional trade, a serious social activity, two parties involved in e-commerce shall join in the market with true identity, and provide real information, that is the real e-commerce. The security of e-commerce refers to the parties involved are in duty bound to keep the documents/products of the other party secret when not authorized to give publicity to them, for these documents and products are all real. The first step of establishing e-commerce law is to establish the system of e-commerce authentification. Without laws, any system of e-commerce authentification is only an empty promise. Therefore, American government has enacted *The Framework for Global E-commerce*; Russia, Germany, and U.K etc. have enacted in succession many regulations concerned. The United Nation Trade Organization passed *E-commerce Demonstration* in 1996, and Chinese government is speeding up to lay down the *E-commerce Law*, which undoubtedly will speedup the sound development of e-commerce in China.

Authentification of e-commerce is far from perfect only with corresponding laws. In other words, the participation of the government is of necessity by means of Internet to manage e-commerce. In e-commerce transaction, the privacy of an enterprise covers its product price, channels for purchasing and selling goods, promotion methods etc. As regard to personal privacy, it is related to one's name, image, gender, identify and so on.

6. Technology standard

Technology standard is the basis of information releasing and transmission and the guarantee of agreement of online information. Furthermore, it defines the technology details of customer interface, transport protocol, releasing information standard, security protocol and so forth. From the perspective of the whole network environment, standard is of significance for compatibility and universality. This can be compared to adopting different voltages to transfer electronic current and different systems for video frequency signal transmission so as to confine the universality of many products in the world. Similar problems have arisen in e-commerce, such as EDI standard, and ebXML standard. To our delight, some international credit organizations as VISA, MasterCard with all social circles have worked out SET protocol for secure e-payment.

1.5.2 Legal Environment

Generally, problems and difficulties in the electronic process of traditional

commerce can be dealt with by means of technology, law and economic measures. Consequently, apart from technology, corresponding laws must be worked out to guarantee e-commerce. More details and solutions shall be covered in the part of e-commerce and law.

1. Legal problems in e-commerce contracts

Legal problems in e-commerce contracts are involved in the expression of the true intention of parties concerned that will be challenged severely in e-commerce. The following shall seriously be dealt with: prescription of whether contracts and promises can be repealed; when and where the e-commerce contract takes effect; the problem that only handwritten signature on contracts and documents is valid. If the above problems are overcome timely, e-commerce will smoothly develop; otherwise it will hinder the development of e-commerce.

2. Legal protection on e-commerce transaction

Electronic contract based e-commerce has been an international trend, and the market of EDI has been increasing by 20% per year. Accordingly, US and EU have proclaimed that they will defer working procedures or refuse to trade with ones who do not adopt EDI to declare customs. Presently in America, 97% of the top 100 large-scaled enterprises have adopted EDI. And in most European countries, EDI has been the only method to do business. Therefore, if enterprises in China intend to join in the international trade and become main parts, they must make full use of the tool of electronic contract. However, electronic contract cannot be put into full play unless corresponding laws are passed as the guarantee. Otherwise, confronted with the dispute caused by electronic contract with foreign enterprises, our enterprises will feel powerless and frustrated, though our government would be glad to help but cannot. Some developed countries have started by turning to laws for protection of e-commerce. In addition, it is necessary to protect e-commerce for the sake of social development. However dispute is prone to arise because of the characteristics of electronic contract, for instance, electronic contracts will become valid even without the traditional handwritten signature and written forms. To resolve these disputes correctly, justly and appropriately, there must be laws to go by so as to maintain social justice and speedup economic development. The sound development of electronic transaction will further speedup the development of social civilization. And the legal protection of e-contract can be carried out by legislation and justice.

3. Problems in the electronicization of banks

Banks, the final executor of electronic payment and settlement, link the seller and buyer, and e-payment service offered by e-bank plays important role in e-commerce, and will directly affect the development of e-commerce. As the develop of e-commerce, it is an inevitable trend for bank to become electronic.

Similar to any burgeoning matter, electronic banks has met the requirement of e-commerce and displayed vitality on the one hand, and displayed the hysteretic nature of laws.

Loss caused by technology shall be remedied by law for the following reasons: firstly, many parties are involved in the system of e-money capital allocation, if any failure occurs, the legal relations will be very complex. Secondly, since capitals in the system of e-money capital allocation of e-banks are large in amount; great loss will arise with any mistake. However, the lack of electronic capital transfer law in China brings about the following problems. For example, if an accident occurs, it is difficult to determine the responsibility of the parties involved so that the transaction capital cannot smoothly be allocated. Apart from what has been mentioned above, the lack of universal management of e-money and security anthentification become the hidden trouble of e-money capital allocation.

1.5.3 Credit Environment

With the globalization of e-commerce, credit crisis in e-commerce invades secretly and various illegal behaviors happen repeatedly such as false trade, counterfeit products, contract cheat, price pushing in online Auction and the impingement of consumers' legitimate right and interests. All the above hinders to a great extent the rapid and health development of our e-commerce or global e-commerce.

Credit is the basis and lifeline of market economy, the credited commodity economy, and even becomes the passport to international market after the globalization of economy. As to e-commerce, a kind of commercial activity, credit is also its foundation and lifeline.

The reasonable and normative credit system is not only favorable for the sound and normative development of e-commerce but for establishment of credit conscience, perfection of our market economy system to establish a just and fair market economy. After making a comprehensive view on the international society, it is easy for us to find out that the Western developed countries have achieved a lot in establishing the social credit system and mainly adopted the following patterns:

1. Pattern of market operation and legislation guide

This Pattern is with the characteristic that the establishment, operation and extinction of credit organization are all operated by market mechanism, while the management of government is reflected by legislation. This pattern can further be divided into two types:

First, credit management system formed in commercial operation is carried out by credit companies. US is the representative of the pattern. In this system, all enterprises and personal credit companies are all centered on market operation, fall into the category of privately-owned enterprises and be determined and become

standard by market mechanism, no matter what industry the credit company belongs to. As to governments, they make neither investment nor business certificates. Business start and authorization thoroughly rely on laws and operation mechanism of market system. Therefore, the focus of the pattern is benefits and the management of government is reflected by legislation to specify the behaviors of all parties in credit activities in order to make all parties behave according to game rules, observe fundamental principles of market rules and compete freely.

Second, credit management system established by central banks with the characteristics of central financial credit registration. The representative of the pattern is Europe. Similar to US, developed areas in Europe are typical of "market-driven". In the pattern, a government is just responsible for legislation and the supervision of credit management system. As for the death of credit organizations, it depends on how much satisfaction the system brings to the investors. In supervision of national credit, central banks play a significant role because they have financial credit of both enterprises and individuals in financial credit registration system, by which credit organizations can analyze and comment on the credit of enterprises and individuals.

2. Pattern of government-driven and direct supervision

This pattern is established and lead by government with large amount investment. Some developing countries, most countries without credit information service, fall into this category of "government-driven" pattern. In this pattern, government is not only the supervisor of credit information service market but the direct driving force of credit information service industry. In terms of experiences of Asian countries, "government-driven" pattern is not ideal, though many credit rating companies were established with the governments of Indonesia, India and Malaysia as initiators.

A sound credit management system shall comprise corresponding national legislation and law enforcement, governmental supervision and management and trade self-discipline etc. However, the system in our country is now far from perfect and has no supervision and punishment systems for dishonor and irregularities. We are still in the primary stage in establishing credit system. Therefore, there are many problems in the system.

(1) Though there are signs of an upturn on the horizon in market operation schema, the operation of it is still non-standard. Credit information service is a case in point. Credit information service companies of different types have competed with others in the market by the principles of commercialization. For instance, there are many distinguished credit information service companies such as China Chengxin Security Valuation Co., Ltd., Dagong International Credit Rating Co., Ltd, China Lianhe Credit Rating Co., Ltd etc. Nevertheless, corresponding supervision system relatively lags behind, because there is not effective management of credit information service companies and activities. This brings

about credit information companies' cut-throat competition for market by low price, high brokerage, and high rating, which makes rating become a commodity.

(2) Effective administrative management system has not come into being. Manifold management and non-universal requirement become the burden to enterprises. What is more, different departments do not cooperate with each other and there are no administrators to carry out universal management.

(3) Industry self-discipline has not come into being. Generally, the staff engaging in credit information service industry is low in quality. In addition, there are no staff functions to administrate the staff, to work out industry standard and to organize international communication.

It is difficult for e-commerce, a kind of virtual economy, to survive and advance without perfect credit system as guarantee. It is inevitable that both enterprises and individuals will run higher risks, for buyers cannot get commodity timely after payment and sellers cannot be guaranteed to get payment after selling commodity. In addition, quality of products and repeated auction on line may be encountered by them.

Presently, there are four typical credit patterns of e-commerce in China: mediator pattern, warrantor pattern, website operation pattern, and commission pattern. In the mediator pattern, e-commerce website functions as mediator. After the agreement is signed, the working body of the mediator will get the payment for goods sent by buyer and goods sent by sellers, and send goods to buyers and payment to sellers after check. This pattern intends to control the whole transaction process by means of working bodies of website, though it decreases the risks of cheat in business to a certain degree, it will cost flood of investment to build up enormous working bodies and cause the problem of transaction speed and cost. In the warrantor pattern, the website and the website host act as the guarantee of parties involved to resolve credit risks. In this pattern, there is a process of check and negotiation, which virtually increases transaction cost. In practice, this pattern is only suitable for enterprises with certain organizations. In the website operation pattern, transactions are made by establishing online stores. After obtaining the commodity transaction right, the website will require buyers to transfer the payment of goods to the appointed account, and deliver the goods after obtaining the payment. This unilateral credit pattern is based on the reputation of the website and only fits for website engaged in retail trade. In commission pattern, the website requires parties involved in transaction to establish, according to presetting terms, a public account in the agreed bank. And the NetPC will manage the transaction fund by means of presetting programs to see to it that the transaction is safe. In this pattern, e-commerce website does not directly participate in the transaction and the credit of transaction parties is on the basis of the fair supervision of the bank.

The above four patterns in Chinese e-commerce are explorations of e-commerce enterprises to tackle commercial credit. But they all have their own defects. For example, regulations of credit patterns are based on enterprise standards, which

lack of stability and authority. Administrators (including banks, Administrations for Industry and Commerce, Ministry of Public Security, and Administrations on Taxation) shall cooperate with each other to build up confidence in e-commerce of parties involved with the aid of governments. Presently, the following aspects shall be perfected.

(1) Build up the online credit sale evaluation model. In the West, credit of clients is evaluated by the following two ways before e-commerce transaction: First, clients' financial statements; second, credit evaluation system suitable for their own banks. However, most enterprises in China are still in the perceptual stage of cognition except some foreign trade enterprises. A few enterprises have drawn lessons from experience, begun to gather clients' information and made great achievements. For example, overdue receivables rate and bad debts decreased greatly and enterprises performance has become better.

(2) Strengthen the management of online clients' files. In the West, enterprises will generally investigate the files of tally customers at regular intervals (half a year in general) and adjust credit level in terms of clients' information. However, because enterprises in China cannot make timely adjustment of credit level on the basis of clients' information, they cannot increase the order of excellent clients and find out the less credit-worthy customers, thus bringing about the loss of bad debts and casting a cloud of gloom over enterprises.

(3) Build up a reasonable receivables account recovery system. As for the management of receivables account, Western countries and many developing countries have clearly specified that receivables account more than half a year shall be treated as bad debt, some with 3 months as deadline. To avoid the happening of bad debt, if the debt is overdue no more than 3 months, credit department of the enterprises will be responsible for demanding payment. If the debt is over 3 months, enterprises will turn to exterior specialized institutions for help. If the debt is over 6 months, enterprises will take legal measures to recover the past due. However, in China, as to the overdue payment left by the former leader, the successor of an enterprise would rather charge it to an account than actively demand the receivables account, for they are worried that if the overdue payment translates into bad debt, it will influence his achievement. Accordingly, with the changes of different leaders, overdue payment of an enterprise will become more and more in amount, longer and longer in time, and most will become bad account.

1.5.4 Financial Environment

E-commerce will present a completely different financial industry. Because the key link and basis of e-commerce smooth development relies on online e-payment, owing to the breakthrough of e-commerce in e-transaction and the presence of various services (e.g. online banks, bank card credit payment network, bank

e-payment system, e-check, and e-cash), e-commerce brings the traditional trade into an entirely new time. The birth of the first world online bank, "Security First Network Bank", in America Oct., 1995 transformed people's ideas about transaction in the whole financial banking industry, though it only has 10 employees with the homepage as the business hall, with no building, no location, and cannot compared with citibank with the total asset over $200 billion. In China, extensive exploration of e-finance has been carried out in succession by government and enterprise since the implementation of "Three Goldens projects" and "Golden Series Projects". The following Fig. 1.16 represents innovative services supplied by finance in e-commerce.

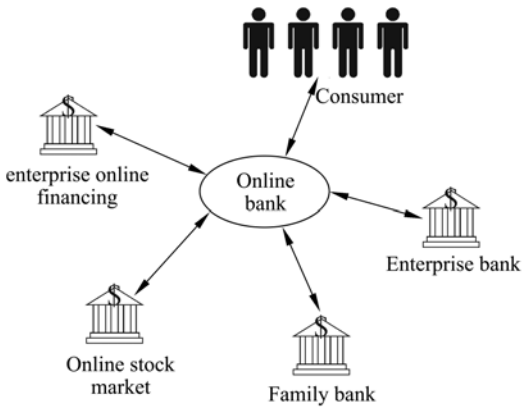

Figure 1.16 Innovative services supplied by finance in e-commerce

1. Financial service in e-commerce era

The development of e-commerce provides wider scope and easier means to obtain information. Product recognition, contract negotiation, and transaction in commerce can be completed by Internet and network software. Moreover, check, counter, insurance, investment, enterprise banking business and family banking business can all be realized by network. Electronic currency of online payment (credit cards, digital cashes etc.) replaces the traditional monetary operation. In addition, competitive factors of financial industry are extended from staff and branch numbers and size to information communication and digital cash etc. That is to say, e-commerce has revolutionary consequences for world economy and finance. Information communication and digital e-currency speed up the breakthrough of finance in space on the one hand and bring difficulty in financial supervision. Therefore, all governments shall lay down financial laws and regulations to specify the rising financial business.

In the field of China's banks, China Financial Data Communication Network constructed by People's Bank of China, the initiator and principal commercial banks and financial institutions and National Credit Cards Message Exchanges

Center, make full use of the infrastructure of electronic financial system to strengthen payment system of Central Bank so as to establish and perfect payment system of China gradually. In addition, speed up the authorization of cross-bank and cross-areas credit card payment business and automatic exchanging of settlement information as well.

2. Online financial services

Actually, the essence of e-commerce is that move the business happening in offices, markets, banks and administrations in the traditional business to a public media, that is Internet. The business scope of e-commerce is extremely extensive, including chain management, non-local banks, placing orders, purchasing, network marketing, advertisement and even terminal household shopping, among which financial service are represented by.

(1) Online bank

The online bank is also called the network bank. It refers to the bank that provides the following traditional services to clients by making use of Internet: opening an account, closing an account, inquiry, payment of fees, balance of accounts, cross-bank transfer, inside transfer, financial credit, online securities, investment and financing etc., which enables clients to manage safely and conveniently current and time deposit, check, credit cards and personal investments etc. without leaving home. Online bank is, as it was, the virtual counter of bank on the Internet. Online banks can provide enterprises or individual and commercial units the information inquiry, currency payment, savings, settlement, online investment etc., releasing the financial information, terminating the basic cashier's check, currency market service, credit card, fundamental saving business etc., for instance. It can also provide clients diverse financial services such as information check and personal confidentiality.

Changes brought about by Online bank to banker, user and commercial units mainly embody the following aspects: first, online banks can cut down operation cost and the amount of bank outlets on the one hand, and make consumer enjoy the every-day-24-hour service free from the limits of time and space. Second, the clients of the online banks, including standard PCs and browsers, are easy to maintain. Online e-mails facilitate the communication between clients and banks and members within banks.

(2) Household bank

The household bank can provide complete and convenient financial services. A client can check and manage the information of check, savings, currency market, and deposit account, balance and capital allocation at any time by personal computer or other tools into the online banks. Apart from above, the client can also do the following financing activities by taking advantage of financing software, such as pay the bill on line, pay the checkbook, check account (for instance, trace out all financial affairs by checkbooks, and even keep track of and

make an analysis of the expense), work out financial plans of taxation, expenditure, and savings, and carry out financial capital activities by network.

(3) Online shopping and consumption

In e-commerce, it is required that market, manufactures, governmental administrations (taxation, industry and commerce, customs etc.), banks, and authentification institutions all shall be connected with network so as to form the smooth flow of information and capital. Clients can preview goods, place an order and make the payment in online markets. In addition, they can still book a ticket, go shopping, and enjoy themselves etc.

(4) Financial payment

In the traditional payment, there are remittance, paying by check, draft check, transfer payment. While in e-commerce, there are enterprise credit payment, e-check payment, e-transfer payment, credit authentification payment etc.

(5) Online enterprise financing

Online enterprise financing contains the following functions: enterprise group service—group clients can check balance, transaction information of all enterprise branches, allocate enterprise fund within group, and manage the account by online bank service. Public account real-time remote inquiry—enterprises can check balance and transactions of the public account in real time; online transfer—enterprises can make payment and transfer by Internet; balance of payments declaration—enterprises can make declaration of public inward remittance to Administration of Exchange Control by Internet, which is presently handled by head quarter.

(6) Express service between bank and stock institution

"Express service between bank and stock institution", a kind of service product, is introduced for the securities dealer to deal with the first, second grade settlement. The express can complete settlement between securities companies and stock exchanges and between securities companies and its sales departments as well.

1.6 M-commerce

1.6.1 The Origin of M-commerce

So-called mobile e-commerce (M-commerce), refers to the e-commerce with the combination of Internet and mobile communication equipments, such as a laptop, cellular phone and PDA(personal digital assistant, PDA),etc. The perfect connection of mobile communication technology and others created mobile e-commerce, but it is service that really and truly boosts market development. Mobile e-commerce can provide the following services: PIM(personal information), banking business, transaction, shopping, services based on location, amusement

etc. Without doubt, m-commerce cannot carry out all business, which is similar to the traditional wired e-commerce. For instance, in some cases, goods are tangible (CD drivers, computer hardware and book etc.), but in some cases, goods are digital (software distribution, capital transfers etc.).

The mobile e-commerce has turned into the new direction for the e-commerce because of its speed, convenience, and ubiquity. John, Diphyl, the American San Francisco Terrifia Company, which is responsible for keeping track of the development of telecommunication industry, once said that "in the long term, M-commerce has a bigger potential over the traditional e-commerce". The reason why wireless e-commerce enjoys the advantages over the traditional wired Internet e-commerce lies in that m-commerce possesses some incomparable advantages. According to Xie Taoling, m-commerce product control Director of AC, Only by m-commerce can difficulties in business be resolved anytime and anyplace.

Along with the globalization of information technology revolution, mobile phones have become the most vigorous up-&-coming star in Chinese telecommunication. With reinforced communication capability, China has transformed into the largest mobile phones country in the world. Therefore, m-commerce in China will have a brighter future.

Looking back the history of mobile phones in China, it can be approximately divided into three phases. Phase One (1987—1993), the initial stage. It mainly is to meet the users' urgent need. Phase Two (1994— the first half year of 1995), the development stage. 90 trillion MHz cellular phones in China became the widest and largest network in international network. Phase Three (from the second half year of 1995 up till now), the improvement stage. The introduction of world advanced GSM, digital mobile phone system symbolizes that our country mobile communication has entered into digital era from the single simulation system.

In the meantime, the development of mobile phones in our country went through the process from the east to the west and from cities to countryside. The utilization ratio of mobile phones has positive correlation with economic development. Thanks to the governmental support and growth in living standard, mobile phones in China have quickly developed, at the average annual rate of growth of 100%. Along with the decline of mobile phones price and the adjustment of mobile communication fee, the market will grow more rapidly.

M-commerce in China. Mobile Internet in China has made a good momentum of growth and presently m-commerce has been put into practice. China Mobile has applied simultaneously "Global System for Mobile Communications", the wireless application protocol (WAP, for short) commercial test network in such six big cities as Beijing, Tianjin, Guangzhou, Hangzhou, Shenzhen etc., which enables WAP phone users to enjoy roaming business. At the same time, Shanghai Mobile has applied WAP website (wap.sh.chnmobire.net) and succeeded in establishing m-commerce system for enterprises such as Shanghai Mailing Aquarius Co., Ltd. and Huayin Technical Co., Ltd. etc. Ebang.com, Toecom.com.cn, sohu, alibaba

are ready to or have provided m-commerce. Sohu and Nokia have declared to cooperate in wireless network service.

1.6.2 M-commerce Components

The development of mobile network and wireless data communications technology have laid a solid foundation for m-commerce. Presently, technologies of m-commerce spring up in multitude, which consists of:

(1) The wireless application protocol (WAP)

WAP, one of the core technologies in m-commerce, enables mobile users to enter into Internet anytime and anywhere, making m-commerce free from the limits of time and places completely. The presence and development of WAP, a communication protocol, is based on the need of Mobile. WAP, borrowing ideas from Internet, enables people to surf the net by adopting standard data format to express application programs and network contents and microbrowser, similar to PC browsers and standard communication patterns. By means of WAP, users can easily have access to and obtain all kinds of services and information of universal format in International network and enterprise interior network, for WAP supplies an open and universal technological platform. People can send and receive e-mails or even surf the net with mobile phones just like PC, if they have website server and such mobile equipments with a set of hardware and software interfaces defined by WAP. At the same time, WAP provides an application development and operating ambient supporting, presently the most popular embedded operating systems such as PalmOS, WindowsCE, FLEXO, JavaOS etc. WAP can favor the overwhelming majority wireless device used currently, including mobile phones, FLEX pagers, two-way radio communication equipment etc. In transport network, WAP favors not only the current mobile networks such as GSM, CDMA and PHS but also the future third generation communication system. Moreover, investment risk can be decreased by means of WAP. Presently, many common carriers have introduced diverse WAP products, including WAP gateway, application development tools and WAP phones to supply clients online information, games, and shopping etc. For the moment, the primary disadvantage of WAP lies in that it relies on, to a large extent, the bandwidth of wireless communication line. As to GSM, the data transmission velocity of short message is limited to 9.6 kbps.

(2) Mobile IP technology

Mobile IP carries out the seamless roaming by transforming IP agreement in the network layer. The mobile main frame recognizes its location by intercepting and capturing the message from broadcast of native agency and out-of-town agencies. When connected with native links, the mobile phone can function as a fixed one. If connected with out-of-town links, it can get its onward transmission address from hometown register. Then the hometown register will transmit data

packet to the mobile host according to the onward transmission address registered by mobile host. Thanks to mobile IP technology, it is unnecessary to change IP address and interrupt the ongoing communication when is transmitted from one link to another. Though mobile IP, to a certain extent, has supported the application of m-commerce, it presently faces the following problems: mobile IP triangle routes, the smooth switching among out-of-town agencies when mobile host is out of hometown, security and power consumption of mobile host.

(3) Bluetooth technology (Bluetooth)

The Bluetooth, a short-distance radio technology standard released by Ericsson, IBM, Nokia, Intel and Toshiba, aims at canceling the wired connectivity, carry out wireless interconnection in order to guarantee the communication between computers and communication equipments. Bluetooth, a kind of low cost, power and small range wireless communication technology can make mobile phones, PC, personal digital assistants (PDA), laptops, printers and other computer equipments to communicate within short distance without cable. For instance, the key technology to carry out the wireless e-wallet is to make the payment in vending machine by mobile phones. In Bluetooth technology the combination of circuit switching and information packet switching is realized by 2.4 GHz ISM frequency band, frequency modulation, and frequency modulation technology, forward error correction edit, ARQ, TDD, and baseband protocol. The blue tooth favors the 64 kb/s real time voice transmission and data transmission with the transmission distance of 10 – 100 ms by the principle of master-slave network.

(4) General Packet Radio Service (GPRS)

In traditional GSM, users can transmit data at the highest speed of 9.6 kbps by Fax, e-mail, FTP etc. This can merely meet the requirement of text and static image but sound and video. GPRS breaks through the prototype in GSM that network can merely favor circuit switching and introduces the packet switching pattern into GSM. It implements packet switching by increasing corresponding functions and transforming the existing base system to improve the utility of resources. The GPRS radical principle is to make several consumers share the certain fixed signal path resources and improve the transmission rate in each time slot from 9.6 kb/s to 14.4 kb/s. If 8 time slots within the frame of TDMA are all used to transport data, the transmission speed can reach up to 164 kb/s. The GPRS is mainly for paroxysmal data service and suitable for the frequent small-amount transmission and infrequent large-amount transmission. GPRS can provide the following bearer services: point-to-point non-linked network service, point-to-point connected-oriented business and other business.

(5) Mobile Positioning System (MPS)

One of the main applications of m-commerce is to provide tourists and employees on business the information of local news, tourism, weather and hotel etc. in terms of their location. This technology will bring enormous business opportunities to the native tourism, business and restaurants.

(6) The third generation mobile (3 G)

From 2.5 G to 3 G, the wireless communication product will favor multimedia service of 2 Mbps bandwidth, voice of high quality, data grouping, multimedia service and the multi-user velocity communications, which will thoroughly transform people's communication and life style. 3 G, as the broad-band communication, will be the future communication terminal aggregating the applications of voice, image, data transmission etc. This will further facilitate the overall m-commerce development. The real-time video, RTV broadcast, for instance.

1.6.3 The Development of M-commerce

Ten trends of the m-commerce:

Trend One: Commercial speculation of Internet will reach the zenith.

The mobile carriers and communication products manufacturers are bound to publicize widely centering on mobile network in that they have invested enormous fund into data communication equipments and business certificate. These companies will do their best to arouse consumers and accept this correspondence method. IDC reckoned that there were over a billion cellular phones all over the world with the access to Internet in 2003. Certainly not all of these cellular phones will be used for web surfing.

Trend Two: The business application will become the center and focus of m-commerce. Thanks to wireless client relationship management (CRM), marketing management and other business applications, business consumers will prosper both in income and working efficiency. Therefore, the publicity focus of carriers will not on customers but m-commerce business application.

Trend Three: The consumer use mobile equipment is not for business and transaction but information.

Consumers are mainly to acquire such information as e-mails, stock, weather, the journey route and flight etc. by mobile phones. Though these services do not represent the direct commercial opportunities, they contribute to establishment of client relations and indirect commercial opportunities creation.

Trend Four: M-commerce will take on a new look by embedding optical bar-code reader into mobile phones.

It is predicted that cellular phones embedded with optical bar-code reader will come into market, which will bridge the traditional trade and Interne trade. Data transmission will be tackled by the embedded optical bar-code reader, which makes m-commerce to step into a higher stage. IDC predicted that this function will be extremely useful for those professional commercial career men.

Trend Five: display screen of intelligence hand-hold equipments will be improved, but it is difficult to input tables and initial data.

Mobile phones with display screen of higher resolution and optical bar-code reader will be friendly accepted by customers, but do not anticipate the occurrence of miracle. The narrow display screen and trivial data input methods are still the main obstruction of the utility and functions of Internet. IDC anticipated that it is impossible to improve data input methods and the size of display screen in the near future.

Trend Six: The mobile security will become an issue.

As people make use of mobile equipments to have access to Internet, much attention is paid to the security of them such as PC, which becomes prominent with the undertaking of data share and increasing of mobile equipments functions. Though currently the number of global user of mobile equipments with the capacity of the data transmission has come to many a million, most of these equipments are almost without any security mechanism.

Trend Seven: Voice network navigation is still under study.

Though it seems that voice is the most natural interface of mobile equipments, there will not be breakthrough progress in its research in the short term, that is, nothing will be put into practice.

Trend Eight: Though the mobile communication equipments combining various functions, many other types of equipment still exist concurrently.

It is impossible for an equipment to replace others, though currently many communication equipment combining various functions. PDA manufacturers will add telephone function to their products and mobile phones manufactures will add PDA function to their products. If so, it will definitely increase volume, weight and cost of the equipments, which will not be accepted by most people.

Trend Nine: The advertisement of wireless communication equipment will continue to grow.

Trend Ten: carriers should transform their sale strategies.

The strategy of carriers is going to change, though it has continuously been on customers. Along with more and more commercial application services have been put into practice, it can be foreseen that the sales object of Mobile carriers will not be on terminating customers but on enterprise users. Those carriers who are successful in strategy transfer will win the market share on the one hand; benefit their customers on the other hand.

Generally speaking, the time has been or is ripe for the development of the characteristic M-commerce that will have an inviting prospect. Superficially, the technical progress and the security breakthrough have promoted M-commerce to develop into a traditional e-commerce. However, essentially, they are distinguishing from each other: E-commerce translates into electronic business, among which B-B is more popular than B-C. While M-commerce will take a different road, for which the driving force is banking service, stock transaction and various tickets booking.

1.6.4 The Application of M-commerce

Along with the popularization of mobile telecommunication technology, real time data exchange of mobile financial service is the direction for financial industry. Consumption patterns of customers will be free from the restriction of areas, time and fixed transmission routes with each passing day. The changing mobile payment is changing people's consumption habits. Currently, though cellular phone users who are attempting to make payment by phones take up 10% of the whole users, according to some foreign research institute, the world m-commerce consumers will have amounted to 1.67 billion, generating the income of $554 billion by 2008.

Currently, m-commerce service mainly covers: online purchase, online finance, online bank, transfer payment, loan application, electronic lottery, electronic shopping, mobile stock transaction etc.

Owing to service supplied by m-commerce, users can operate conveniently, and financial and commercial institution can also lower cost and raise efficiency. It is m-commerce that avoids the troubles and difficulty in cash transaction such as insufficient fund, false currency, caring and carrying. Apart from this, the privacy of customers in business is also guaranteed in the process of punching the card, because the valid identification of the card holders and the trade authenticity of the sale will be verified by banks and receipt will be printed when the transaction terminates.

Several characteristic m-commerce applications will be introduced as follows.

(1) Points of Sells (POS)

NTTDoCoMo, the Japanese mobile phones industry magnate opened the settlement and authentification service by built-in non-contact IC card—"i-modeFeliCa" in Jul., 2004 and manufactured subsequently four types of such mobile phones. With the service and above mentioned cellular phone, expense will be subtracted from the phone after radio recognition and identification as long as the consumer makes his phone face the electronic scanning equipment of the adding machine, which is like the use of credit card without key operation. Because the above four kinds of phones all can be Internet connected and enable consumers to replenish money into the phone from his credit card via Internet. Apart from substituting purse, the new cellular phone can also act as train ticket and other identification cards. Some Japanese airport has already allowed the passenger to make use of the cellular phone to speed up security check. JCB, a Japanese credit card company, will release a new service to enable enterprise clients to use built-in chip phone as the electronic key to business building at the end of this year. In the next year, consumers will be able to pay the train ticket fee by cellular phone.

POS, the extension of wired POS, enables clients punch credit cards anytime and anyplace, getting away from the restriction of operation site and communication routes by making use of SMS or GPRS. The presence of POS system meets the

expanding requirements. The "selling while walking" is realized with m-commerce and various open-air toll house, which brings customers unlimited business opportunities.

The presence of POS business embodies vividly technical advantage in financial field. Currently, to become competitive in technology means pooling flood of fund into technology and introducing new types of financial services by means of advanced technology means. The development of wireless POS application system enables developing banks to rush to introduce new financial services and take up the new field and better their own images. What is more, the development of wireless POS application system enables developing banks to free from the restriction of places and routes, expand their financial services and space, bring a large amount of deposit and become competitive. Last, the development provides a brand-new settlement and promotes the sound development of e-commerce.

(2) Mobile booking

Information about the nearest restaurant, movie theater or theater can be sent to the consumer's mobile phones in terms of location technology, which enables the customer to book cinema ticket or have dinner by his mobile phone.

According to the report on the prospects of booking ticket by mobile phones by Juniper Research, a British market survey company, this service will have made up the majority of m-commerce by 2007 and been expanded to $39 billion in scale, making up half of the whole turnover of m-commerce, $88 billion by 2009. Consumers, especially customers in Europe and Japan, have begun to show their interest in Mobile booking tickets of trains, buses, films and dramas and car parking.

The mobile phone booking has the potential of becoming the large-scale market, and will extensively be used in sales of commodity and tickets because acquisition is extensive to apply, and the cost is also very cheap because of the low risk and cost, which makes a large number of customers are willing to have a try.

(3) Mobile phone bank

The mobile phone bank, mobile bank, is the abbreviation for banking business by mobile phones. It can be regarded as "service for the convenience of the customers" carried out by financial institution with the help of new technical platform of mobile carriers. A customer just does as the mobile phone prompts, he can enjoy personal financing service provided by mobile banks and complete the following things: account information inquiry, transfer between accounts, silver credit transfer, stock jobbery, personal firm offer, exchange transaction, payment, and financial information inquiry etc.

The products of mobile phone bank consist of SMS and WAP. The SMS mobile phone banking business is comprised of mobile phones, the GSM message center and banking business system. The connection of GSM message center and mobile phones can be connected by and GSM centers by the communication between system, and the connection of GSM message center and bank systems can be connected by network. In some cases, the message center maybe connected

with the bank preposing machine by a value-added service platform to reduce the burden of message center. The SMS mobile phone bank has won high favor of the consumers in the Asia.

This business has been released by financial institutions in China such as Bank of China, Industrial and Commercial Bank of China, China Construction Bank, China Merchant Bank. While abroad, the service of the Korean SK telecommunication is characteristic. The company releases the brand new service "M-BANK" as the important business in the mobile financial service brand "MONETA" by integrating remittance service of the company. Consumers can enjoy the e-commerce service such as bankbook, cash card business, and Internet bank etc. by the mobile phone with built-in intelligence chip. The user can do business in the ATM of the bank or even roam in some neighboring countries, free from the restriction of the time and space.

In addition to the above mentioned business, M-commerce will find something new in what is old as time goes on. For example, in essence, the current amusement-centered IVR can be used to aim at enterprise users in commercial business. Currently though there is no special IVR product for enterprise users, the voice system of IVR enables them to have teleconference and communicate anytime and anyplace, greatly improving the work efficiency and reducing the cost of conferences. Though it is just a speculation, it must be a process for a consumer to know a rising business from acquaintance to habituation, understanding and reliance. It is beyond doubt that with the development of IVR business and the progress of technology, mobile IVR will be applied in enterprise in the near future.

Similar to Internet commerce, the bottleneck of M-commerce development is the security of the information of users and transaction. Presently, several principal Korean carriers are intending to develop hand in hand information security standard for M-commerce industry in order to break the bottle neck and lay a solid foundation for exploring a greater market.

1.7 Summary

E-commerce is the inevitable product of the international commerce, and the international commerce is the first cause of the development of e-commerce. e-commerce, the electronicization of the traditional commerce, is the commercial activity carried out by making use of the electronic information technology. The development of e-commerce is the interdisciplinary cross-impact product, among which computer and communications science give technological support to the establishment of e-commerce, the technologies of computer and communication lay a solid foundation for the development of information security and steer the smooth development of it, and management science orients the development of e-commerce strategically.

The fundamental patterns of e-commerce match those of traditional commerce, among which B2B is suitable for transactions between enterprises, B2C for the transaction between enterprises (the retailer) and consumers, B2G for governmental procurement and C2C for transactions between customers.

The following are integral to an e-commerce system: Internet business clients, perfect logistics, and an overall supply chain and customer relationship management. In addition, the sound development of e-commerce shall have the support of corresponding laws, credit and financing.

M-commerce, the latest e-commerce, is promising, because it gives full play to all advantages of e-commerce and really and truly gets away from the restriction of time and space; nevertheless, M-commerce will not predominate because of the limitations of mobile equipments in information storage, information processing and exchange capacity.

The chapter covers the fundamentals of e-commerce: origin, history, influences on its development by corresponding disciplines, fundamental patterns, components, supporting environments, and the brief introduction to M-commerce.

On the basis of the mentioned above, the following points can be made out:

(1) E-commerce, the electronicization of the commercial activity, refers to commercial activities carried out by electronic methods. It comprises Internet, e-commerce users, certification Authority, distribution centers, online banks and administrations.

(2) The development of e-commerce is the interdisciplinary cross-impact product, among which computer and communications science give technological support to the establishment of e-commerce, and management science orients the development of e-commerce strategically.

(3) The hardware platform of e-commerce mainly is composed of data communication transmission media, data communication system and computer network; The software platform is mainly made up of network protocol, operating system, databases, middleware, network service, application software, information processing technology.

(4) Supporting environments of e-commerce mainly include technologies, law, credit and finance etc.

(5) The main mathematical models involved in e-commerce consist of probability model, queuing model, nonlinear dynamics model, and graph theory model etc.

(6) M-commerce, the currently rising e-commerce, is promising.

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Part 2 Technology

2 E-commerce Supporting Technologies

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Abstract E-commerce must be supported by corresponding technologies. To study e-commerce, one must masters the e-commerce supporting technologies. General speaking, e-commerce supporting technologies can be divided into three categories:

(1) Information display technologies which include Web, HTML, XML and Java technologies.

(2) Information transmission technologies which consist of EDI, TCP/IP, WAP, WLAN and Bluetooth technologies.

(3) Information processing technologies which comprise some common used technology such as GPS, GIS, DSS, GDSS, IDSS.

All the above will be briefly introduced in this chapter. What's more, the purpose of this part is to give readers a basic understanding of these technologies and help them to build a foundation for their further study on this field.

Key Words e-commerce, supporting technology, Web, HTML, HTTP, XML, Java, EDI, TCP/IP, WAP, WLAN, Bluetooth, GPS, GIS, DSS, GDSS, IDSS.

This chapter provides complete coverage of the supporting technologies in e-commerce. In this chapter, you will get an overall knowledge of the fundamental supporting technologies of e-commerce. The main points of this chapter include: E-commerce fundamental technologies (Web, JSP and Java), computer communication technology (TCP/IP, HTTP, WAP, WLAN and blue tooth) and e-commerce information processing technology (GPS, GIS, DSS, GDSS and IDSS).

The introduction of programming languages, protocols, standards and various supporting platforms in this chapter, will help you get systematic and thorough

comprehension of the supporting technology of e-commerce systems, and it will, too, help you lay solid foundation for the design, construction and application of e-commerce.

2.1 E-commerce Fundamental Technology

2.1.1 Web Technology

The structure of web technology is shown in Fig. 2.1. In this kind of architecture, web client means the terminal with a browser. Web server is the mainframe which stores multimedia data resources and provides www services. The middleware can invoke the database and other applications in the web server. Common middleware include CGI, JDBC and WebAPI.

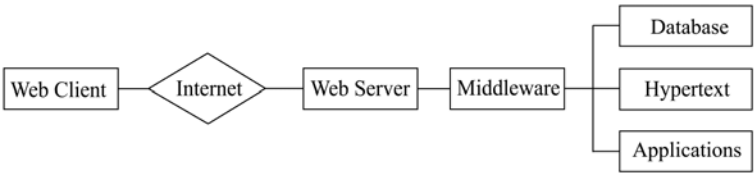

Figure 2.1 Web technical structures

The fundamental principle of web communication is as follows. The browser sends http request to the www server. After receiving the request, www server will make response processing, and return the processing result to the browser in the form of html file. Then the browser will interpret and display it to the user. The interaction between www server and database server has to be connected by the middleware.

The web browser is an application, which seems like a word processing application (such as Word Perfect or Microsoft Word) at the client terminal. The webpage displayed on the computer screen is the interpretation of the html document. Instead of typing various commands with the keyboard, the browser with GUI has made it possible for the users to execute their operations by selecting the icons with the mouse, which is a great convenience to the users.

The web browser gets access to a designated document or service by sending request to the web servers based on http protocols. Correspondingly, the web server returns the responding document of the request. Then the browser interprets all the tagged codes and displays them in correct format. Browsers usually have the functions such as URL locating, hyperlink, offline browsing, searching and printing.

2.1.2 HTML

HTML (Hyper Text Markup Language) is a simple markup language that is used to make hypertext documents. HTML documents are independent of operating system platforms (such as UNIX and Windows). Since 1990, HTML has been used to represent information on the Internet, including the definition of the format and style in pages and the relationships among several documents.

HTML documents (the source code of the page) is a marked up ASCII text, the file name is usually followed with .html or .htm. There are three ways to generate html file:

(1) Directly manual coding (using ASCII text editor or other HTML editors).

(2) Transferring the exist documents in other format to html documents with some format transformation tools.

(3) Dynamically generated by the web server (or http server).

Html marks the structure of the documents and the hyperlinks by using various tags. Although it describes the structure of the document, it cannot define but suggest the way in which the document displays and arranges the information. The final result displayed in front of the user is determined by the display style and the explain ability to the tags of the web browser. That is why the same document will be displayed differently in different browsers. Now the version of html is 2.0, which evolves from a subset of the Standard Generalized Markup Language (SGML).

2.1.3 XML

XML is the extensible markup language, which is usually misunderstood as the simple extension of the HTML.

XML combines the advantages of SGML and HTML while eliminating their disadvantages. XML is still considered as a kind of SGML, which can realize most of the functions of SGML. In summer 1996, John Bosak of the SUN Microsystem began to develop W3C SGML (now called XML group). Their goal is to develop a new SGML which has the advantage of SGML with the simplicity of html.

There are many projects of web mark language in special areas, for example, the chemical markup language (CML) developed by Peter Murray Rust. In mathematics, companies including IBM are engaged in developing MathML. In Apr. 1997 the first version of XL1 was released. When the XL1 was completed, its function would be more complicated and stronger than that of the current html and browser. In Feb. 1998, W3C released the formal version of XML1.0. With the rapid development of network applications, the development of XML is also popular in recent years. New terms such as DOM (Document Object Model) and XSLT (XSL Transformation) appear, and the application of XML is also developing very fast. Companies such as Microsoft, IBM, Breeze and Stilo turned out their own solution or development platforms. Thanks to the promotion made by

Microsoft, Breeze, HP, etc., now there are two well-known XML research groups, biztalk.com and oasis.org. And they proposed the standards to W3C together. The former is initiated and organized by Microsoft. It is quite interesting that Microsoft has joined Oasis at the same time. Different from IBM, HP, Microsoft just turns in 100 thousand US dollars as annual fee. As the spokesman of Microsoft is quoted, all depends on the development of Oasis. That means that, if the standards formulated by Oasis are against the application of Microsoft, a war about the standards will be unavoidable.

XML is a meta-markup language. “Meta-markup” means that the developer can define his own tags according to his own needs. For example, one can define tags such as <book> or <name>. Any name that conforms to the naming rule of XML can be used as tags, which provides an access to different applications. Html is a predefined markup language, which cannot identify the user-defined tags but such predefined tags as <html>, <p>. Moreover, XML is a semantic/ structured language, which can describe the structure and semantics of documents.

From the above comparison we can tell that the XML documents have definite semantic and structures. XML is a universal data format. From the fundamental point of view, XML is a simple data format and 100% ASCII text, different from compressed data or Java objects which will not be readable once a single datum is corrupted. From an advanced point of view, it is a self-described language. XML can be used in data exchange primarily because the information represented by XML is platform-independent. Here the platform may refer to programs as well as operating systems. It has described a kind of regulation, with which the word documents of Microsoft can exchange information with Acrobat and databases.

For large and complex documents, XML is an ideal language. It allows designating the vocabulary in documents and the relationship between elements. For instance, it can be prescribed that an author element must have a name sub-element, or the business should include sub-business.

XML documents are composed of DTD and XML documents. DTD (Document Type Definition) is a set of grammar rules for tags, which indicates how the XML text should be organized. For instance, DTD can represent that a <book> should have a sub tag <author>, with or without sub tag <pages>. Of course, a simple XML document may not have DTD.

Although the XML Schema has imposed restrictions to the use of tags, the automatic processing of XML needs more strict and comprehensive tools. For example, DTD cannot guaranteed that a certain attribute of a tag should not be negative, so there comes the XML Schema. Since XML Schema itself is a formal XML document, the information exchange between it and other XML can be realized with the same tool. The initial XML Schema is proposed by Microsoft. Then after plenty of discussion and argumentation, the experts of W3C published a requirements definition in Feb. 1999, indicating the requirements that scheme must conform to. And in May of the same year, the definition of schema came out. Currently, the XML revolver can work according to DTD or XML schema.

DOM realizes the content of XML as an object model, which simply represents

how the applications access XML documents. DOM Level 1 of W3C defines how to realize the attributes, methods and events.

XSLT (XML Style sheet Language Transformation) is a language used to transform between XML documents. To put it simply, since different developers use different XML documents according to different applications, XSLT enables us to extract the data we need from a pre-defined XML document to construct the different forms such as XML, html and various scripts.

Framework is a high-level control of structure. With XML framework, the logic of business can be set apart so as to achieve the segregation of data from computation. Now the well-known frameworks include Biztalk of Microsoft, EBXML co-published by UN/CEFACT and Oasis in 1999. It is believed that there will be many frameworks soon. Of course, the development of XML has promoted many new technologies, including RDF and Xform. But for the most of them, W3C only proposes suggestions without formal standards. Some contents are still under discussion.

2.1.4 Java

Java language, which came into being in 1991, was initially named OAK language. It is a general environment designed by SUN for some digital products. The initial goal is to develop a software technology that is independent of platform. Before the appearance of network, OAK is unknown to the public. However, the network changed the fate of OAK.

Before the emergence of Java, the information on the Internet is made up of some dull html documents. It became unbearable to those who are absorbed in web surfing. They are eager to see some interactive content on the web. At the same time, developers hope to bring out some applications with high security, which are independent of hardware platforms. As to these requirements, the traditional programming languages appear helpless. The engineers in SUN subtly perceived this point. They began to apply the OAK technology to the web since 1994, and then developed the first version of HotJava.

Java is a simple, object-oriented, distributed, interpretative, robust, neutral, transplantable and multi-thread language. There are different editions for development environment of Java, such as Java Developers Kit of SUN, or JDK for short. Subsequently, Microsoft released Microsoft Visual J++, which, VJ++ for short, supports Java norm. Java has the following features:

1. Platform-independent

Platform independence means that Java can run on different platforms. Java has introduced the principle of virtual machine. JVM, established on hardware and operating system, implements the interpretation of Java binary code and provides interface for different platforms.

2. Security

The programming of Java is similar to C++. C++ users can quickly master its essence. Java abandons the direct memory access mechanism of C++, and the memory is allocated by operating system when the program is running, which avoids the virus intruding the system via pointers. Java also provides security management for programs, which can avoid illegal access to programs.

3. Object-oriented

Java has adopted the object-oriented concept, which encapsulates the data into classes, and thus accomplishes the simplicity and low maintenance of programs. The encapsulation and inheritance of class enable the code to be reused by being compiled only once. The programmer just needs to concentrate on the design and application of the classes and interfaces. Java provides plenty of general object classes, and users can use the methods of parent class via inheritance. In Java, one sub class belongs to only one parent class. The inheritance relationship between object class and the subclasses provided by Java seems like a tree posed upside-down, the root of which is Object class. Object class with strong functions and its subclasses are commonly used.

4. Distributed

Java is built on the extended TCP/IP network platform. The library functions provide methods transferring and receiving information through http and ftp, which enables the programmer to use the online files as easily as the local files.

5. Robust

Java concentrates on checking errors during compilation and running time. Validation of Class helps to reveal many early errors. Java manipulates the memory by itself, which reduces the memory errors. Java also implements real array and avoids data overlapping. These functions greatly facilitate the development of Java applications.

Java provides all the functions of a powerful language, without any confusion. C++ has poor security feature, however, C and C++ are widely accepted. So Java is like C++, which makes it easy for users to learn. Java gets rid of many features of C++, which makes it highly refined. Java is also added with many useful features, such as garbage collection. Java has abandoned the following functions of C or C++: pointer, structure, Typedefs and #define, memory release. These modifications reduce general errors by 50%. Moreover, Java is small, the interpreter needs only 215K memory to run; it is more object-oriented and stronger in certain aspects than C++. Java processes data using object interfaces.

Nowadays, e-commerce is a popular topic. However, traditional programming languages are not sufficient for e-commerce systems. The features of Java, such as high security, excellent reliability, platform-independence, simplicity and object-orientation, have made it the principal language for implementation of e-commerce systems.

2.2 Computer Communication Technology

2.2.1 TCP/IP Protocols

In this part the infrastructures of TCP/IP are briefly introduced and made a lead-in to the security problems on the Internet. TCP/IP has become popular partly because it can be used in various channels and protocols. To be exact, TCP/IP is a set of protocols including TCP and IP, UDP (User Datagram Protocol), ICMP (Internet Control Message Protocol) and some other protocols, as illustrated in Fig. 2.2.

<table>
<tr><th>OSI Model</th><th>Layer No.</th><th>The TCP/IP model (RFC 1122)</th></tr>
<tr><td>Application layer</td><td>7</td><td rowspan="2">Application layer</td></tr>
<tr><td>Presentation layer</td><td>6</td></tr>
<tr><td>Session layer</td><td>5</td><td rowspan="2">Transport layer</td></tr>
<tr><td>Transport layer</td><td>4</td></tr>
<tr><td>Network layer</td><td>3</td><td>Internet layer</td></tr>
<tr><td>Data link layer</td><td>2</td><td rowspan="2">Link layer</td></tr>
<tr><td>Physical layer</td><td>1</td></tr>
</table>

Figure 2.2 TCP/IP infrastructure

Different from OSI reference model, TCP/IP model focuses more on the data transmission between interconnected equipments, rather than strict function classification. It has achieved this goal by explaining the importance of the function architecture, which allows wide room for designers to execute the protocols. Thus OSI is more suitable to explain the Internet communication mechanisms, while TCP/IP has become the market standard of Internet protocols. TCP/IP is more flexible than the OSI model, as illustrated in Fig. 2.2.

TCP/IP enables the network interconnection between different platforms. For instance, a Windows NT network can include workstations of UNIX and Macintosh, or even UNIX or Macintosh network. The features of TCP/IP are as follows:

(1) a sound recovery mechanism
(2) entering the network without interrupting the existing service
(3) efficient error processing
(4) platform independence
(5) low cost

The original aim of TCP/IP is related to national defense, so the features listed above are actually the design requirements of TCP/IP. “A sound recovery mechanism” is based on the following idea. When the network is being intruded or destroyed, the rest part of it will still be able to work. The same consideration

applies to new service addition mechanism. “Efficient error processing” is based on the following occasion: if the message gets lost at a certain router, there should be a mechanism to enable it to reach its destination via another router. Platform independence means the network and workstations can be any combination of Windows, UNIX, Macintosh and any other platforms. TCP/IP is highly efficient because of its low cost. Performance is the key to any network. No other protocols can match TCP/IP in speed and simplicity.

The data flow of the network is co-managed by TCP and IP. IP constantly puts the messages on the Internet, and TCP takes charge in ensuring the arrival of the messages. TCP does the following jobs:

(1) handshake process
(2) message management
(3) flow management
(4) error checking and processing

TCP/IP provides an environment for the operations mentioned above. TCP/IP is composed of four layers, different from the seven-layer model of OSI. These four layers include:

(1) Application layer
(2) Transport layer
(3) Network layer
(4) Link layer

TCP/IP differs from OSI primarily in the aspects below: the transport layer does not guarantee the transport of any moment. TCP/IP provides UDP for users, which is an easier protocol. In UDP, all layers in the TCP/IP execute specific jobs or applications.

(1) Application layer

The application layer includes SMTP, FTP, NFS, NIS, LPD, Telnet and Remote Login, which are familiar to most Internet users.

(2) Transport layer

The transport layer includes UDP and TCP. UDP rarely checks, and TCP guarantees the transport.

(3) Network layer

The network layer is composed of ICMP, IP, IGMP, RIP, OSPF and EGP used for routing. Users are unnecessarily concerned about these, since they are very fundamental.

(4) Link layer

The link layer includes ARP and RARP, in charge of message transport.

2.2.2 HTTP Communication Protocol

Http is an object-oriented protocol that belongs to the application layer. It is simple and fast, and suitable for distributed hyper-media information system.

Proposed in 1990, now Http has evolved to the sixth edition of HTTP/1.0 after several years' development, which is now used in www. While the standardization of HTTP/1.1 is under way, HTTP-NG (Next Generation of HTTP) has been proposed as well.

The primary features of http protocol can be outlined as follows:

(1) Supporting the client/server mode.

(2) Simple and fast: When the client sends a request to the server, only the method and path are required. Commonly requested methods include GET, HEAD and POST. Each method prescribes the different types of the interconnection between client and server. Because of the simplicity of http, the http program is small, thus the speed is high.

(3) Flexible: Http allows the transport of data object of arbitrary type. The type that is being transported is marked with Content-Type.

(4) Connectionless: Connectionless means that each connection was restricted to process only one request. The server disconnects immediately after receiving the response. In this way time is saved.

(5) Stateless: Http is a stateless protocol. Stateless means that the protocol has no memory concerning business transaction. That is, if the business transaction afterwards needs previous information, it has to be resent, which means the data amount would be increased. On the other hand, when the server does not require previous information, the response would be faster.

Some important concepts in HTTP protocol:

(1) Message: The basic element of http communications, including a structured eight-element sequence.

(2) Request: A message from the client to the server, which should include the method of using resources, the resource identity and version number of protocol.

(3) Response: A message returned from the server, which includes the version number of http protocol, request state (success or unavailable) and the MIME type of document.

(4) Resource: The network data object or service marked by URI.

(5) Entity: A special representation of data resource, which might be rounded up by a request or response. An entity should include the entity head and its content.

(6) Client: An application established to send request.

(7) Client proxy: The terminal that initializes requests, such as browser, editor or other tools.

(8) Server: An application that receives request and returns response.

(9) Source Server: a server where resources can stay or be established.

(10) Proxy: An intermediate program which acts either as a server or a client to form request for its client.

(11) Gateway: A server that acts as the media for other servers. Different from proxy, the gateway acts as a resource server to the client sending the request. The

client does not realize that it is interacting with the gateway. The gateway usually acts as the firewall server, which can also acts as a protocol interpreter to access the resources that are stored in non-http systems.

(12) Pathway: The media program between two connections.

(13) Buffer: Local storage of response information.

The http protocol is based on the request/response mode. Once a client gets connection with a server, it sends a request to the server, the format of which includes URL, protocol version number, the MIME information, as well as the request modifier, client information and possible content. When the server receives the request, it will return immediately response, the format of which is a status line, including protocol version number, a success or error code, MIME information, plus server information, entity information and other possible content. Many http communications were initialized by a client proxy and include a request for the resource on the resource server as well. The simplest case might be to set up a single connection between the user agent and the source server.

2.2.3 EDI Communication Protocol

Within the general transaction process, traditional trade is usually discussed, entered into contracts and executed by relevant parties through telephone, fax or mail. Relevant trade documents have to be made and delivered manually. Different texts with the same message should be processed more than once in a transaction process that usually involves banks, customs, commodity inspection and transport. Therefore such a way of transaction often incurs redundant labor and extra expenditure and opportunities of committing mistakes on the one hand; and any delay or loss of messages often cause the unexpected losses to both sides on the other hand.

Ever since computers are used, people are searching for new ways to replace the traditional paperwork in an attempt to reduce the error caused by manual work.

EDI (Electronic Data Interchange) is a technological means to simplify the traditional trade transaction by simulating the movement of commercial bills and documents. It is not a new technology. As a matter of fact, it can be traced to 1970s when it is used to exchange internal data within an enterprise and then to deliver commercial data between enterprises. Because of the different areas and aims it serves, so it is difficult to define EDI in a unified way. Here we enumerate some definitions given by authorities.

Definition 1: Bill exchange in standard format for commercial use.

Definition 2: Transmission of information with commercial or strategic significance between independent institutions.

Definition 3: Standard formatted data exchange between computer systems for trading.

Definition 4: The transmission of the authorized, standardized, and structured data which are processed by computers.

From the authoritative explanations about EDI listed above comes our understanding of EDI:

(1) EDI is the transmission of electronic information between computer systems.

(2) EDI is the interchange of standardized and structured data.

(3) EDI is the data interchange between sender and receiver on the basis of the standard and structure agreed on by both sides.

(4) EDI is the data interchange that computers automatically process without manual interference.

(5) EDI is the data interchange that serves commercial purpose.

EDI uses computers instead of manual work to process transaction information, which greatly enhances the speed and accuracy of data process. Digital communication network replaces telephones, fax and mails as the media to transmit transaction information. In order to enable the computers to process the information, it should be formatted in advance according to some unified standard predefined, which is a little different from traditional commercial operation patterns. Thus, EDI can be generally defined as: information transmission and automatic processing via network among multi-parties.

The core content of EDI is commercial information and documents, such as orders, invoice, and advice of charge, certificate of payment, schedule and proof of delivery. Because EDI is being used more and more extensively in commerce, more and more commercial documents are generated by computer programs. Thus EDI has become the information interchange between computer programs. As the electronic capital transfer and payment system supported by EDI is used more extensively, use of checks and other payment will be declined tremendously. EDI greatly simplifies the processing of paper documents, which is a way to save paper. What's more, it is causing changes in the operation of banks. Capital transfer through networked banks will be an irreversible trend in the future. A flow chart about documents flow, framework, and message generation and transmission is illustrated in Figs. 2.3, 2.4, 2.5.

Another important impact on commerce by EDI is that it makes the relationship between businesses partners more close and causes a subtle change in the role played by salespersons. For instance, on-line ordering system and on-line client information system will have great impact on businesses that enjoy tremendous sales. EDI will make revolutionary change in the operating patterns between business partners in the future. So as far as commerce is concerned, EDI will become an important fundamental establishment in the future economic world in that it is not only a new communication technology, but also a bridge connecting the international production and commercial activities.

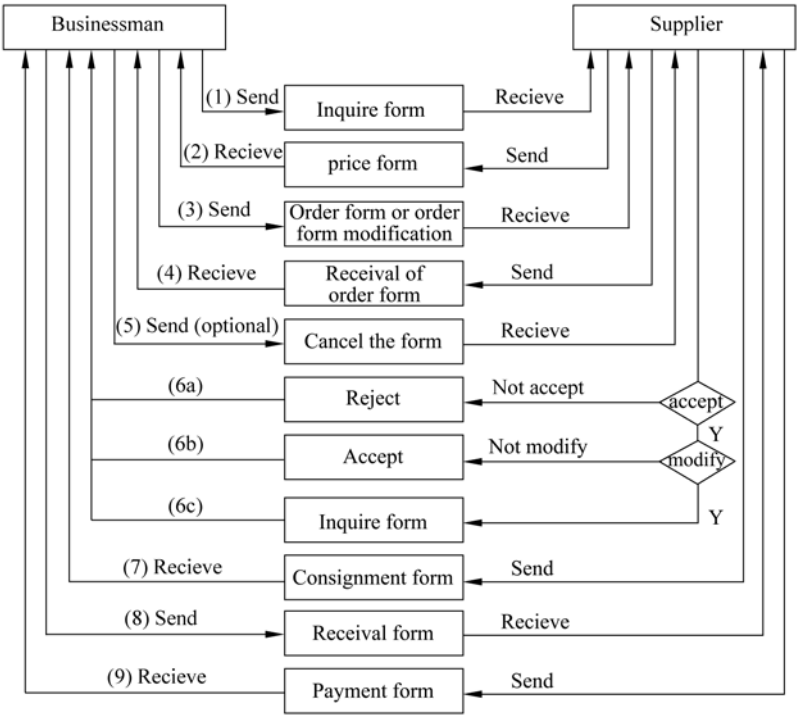

Figure 2.3 EDI certificate flow

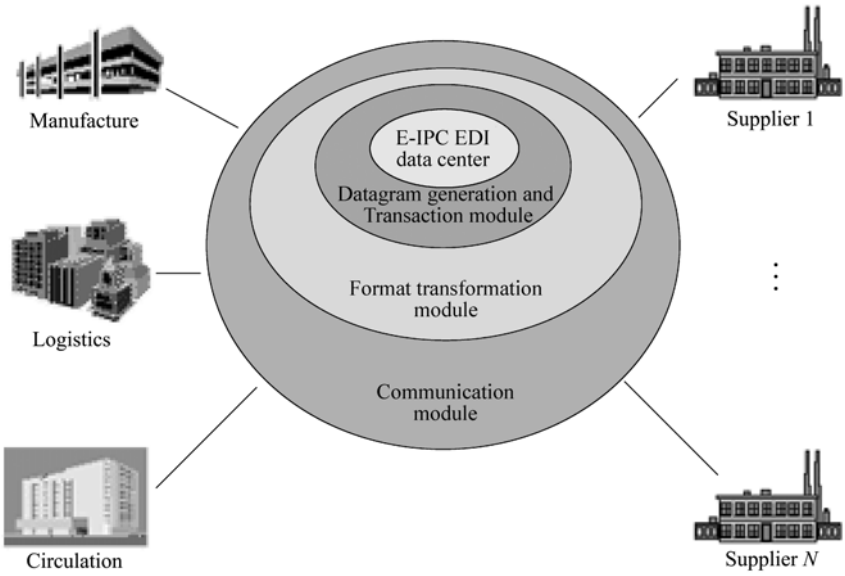

Figure 2.4 EDI framework

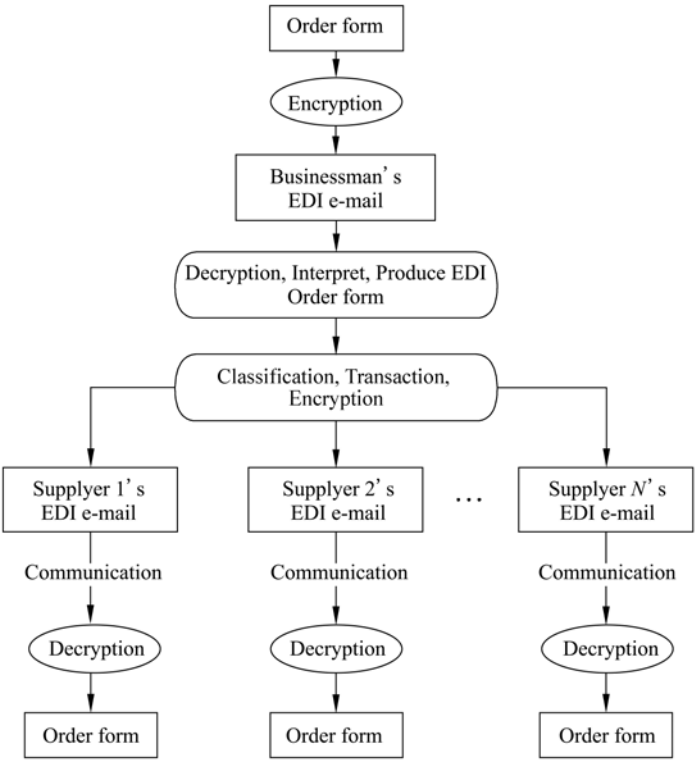

Figure 2.5 EDI diagram generation and transmission process

The strategic role of EDI has been gradually recognized by the world. Ever since the 1970's, as the computer technologies are being used more widely, the world has stepped into the era of automatic information processing. In the 1980's, EDI was often considered as a way to improve management, promote efficiency, and reduce cost. At that time EDI was used only in big companies with complicated management. Since the 1990's, people have not confine EDI within the enterprise or business any longer. EDI, as a new communication technology, has acquired new implications. Currently, people consider the development of EDI from the commercial perspective more than from the technical perspective, for it is the business area that gives it power of development. It is estimated according to its application and development that EDI will cause a revolution to the commercial world.

2.2.4 WAP Communication Protocol

The proposal of WAP (Wireless Application Protocol) is based on the need of connecting mobile phones into the Internet. In June 1997, PHONE.COM, together with Nokia, Ericsson and Motorola, began to establish the WAP forum, the aim of which was to make a unified standard for the Internet business operated by

mobile communication suppliers. In September 1997, WAP forum published the first WAP standard infrastructure. In the next May, WAP 1.0 was formally developed. Then version 1.1 was published in June 1999.

After the establishment of WAP forum, it has received wide attention. Now there are more than 200 companies that have become the members of the forum, including major telecom operators, equipment manufacturers and software providers. Since the members of the WAP forum represent 95% of the global mobile markets, the WAP regulations thus formulated have to enable equipments produced by different manufacturers to realize mutual inter-connection. Thus WAP is becoming a widely accepted standard for wireless network interconnection.

WAP has provided a set of open and unified technical platforms. It is easy for users to access and obtain, through mobile agents, information and services in a unified format, as illustrated in Fig. 2.6.

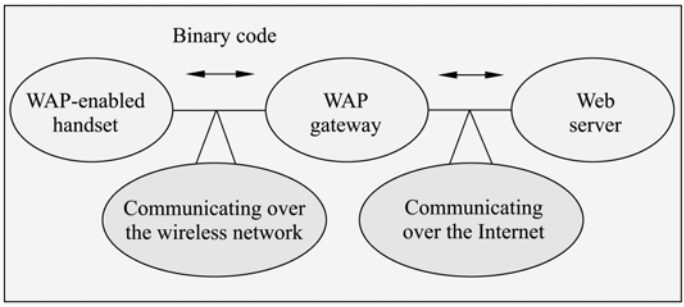

Figure 2.6 WAP infrastructure

WAP defines a set of interfaces for both hardware and software. The mobile agents and web servers that implement these interfaces will make it possible for us to receive and send e-mails, and even browse the Internet by using cell phones.

WAP supports mobile terminals, which have relatively weak CPU, small memory, limited power supply and input. As for the network, WAP also supports the existing networks, including GSM, CDMA and PHS. It also supports the third generation mobile communication system. However, compared with general network, the bandwidth of wireless network is always restricted. Considering these factors, WAP takes full advantage of the Internet, and makes certain modifications and simplification. That is, applications and network contents are represented in the standard data format; micro browsers similar to that of a PC are used, thereby enabling network surfing in standard communication mode.

WAP standard defines an application environment, which allows the designers to develop user interface independent of equipments and use the WMLScript to embed executables to mobile terminals. Actually, a micro browser is running at the mobile terminal, which resembles the browser used on PCs.

The WAP application environment in its general sense is an application development framework, which guarantees efficient development and application

of WAP on different wireless communication networks. This framework is primarily based on the existing Internet technologies.

The structure of WAP application is similar to the Internet structure, and a typical WAP application has defined three kinds of entities:

(1) Mobile client with WAP user agent. Typical clients like WAP cell phones equal the PC in the Internet in that there is a micro browser running on their screens. The user can simply use selected keys to send WAP service request, and receive the response information wirelessly. WAP mobile terminal uses WML (Wireless Markup Language) to display text and image. WML is a language based on XML, primarily used to mark up the Internet information and user interface. WML enables the designer to define WAP application interface in a device-independent way.

(2) WAP agent

It includes the protocol gateway, the transformation between WAP protocol stack (WSP, WTP, WTLS and WDP) and the Internet protocol stack. Content Encoders and Decoders compress and encode the WAP data to reduce data flow and make full use of the wireless network bandwidth. Meanwhile, WAP adopts error correction technology to ensure that web surfing and data transmission will not be affected by the quality of the wireless communication.

(3) Data source servers, such as websites that supports WAP, the servers of which contain WAP applications coded by WMLScript. These applications can be downloaded to the WAP client if needed, and uninstalled when not needed anymore.

WMLScript can supplement some restrictions of WML, such as inability to check the validity of user input. This enhances the browsing and representing functions of WML, allowing users' operations to be more flexible and intelligent. At certain moments, WMLScript can process some warning messages on the mobile agent, thereby avoiding data transmission between mobile client and remote server, which reduces the cost of bandwidth.

The protocol stack of WAP is a hierarchically designed environment for the development of application system. Interface is defined for each layer, and is able to be used by the upper layer protocol and by other services or applications directly. WAP has borrowed the idea of the Internet protocol stack and made it simpler, which makes it more applicable in wireless environment.

(1) WSP (Wireless Session Protocol): The session layer protocol provides connection oriented, WTP-based session service or WDP-based, connectionless and reliable services.

(2) WTP (Wireless Transaction Protocol): Provides a light-weight and transaction-oriented service, which specializes to optimize and adapts to the design of mobile agent.

(3) WTLS (Wireless Transport Layer Security): SSL-based secure transmission protocol.

(4) WDP (Wireless Datagram Protocol): Is a universal data transmission service supporting multiple networks, making WAE, WSP, WTP and WTLS in the upper layer independent of lower layer wireless network. Of course, the data transmitted and the nature of user interaction will surely influence the operator's choice of the network to maximize the efficiency.

Apart from WAE and protocols, WAP standard also defines WTA (Wireless Telephony Applications), and therefore WAP can be used in the existing telecom operations, such as intelligent network. Using the user interface in the form of browser, mobile users can apply various operations without modifying mobile terminals. The WAP mobile agent uses WML and two kinds of WAP servers: WAP agent server and WTA server. WAP agent translates the WAP requests into www requests, thus mobile terminals can send www requests to web servers, WAP agent then translates the responses from web server into compressed binary WML data understandable to mobile terminals. If the web server supports WML format, WAP agent can get data directly from web server; if web database only supports html, then it can be transformed into WML via html filter, and then transmitted to web agent. WTA server can provide WAP users with various advanced intelligent network services.

WAP has created a business opportunity, which makes the existing or new businesses accessible to users at any moment, regardless of the location of the user. Since WAP is an open and unified technical standard and is independent of networks, it enables all mobile manufacturers to produce compatible products, and telecom ISPs can select products from a wide range. The whole telecom industry thus avoids redundant construction due to this universal standard.

WAP is commonly applied on WAP mobile terminals to connect directly to the Internet, receive and send e-mails or browse other information.

The biggest potential application of WAP is its combination with e-commerce to realize mobile e-commerce, such as real-time securities trading, mobile banking business, and mobile online shopping. In the near future, you may only need a WAP cell phone to manage all that you need carry with you a wallet, a telephone book, credit cards and mobiles to accomplish.

2.2.5 WLAN Protocol

With the rapid development of the Internet, communication network has evolved from traditional network to wireless network. WLAN (Wireless Local Area Network) which is becoming the public wireless local network and the Internet gateway.

WLAN is a kind of locally built networks based on wireless communication technologies, the combination of computer network and wireless communication technology. Because wireless multi-channel is regarded as transmission media, it provides the functions of traditional local area network and enables the users to have Internet access at any location and any time.

Since WLAN is based on computer networks and wireless communication technologies, LLC (logic link control) has the same or different requirements for physical layer as the upper application layer does. Thus, WLAN standard primarily focuses on the physical layer and media access control (MAC) layer. It is related to technical standards such as wireless frequency range and air interface communication protocol. The technical standard of WLAN is illustrated in Fig. 2.7.

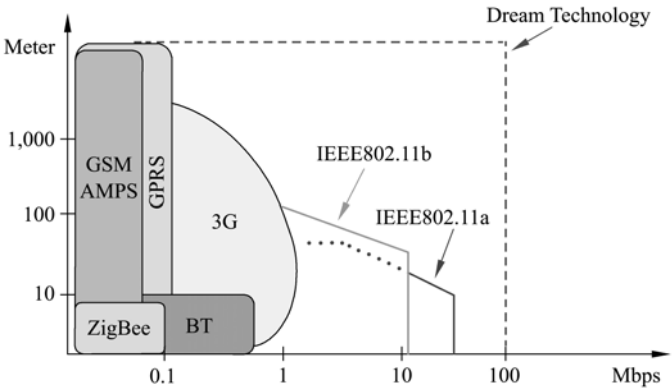

Figure 2.7 WLAN technical standards

1. IEEE 802.11X

(1) IEEE 802.11

In 1990 the IEEE802 standardization committee has established the IEEE 802.11 WLAN standard panel. IEEE802.11 (also name as Wi-Fi (Wireless Fidelity)) is a standard passed in June 1997, which defines the physical layer and MAC regulation. The physical layer defines the data transmission feature and modulation, as well as two RF transmission methods and an infrared transmission method. The RF transmission standard is frequency-hopping spread spectrum (FHSS) and direct sequence spread spectrum (DSSS), working at the frequency band of 2.4000 – 2.4835GHz. FHSS uses 2 – 4 PWL GFSK modulation technology, and supports data transmission at the rate of 1 Mbps, with 22 sets of frequency-hopping patterns in total and 79 channels included. DSSS uses BPSK and DQPSK modulation technologies and supports data transmission at the rate of 1 Mbps and 2 Mbps. Infrared transmission method works at the frequency band of 850 – 950 nm with 2W peak power, and supports data transmission at the rate of 1 Mbps and 2 Mbps.

IEEE 802.11 is the initial standard published for wireless LAN, primarily used for office LAN and wireless access in campus networks. The highest transmission speed just reaches 2 Mbps. Because the speed and transmission distance did not satisfy the need, IEEE 802.11 standard was quickly replaced by IEEE 802.11b.

(2) IEEE 802.11b

In September 1999, IEEE 802.11b was formally approved. This standard

prescribes that the working frequency interval of WLAN is between 2.4 – 2.4835 GHz, the data transmission rate reaches 11 Mbps, and the transmission distance is 50 – 150 feet. This standard is a supplement to IEEE 802.11. It uses Complementary Code Keying (CCK), with p2p and basic modes, so it can accomplish automatic speed switch among 11 Mbps, 5.5 Mbps, 2 Mbps and 1 Mbps. It has changed the design status of WLAN, and extends the application area of WLAN.

IEEE 802.11b has become the mainstream WLAN standard, and has been adopted by most of the manufacturers. Now the products have widely been used. However, new standards like IEEE 802.11a and IEEE 802.11g are receiving more attention.

(3) IEEE 802.11a

In 1999, IEEE 802.11a was published. This new standard prescribes that the working frequency interval of WLAN lies between 5.15 – 8.825 GHz, the data transmission rate is 54 Mbps/72 Mbps (Turbo), and the transmission distance is 10 – 100 meters. This standard is also a supplement to IEEE 802.11. It uses Orthogonal Frequency Division Multiplexing (OFDM) and QFSK modulation. It can provide wireless ATM interface of 25 Mbps and wireless frame interface of 10Mbps for Ethernet. And it supports multiple operations such as voice, data and images. Within one sector, it allows access from multiple users, who each may use more than one terminal.

IEEE 802.11a is a subsequent standard of IEEE 802.11b, and its design aims to replace the 802.11b standard; however, working under 2.4 GHz does not require license, because this frequency interval is reserved for industry, education and medicine. On the other hand, working in the frequency interval 5.15 – 8.825 GHz needs to be approved. And since IEEE 802.11a works at 5.15 – 8.825 GHz, which may cause interference to domestic apparatus such as microwave oven and cordless telephone, some companies have not demonstrated support for 802.11a while others think better of a new mixed standard, 802.11g.

(4) IEEE 802.11g

Now IEEE has published the latest IEEE 802.11g standard, which declares to have the transmission rate of IEEE 802.11a, with better security than IEEE 802.11b. In order to be compatible with 802.11a and 802.11b, it uses two kinds of modulations.

Although 802.11a is more suitable for enterprises, the operators of WLAN are more likely to choose 802.11g for the compatibility with 802.11b. For the manufacturers of WLAN, there is no unique choice of the standards in their R&D. They have to consider all of the existing standards.

(5) IEEE 802.11i

IEEE 802.11i combines the user port verification and device verification of IEEE 802.11x, modifies the MAC layer of WLAN, and defines strict encryption format and authentication to improve the security of WLAN. The newly revised standard of IEEE 802.11i primarily includes two points: “Wi-Fi Protected Access”

and “Robust Security Network”. The principal task of “Wi-Fi Protected Access” is to insert security holes into old devices, usually accomplished by updating of hardware or drivers, which employs the TKIP (Temporal Key Integrity Protocol) to improve the security of the WEP (Wired Equivalent Privacy) key. TKIP is based on RC4 like WEP, but the method of creating key is different. It can update the key quickly, which solves the weakness of WEP. “Robust security network” is based on 802.1X protocol and extensible authentication protocol (EAP). With the use of Advanced Encryption Standard (AES), it has become more powerful in encryption and wholeness of information. The Wi-Fi league planned to use the 802.11i as the second version of WPA, and put it into effect from the beginning of 2004.

The IEEE 802.11i standard is quite important in the construction of WLAN, and the data security is the principal issue of the WLAN manufacturers and ISPs. Only when the security of user data is guaranteed do the WLAN products have a promising future.

(6) IEEE 802.11e/f/h

The IEEE 802.11e standard improves the WLAN MAC protocols to support multimedia transmission.

IEEE 802.11f defines the communication between nodes, supporting the IAPP of IEEE 802.11.

IEEE 802.11h is applied to spectrum management technology of 802.11a.

2. HIPERLAN

The BRAN panel of the European Telecommunication Standardization Institution (ETSI) is setting about establishing the Hiper (High Performance Radio) standard, which has already been preceded by HiperLAN1 and HiperLAN2. When HiperLAN1 was just published, the data transmission rate is low. In 2000 when HiperLAN2 was published, the transmission rate can reach 54Mbps. The HIPERLAN2 standard defines the testing function and signal switching of WLAN to support wireless network, dynamic frequency selection (DFS), wireless signal transformation, link adaptation, multi-bean antenna and power control. This standard also gave some definitions on WLAN performance, security, and quality of service (QOS).

HiperLAN1 corresponds to 1EEE802.11b, while HiperLAN2 and IEEE082.11a have the same physical layer, which has the same unit. Moreover, HiperLAN2 emphasizes the integration with 3G. HiperLAN2 is also a rather sound protocol of WLAN. Now the manufacturers that support HiperLAN2 primarily cluster in the European areas.

3. HomeRF

The HomeRF working group is established in 1997, the aim of which is primarily to establish the interactive voice and data communication network for homes. In Aug. 2001 HomeRF2.0 was published, which integrated voice and data transmission

technology. And its working frequency is 10GHz and its data transmission rate is 10Mbps. It pays more attention to access control and encryption technologies in WLAN security.

HomeRF is the integration and improvement of existing wireless communication standards. When data transmission is going on, TCP/IP protocol is being used; when voice communication is going on, DECT (Digital Enhanced Cordless Telecommunication) is being used.

Besides the IEEE 802.11 committee and European Telecommunications Standards Institute (ETSI), the WLANA (Wireless LAN Association) has also done much work in the technical support and execution. The WLANA is a non-profitable organization established by WLAN manufacturers, including 3Com, Aironet, Cisco, Intersil, Lucent, Nokia and Symbol, whose primary work is to authenticate the compatibility of the products from different manufacturers, and give trainings to WLAN users.

4. WLAN standards in China

The Ministry of Information Industry of PRC is also trying to publish an industrial WLAN standard, which is concerned with the IEEE 802.11X series (including IEEE 802.11, 802.11a, IEEE 802.11b, IEEE 802.11g, IEEE 802.11h, IEEE 802.11i) and HiperLAN2. The WLAN devices will be evaluated comprehensively in terms of performance, compatibility, security and reliability.

Besides the standards mentioned above, WLAN will have some other standards concerning WLAN applications, among which are two national standards formulated by China Broadband Wireless IP Standards Working Group. These two standards are based on ISO/IEC 8802.11 and ISO/IEC 8802.11b and will standardize the application of WLAN in China.

The WLAN standard is the foundation of promoting the development of WLAN. So many standards in WLAN and their swift changes reveal that WLAN is deeply favored by WLAN equipment manufacturers, ISPs and users. Since WLAN rids itself of complex wires, it is easy to install, manage, maintain. It will play an important role in the future network construction.

2.2.6 Bluetooth Protocol

In May 1998, Ericsson, Nokia, Toshiba, IBM and Intel jointly proposed Bluetooth technology, with the tenet of providing a short-distance, low-cost wireless transmission technology. Bluetooth is a wireless data communication technology. Its transmission rate is 1Mbps, and transmission distance is approximately 10 meters. With Bluetooth technology, the communication among PDA, laptop computer and cell phones can be more efficient and faster. Therefore, Bluetooth successfully simplifies the interconnection between the portable devices and the Internet. Its application can be extended to domestic apparatus and automobiles,

thus forming a huge wireless network. The Bluetooth system is composed of several functional units: wireless unit, link control unit, link management unit and relevant software. Bluetooth technology works at the global universal frequency 2.4 GHz ISM, and the transmission rate is 1 Mb/s, using Time Division Duplex (TDD) to realize Full Duplex Transmission (FDT). The system infrastructure is illustrated in Fig. 2.8.

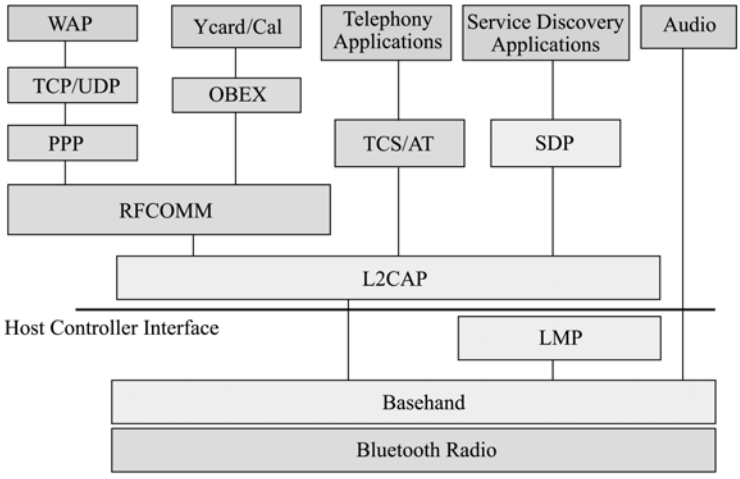

Figure 2.8 The system framework of Bluetooth

In the 2.4 GHz frequency interval, the client device does not need to apply for access to the frequency. And most countries have similar regulations concerning the use of this frequency. Thus Bluetooth has the following features:

(1) Short transmission distance: Now the work distance of Bluetooth is less than 10 meters, and it can reach 100 meters after RF power is amplified. This range guarantees that Bluetooth has a high transmission rate, while rarely interfered by other apparatus and products.

(2) Frequency-hopping spread spectrum technology: The frequency interval 2.4 – 2.4835 GHz is divided by 79 points. According to piconet formed by master machine and subordinate machine, frequency of hopping is 1600 ps. Frequency-hopping technology is used to guarantee higher security and anti-jamming performance of Bluetooth wireless links. The air interface of Bluetooth is based on the PWL of antenna that is 0dBm. The air interface conforms to relevant standards of ISM issued by FCC. When the global PWL reaches more than 100mW, spread spectrum can be used to realize some supplementary operations. Spread spectrum function is realized by 79 points at an interval of 1 MHz between 2.402 GHz and 2.480 GHz. As a result of consideration of local regulations, bandwidth has been narrowed down in Japan, France and Spanish, where the maximum hopping rate is 1660 ps.

(3) Time division multiple access (TDMA) technology: The basic band rate of Bluetooth is 1Mbps, and transmission is executed in the form of data packet according to time slots (TS), 0.625ms per TS. Much higher rate of transmission is not excluded in the future. Each Bluetooth equipments sends data packets within its own TS, which effectively avoids “collision” and “hidden terminal” in wireless communication.

(4) Network technology: Several piconets can be connected in sequence and identified according to the sequence of hopping. All users within the same picot synchronize with the sequence. And the topological structure is described as multi-piconet structure. In a multi-piconet structure composed of 10 independent piconets, the data transmission rate can exceed 6Mb/s.

(5) Voice support: The voice channel adopts the CVSD coding solution, and does not resend voice datagram. CVSD is good at dealing with lost and damaged voice sampling, and even if the error rate reaches 4%, it is still recognized after processed by CVSD.

(6) Error correction technology: Bluetooth uses Forward Error Correction (FEC), which aims to reduce the resending of data and load of data transmission. However, to realize errorless transmission, FEC has to generate some bit of extra load, thus lowering the data transmission rate. That is because datagram has flexible definition as to whether to use FEC. The datagram head has at least 1/3 part of protective FEC code, which includes useful link information. Within a numberless ARQ solution, the data transmitted in a time slot must be confirmed in the next time slot. It is until data have been proven errorless at the receiving terminal through header-error-check and cyclic redundancy checks that the confirmation message will be sent back to the sending terminal. Otherwise an error message will be returned.

The baseband of Bluetooth can provide security and encryption mechanism for users at the physical layer. Authentication is the key part in the Bluetooth system, which allows the user to establish a trust domain for the personal Bluetooth device.

Encryption is used to protect personal information. The key is managed by the upper part of program. Network protocols and applications can provide a stronger security mechanism for the user.

The standardization of Bluetooth can be divided into three phases. The first phase began from 1997, in which three enterprises including Ericsson determined the business model through negotiation. The second phase began from May 1998, in which the first version of Bluetooth technical regulation was published. In the third phase authentication of machine format was taken into account.

In the first version of technical regulation, the data transmission rate is prescribed as 1Mbps (nominal value), and the transmission distance is about 10 meters (when the transmission power is 1mW), with frequency 2.4GHz. In this frequency band there are 99 channels with 1MHz each. Frequency hopping 1600ps is allowed. When data is transmitted, the maximum currency is 30mA, which can

drop to below 0.3mA in standby. Moreover, it is estimated that in 2001 the data transmission would be increased to 10Mbps to meet the need of image transmission.

As described above, authentication should be made in the physical layer as well as between machines from different manufacturers. Although the authentication in the physical layer started with LSI from the fourth quarter of 1999, the experiment on interconnection between machines produced by different manufacturers still waits for the Qualification Program, technical parameters of which was accomplished in the middle of 2000. However, Bluetooth SIG has determined so-called Branding system. Equipment manufacturers test according to the sequence prescribed by the program before submitting it to the authentication organization. The machine that is authenticated will be given the mark of Bluetooth technology. If Bluetooth equipment without this mark is sold, Bluetooth SIG will fine its manufacturer and claims fees of patent.

The Bluetooth interface can be integrated into the laptop computers or connected with computers via PCI card or USB. Bluetooth is an independent technical standard, which does not depend on any other technical regulations.

(1) Personal LAN

The Bluetooth interface can be integrated to the cell phone or connected via appended device. The application models of telephone include: hand-free telephone using Bluetooth; the wireless connection between laptop computer and cell phone. Thus, the application of Bluetooth to laptop computer, cell phone and office phone can realize personal communication in its true sense. This “personal LAN” uses cell phone as gateway, rendering more convenient information exchange among portable devices.

(2) Domestic wireless networking

Although there are various domestic apparatus and devices, Bluetooth technology makes interconnection among all these devices wireless except power supply, including refrigerator, washing machine, TV and microwave over.

(3) Mobile office

Bluetooth enables laptop computers and cell phone to access the printer, DC, recorder, etc., thereby creating a mobile office.

(4) Internet access

Bluetooth standard defines interfaces for Internet, LAN and WAN. Therefore a single Bluetooth standard is enabled to establish connections with various networks. Equipments with built-in Bluetooth chip can access to the Internet.

(5) E-commerce application

The security feature of Bluetooth will tremendously extend the existing e-commerce systems, and structure the e-payment systems in various consumption circumstances.

(6) Others

Bluetooth can apply to other devices including HID devices, data and voice access points. Many companies are developing products with Bluetooth features, which enable access to resources in LAN. In the future, WAN and personal

information network will be developed, which will enable users to move anywhere without disconnection to the networks.

2.3 Information Processing Technologies in E-commerce

Information processing technologies are an important foundation of the e-commerce system. This section will focus on 5 technologies: Global Positioning System, Geographical Information System, Decision Supporting System, Group Decision Support System and Intelligent Decision Supporting System. The relation among these technologies is illustrated in Fig. 2.9.

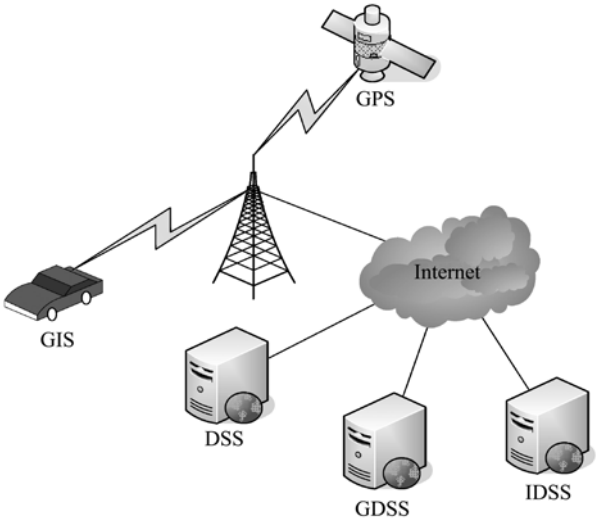

Figure 2.9 Relationship among different e-commerce information processing technologies

2.3.1 Global Positioning System (GPS)

GPS (Global Positioning System) was originally established for the star war plan by the US Department of Defense, the aim of which was to pilot the aircrafts and vessels for the US forces. In the Gulf War, GPS was widely used.

GPS is a tremendous project, which is considered as the third space project after Apollo project and space shuttle. During the gulf war, GPS was not finished yet, but the preliminary use demonstrated great triumph. As the GPS satellite network was established completely in 1993, the scope of application has been extended continuously. In 1994, the US government announced that it would

provide the world with access to GPS free of charge in the next 10 years. On Feb 29 1996, the US government formally announced that GPS was opened only for military and civil applications; however, the positioning precision was reduced to restrict civil applications. On May 1st, the US president announced that SA was set to zero, which greatly promoted the development of GPS civil applications.

There is a popular saying in the GPS industry: "GPS is only restricted by people's imagination". Now the application areas of GPS include land transportation, marine transportation, civil aviation, communication, mapping, mining, agriculture, power system, medical application, scientific research and entertainment. The positioning precision has evolved from 10 meters to 1mm.

GPS is a system composed of 24 satellites for global positioning and piloting, the GPS receiver at any place will receive the space signal from at least 4 satellites. Therefore, GPS has the powerful function of positioning. The receiver interprets the positioning information from each satellite to determine the position, thus providing highly precise 3-dimensional positioning and piloting.

The space part of GPS is composed of 24 satellites evenly distributed in six orbit planes: the ground supervision part, in charge of supervising the satellite and calculating satellite calendar, includes a principal controlling station, 3 upload stations and 5 monitoring stations. The client device of GPS is primarily composed of hardware and processing software. The user receives GPS satellite signal via client device, and obtains the information about location and speed and so on so as to finally implement GPS piloting and positioning. Figure 2.10 illustrates GPS system.

Figure 2.10 GPS illustration

Generally speaking, GPS is composed of three parts: space part, controlling part and client part. The space part is composed of satellite constellation, the controlling part is managed by the ground satellite controlling center; the client part is developed and maintained by military or civil manufacturers. The space part and controlling part are now controlled by the US Department of Defense.

According to statistics from the US Department of Commerce, in 2000 the turnover of GPS client machines is 8 to 9 billion dollars. In 2003, GPS civil products will exceed 16 billion dollars. It is no exaggeration to say that after 2010, the GPS products will become an indispensable part of people's life and a platform for R&D of various products.

No matter whether it is analyzed from military use or civil use, GPS has aroused the concern of countries all over the world. It has been realized that the owner of the global GPS satellite network and GPS controlling network has much stronger national power and huge commercial markets. The former USSR tried to establish its own GPS (GLONASS) as early as 1982, and Russia continued to carry on this project. Although the economy of Russia is not good enough, it still launched 9 satellites belong to the GLONASS. Europe also speedup its progress to construct its Galileo system. At the present China does not have the capability to construct its own system, it chooses to take part in the Galileo project.

The implementation of GPS system is divided into three phases:

The first phase witnessed solution argumentations and initial design. From 1973 to 1979, there were 4 experimental satellites launched, and ground receiver was developed and tracking network was constructed.

The second phase is the time when comprehensive research and development and experiments were made. From 1979 to 1984, there are 7 satellites launched and receivers for different purposes developed. The experiment result suggested that the accuracy of GPS far exceeded the design standard.

The third phase is applicable network construction. On Feb 4th 1989, the first GPS satellite was successfully launched, indicating that GPS system has formally entered the stage of construction. By the end of 1993, the GPS constellation (21 + 3) has been completed. For the future, satellites will be replaced according to planning.

GPS is composed of three independent parts:

(1) Space part: 21 satellites, 3 backups.

(2) Ground support system: One master controlling station, 3 upload stations, 5 monitoring stations.

(3) Client devices: Receiving GPS satellite signal to obtain sufficient positioning information about navigation and positioning. The hardware usually includes receiver, antenna and power supply.

The principle of GPS is: The satellites continuously transmit the parameters, and the user receives the information and works out the 3-d position, 3-d direction, velocity and time of the receiver through computation. Currently the accuracy of GPS is within 10 meters, and for a higher accuracy, we usually adopt different GPS technology: plant a GPS receiver at the reference station to obtain measurement data with GPS; and then calculate the modification value against the precise coordinates of the reference station and transmit the value synchronically. Once

the client receives satellite signal, it also receives the correction transmitted by the station. There are two kinds of difference GPS: pseudo-range difference and carrier phase difference.

1. Pseudo-range difference

This is a most widely used difference. At the reference station, all satellites are observed and their true distance to the station is worked out according to the known coordinates. And then the true distance is compared with the measured value of GPS to obtain the modification of the pseudo-distance values. The modification is sent to the clients to improve accuracy. This method can achieve meter accuracy.

2. Carrier phase difference

This technology is also called RTK (Real Time Kinematic), in which carrier phase of two monitoring stations is measured. This method can achieve centimeter accuracy.

2.3.2 Geographical Information System (GIS)

Geographical information means the relevant information to geographical distribution of the research subject, including quantity, quality, distribution characteristics, correlation of the subject and its environment. Geographical information is a kind of spatial information, and since the identification of locations is closely related to data, it is regional. Geographical information is also characterized by multi-dimensions, that is, the same location may possess an information structure covering several subjects and properties. For instance, at a certain point, there is information concerning altitude, earth bearing strength, noise, pollution and transportation. Moreover, geographical information is evident characteristic of time sequence, namely, dynamic feature. This feature requires timely data collection and updating so that prediction of the future can be made on the basis of its temporal laws that are worked out according multi-phase data and information.

GIS is a spatial information system mainly concentrating on collecting, storing, managing, analyzing and describing information of part of or the whole surface (including the atmosphere) of the earth that is relevant with the spatial and geographical data.

GIS is an interdisciplinary subject that combines computer science and spatial data analysis. The areas it relates to include geodesy, photography, cartography, geology, remote sensing, and image analysis and so on. GIS is closely related with but differentiated from these disciplines. The following are several differences that are easily misunderstood.

1. GIS vs. general database

The primary difference between GIS and general database is that GIS deals with space data, that is, besides a text database, there is also a graph database. Thus GIS has more complex hardware and software than general databases, and is more powerful. For instance, if the telephone directory is considered as a general database, it can only answer the requested telephone number. However, the communication information system can also provide the information about geographical distribution and spatial density of the telephone users, and the location of nearby post offices and telephone booths. Of course, the general database can also be a part of the GIS.

2. GIS vs. digital map

Digital map is a simulated map in computer, which primarily considers the landform and the presentation of various elements on the map. It is digitally stored, managed and outputed. On the other hand, GIS enables the graph data and non-graph data to be separately stored but interoperated. The emphasis of digital map is on the map, while GIS emphasizes information and the operation.

Digital map, if managed by the map database, can provide spatial query, analysis and indexing functions. However, it is unlike GIS, which can integrate graph data and attribute data to make more profound analysis, and provide useful information for planning, management and decision-making. Of course digital map is the data source of GIS, and plays an important role in GIS.

The development of GIS in China started a little late, which has experienced four phases, namely, initiation (1970—1980), preparation (1980—1985), development (1985—1995), industrialization (after 1996). GIS has been widely used in many areas and therefore it has gained much attention from the government. Many software products (such as GeoSTAR, CityStar, MapGIS) have been successful developed and GIS-related subjects or disciplines and hi-tech enterprises are founded. In addition, China GIS Association and China GIS Application Association have been set up.

With the development in a decade, China GIS has achieved great progress. And the research and application of GIS is gradually developing into an industry.

2.3.3 Decision Supporting System (DSS)

Decision Supporting System (DSS), is an intelligent man-machine system that is based on management science, operational research, control system and behavioral science. It uses computer technology, simulation technology and information technology to solve semi-structured decision problems. This system provides data, information and background for the decision maker to help them identify the problems and establish decision models. It evaluates and selects various cases

through analysis, comparison and judgment, providing necessary support for the best decision.

The concept of DSS was proposed in the 1970's, and developed in the 1980's. It originated from the following backgrounds: traditional MIS did not bring tremendous benefit to the enterprises while people require more advanced systems to support decision; therefore the computer application satisfied the need and provides the foundation for the DSS.

The concept structure of DSS is composed of session system, control system, operating system, database system, model base system, and rule base system and the users. The simplest and most practical DSS logical structure (database, model base, rule base) is illustrated in Fig. 2.11.

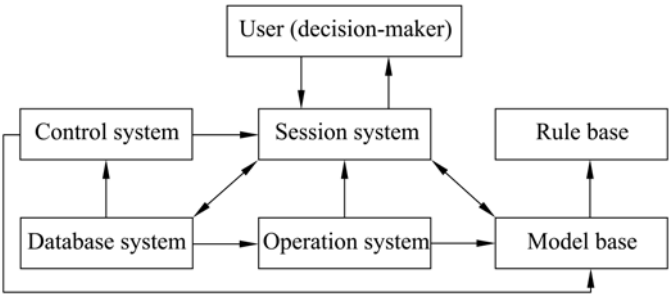

Figure 2.11 Structures of DSS three bases

The process of DSS can be simply described as: the user inputs the decision problem through the session system, which then passes the input problem to problem processing system; then the problem processing system begins to collect data and identify the problem according to the knowledge stored. If a problem occurs, the system will interact with the user via the session system until the problem is identified; then the system begins to search for the appropriate model to solve the problem, induces the feasibility of the solution, and finally renders the decision information to the user.

DSS technology includes:

(1) Interface part. It is the interface of input and output and also acts as the platform of interaction.

(2) Model management part. The system will retrieve the existing basic models according to the problems raised by users. Therefore the model management part has to possess storage and dynamic modeling functions. Currently the implementation of model management is accomplished by model base system.

(3) Knowledge management part. It concentrates on managing the knowledge (rule and facts) of decision problem, including the retrieval, expression and management of knowledge.

(4) Database part. It manages and stores decision-related data.

(5) Induction part. It identifies and answers the questions raised by users, divided into determinant induction and non-determinant induction.

(6) Analysis and comparison part. It makes comprehensive analysis and comparison among solutions, models and results, in order to obtain the most satisfactory solution.

(7) Problem dealing part. According to the question raised by users, it constructs the model and solution of the problems, and matches algorithm, variable and data to obtain solutions.

(8) Controlling part. It connects and coordinates all parts of the system, prescribes and controls running applications for different parts of the system to maintain and protect the system. In addition, it includes consultation part, simulation part, and optimization part.

The primary features of DSS have been outlined as follows:

(1) The system is decision-maker-oriented. The participant in the whole process is the decision maker.

(2) The problems that can be solved by the system belong to semi-structured decision problems and the use of the model and methods is determinant; but the decision makers differ in their understanding, and the condition of the problem is uncertain. Therefore the result of the decision is made un-determinant.

(3) The system emphasizes the support concept and helps the decision-maker to make scientific decision.

(4) The driving force of the system stems from the models and users. And man is the initiator of the system while model is the core of the link between different parts.

(5) The system emphasizes interactive transactions. A decision needs repetitive and frequent interactions; the human factors such as personal preference, subjective judgment, ability and experience have profound influence on the decision result.

DSS is generally developed with the combination of objective-oriented method and prototype method, described as follows: first use prototype method to develop individual parts of the DSS, then assembles them to form development toolset and environment of DSS according to the general method of system generation.

Analyzed from the perspective of system development, DSS can be divided into three different technical layers: DSS tools, namely, DSS fundamental parts; DSS generators, i.e. the general framework that organizes DSS; specialized DSS, i.e. the practical application system generated by the DSS generator. The relation between three layers is illustrated in Fig. 2.12.

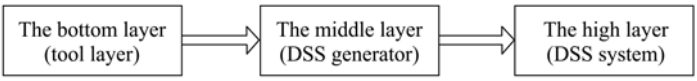

Figure 2.12 Hierarchical relations

The design of the foundational layer is done by software developers, and the user belongs to the highest layer. The construction process from the foundational

layer to the intermediate layer is the task of system engineers; the intermediate layer is DSS constructor-oriented. The design between the intermediate layer and the highest layer is the task of system analysts and designers. The development of DSS usually aims at a specific problem, which can be divided into five phases: problem analysis, feasibility research, selection of development method, system development and decision supporting. The decision maker should be involved in the process for he is the director user and his need is the aim of the system.

The work of each phase is outlined as follows:

(1) Problem analysis phase. This phase includes field investigation and analysis to identify the problem.

(2) Feasibility research. Based on the analysis of the previous phase, the feasibility of the system development is studied in terms of technology, feasibility, effectiveness of solution, and economic and social benefits.

(3) Determination of the development methods and strategies. This phase involves the determination of how the system development is organized and what tools, methods and approaches are employed.

(4) System development phase. It involves the development of a DSS specific to the problem, including the establishment of the DSS structure, data model and evaluation standard.

(5) Decision supporting phase. It means the actual operation phase after the system development is completed. It includes the result analysis, decision support and the data collection that reflects the validity of the system operation.

2.3.4 Group Decision Supporting System (GDSS)

Group Decision Supporting System (GDSS) means that multiple decision makers communicate with each other to find a satisfying and feasible solution, but the final decision is made by a certain one, who also takes responsibility for the result. GDSS is developed out of the DSS by increasing the number of participants and making the information source more extensive. It effectively avoids one-sidedness of decision and dogmatized behaviors.

The function of GDSS includes the following points:

(1) The difference is eliminated by enforcing communication and the relation between participants is controlled and coordinated by restricting the unnecessary emotional interaction.

(2) The status of participants and the justness of the conclusion are enhanced.

(3) The implementation of the system is permanent or temporary.

The technical functions of GDSS include the following points:

(1) Control over data exchange in the decision process.

(2) Automatic selection of appropriate GDSS technology.

(3) Computation and explanation of the feasible solutions.

(4) If GDSS cannot reach agreement, the difference is discussed or the problem is redefined.

A typical GDSS structure is illustrated in Fig. 2.13.

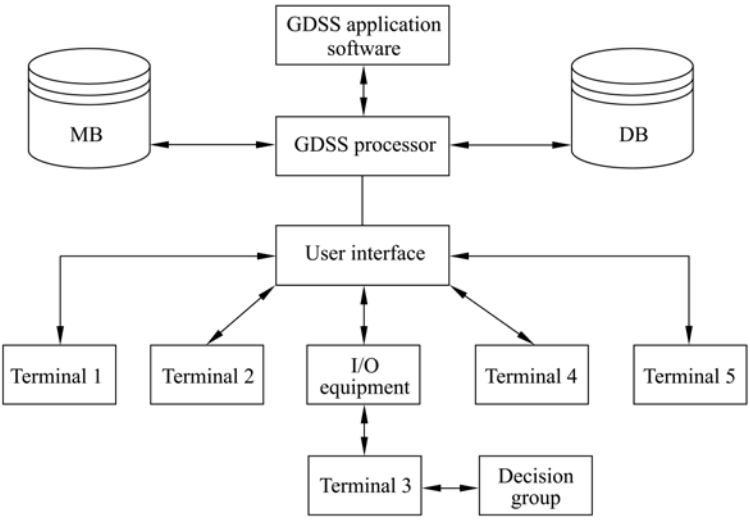

Figure 2.13 General structures of GDSS

GDSS is a new branch of the decision supporting area, an extension of DSS, which includes:

(1) A Communication Base is added to facilitate the communications between the decision makers.

(2) Model base is enhanced, providing voting, sorting, classified evaluation to fulfill the agreed decision.

(3) The system can be self-prepared and coordinated before used, such as scheduling a meeting.

(4) Necessary physical devices are extended.

The type of GDSS depends on the problem which will be decided and its environment to a certain degree, thus GDSS is generally classified into four types:

(1) Decision room: it seems like a traditional meeting room, where the decision makers gather and take part in the decision making process through terminals. This process is restricted by time.

(2) Local decision network: the participants of GDSS are not restricted by space. Once the LAN is equipped with public GDSS software and database is stored in the central processor, the participants can make communication between the central processor and the members or each other via the LAN.

(3) Fax conference: it is intended for the group that is separated geographically but can be assembled when necessary.

(4) Remote decision-making: it is intended primarily for those members who have to meet regularly but cannot meet each other physically. These dispersed decision makers keep constant communication with each other via remote decision stations.

2.3.5 Intelligent Decision Supporting System (IDSS)

Intelligent Decision Supporting System (IDSS) is a supporting system that combines Artificial Intelligence and DSS, and uses the technology of Expert System to enable DSS to sufficiently apply human knowledge so as to solve complex decision problems. With Expert System, the DSS can apply human knowledge more sufficiently to solve problems through logic reasoning.

The concept of IDSS was originally proposed by Bonczek in the 1980's, the function of which was to deal with quantitative problems as well as qualitative problems. The core idea of IDSS was to combine AI and other relevant disciplines to make DSS more intelligent. In order to introduce AI to DSS, the expert system is combined with DSS, what's more, inference machine and rule base are also introduced to DSS. In the decision process, some knowledge cannot be represented by data or model. The rule base introduced in IDSS can store the knowledge and provide important reference to the decision process.

IDSS has multiple kinds of information bases (as illustrated in Fig. 2.14): text base (TB), database (DB), approach base (AB), model base (MB) and rule base (RB).

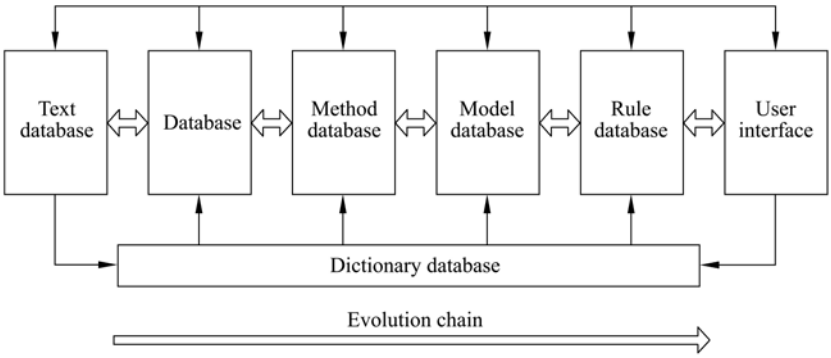

Figure 2.14 The framework of IDSS

The text base stores numerous texts written in natural language; the database stores records of key fields; the model base stores various models that illustrate the relations of information; the rule base stores the rules. The process of information extraction from raw data to processed information is called "evolving link".

The IDSS can be technically divided into three layers:

(1) Application layer. It is directly oriented to the user of IDSS. In this layer, the decision maker can determine the state and impose restrictions on IDSS according to his need. And through the user interface he may input some information, which will be understood by DSS via information transformation. Through inference and calculation, the system will return the user the result through interface. The whole process is transparent to the user.

(2) Control and coordination layer. It is oriented to the designer of IDSS, the fundamental element of which is the control and coordination modules of the databases. The system engineer establishes the connections between such modules via the standard interfaces.

(3) Basic structure layer. It is oriented to programmers. The programmer realizes all bases through this layer, including the structure and communication mode of them, so as to accomplish internal management and external communication of bases.

IDSS has the following features:

(1) It is based on mature technology. So it is easy to construct applicable system.

(2) It sufficiently uses the information resources of all the layers.

(3) It is based on rules, which enables users to use it easily.

(4) It is characterized with strong modulization, which enables reuse and low cost.

(5) It is flexible to combine system parts, which enables easy maintenance and powerful functions.

(6) It is easily upgraded by adopting advanced supporting technology, such as AI.

The modules have to call the upper layer repetitively, which has lower efficiency than calling lower layer while IDSS is running. However, since IDSS is just used in important decisions, it is worthwhile to sacrifice the running efficiency for the efficiency of system maintenance.

2.4 Summary

E-commerce is a kind of dynamic business that emerges when the Internet and traditional information technologies combine. The application and development of e-commerce system cannot be divorced from the support of the fundamental technologies. E-commerce is a comprehensive support and service to the new business operations.

This chapter describes the supporting technologies of e-commerce system in terms of fundamental information technology, advanced communication technology and applied information processing technology. Fundamental information technology primarily includes Web, HTML and Java. Advanced communication technology primarily includes network technologies, such as TCP/IP, EDI, WLAN and Bluetooth protocols. Applied information processing technology means special information systems involved in e-commerce, including GPS, GIS and DSS.

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3 Payment Technologies for E-commerce

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Abstract All business activities need the support of payment system, so does the e-commerce. As e-commerce process transactions through the Internet, it requires a more secure, stable and efficient payment system for supporting commerce done electronically. By the success of online banking and online payment in recent years, the market seems to have a solution for e-commerce. Online payment can be conducted in different means, such as intelligent card (IC), e-check, e-Wallet, e-Cash etc. This chapter briefly introduces the online banks and the online payment tools that are common used in e-commerce.

Key Words e-commerce, payment, online bank, intelligent card, e-check, e-wallet, e-cash.

Payment technology is an important part of the capital flow in the development of e-commerce. Its development determines the fate of e-commerce directly. In the context of international e-commerce operation, how to utilize relevant electronic payment technologies is the key of realizing online purchase and real-time payment. The keys in this chapter include the functions and features of online banks, e-payment system, e-cash, e-check and e-wallet.

In the new century, e-payment technology will change the way we live and trade. E-payment system is being applied all over the world and has achieved tremendous success. With the wide spread of e-money, e-payment has become a new development area. In the information era, e-payment will definitely enter every common family.

3.1 Online Bank

Online bank, also called network bank, e-bank, virtual bank, is actually the extension of bank business on the network. Online bank is based on the fast development of computer and network communication technologies. It uses the Internet that covers every corner of the world, makes a breakthrough in the traditional bank business, and gives up the traditional service that begins from the service hall. This new online bank includes home virtual bank, virtual finance, and the virtual financial world, which almost covers all the business of current bank and finance industry. And it represents the future of the finance industry.

Nowadays online banks exist in two forms. One is totally based on the Internet. This type of bank carries out all operations via the Internet, such as Security First Network Bank (SFNB). The other one develops the operations through the Internet on the basis of current business banks by opening electronic service windows online, which is called the e-bank system based on traditional banks. The online banks in our country belong to the latter one. From the day that online banks were born in the US, online banks have been developing rapidly. Now there are thousands of financial organizations in Europe alone that do the online banking business.

3.1.1 The Development of Online Banks

Ever since 1997, China Merchant Bank, Bank of China, China Construction Bank, and Industrial and Commercial Bank of China have opened their online banking business successively, and preliminarily realized online financial services. Now the latest version of online banking system is able to fulfill online exchange and online credit card, which brings great convenience to personal and enterprise customers. Bank of China uses the SET protocol, while others use SSL.

The online bank of China Merchant Bank began operation at the end of 1999, the function of which primarily includes personal banking system, online payment system, online securities system, online shopping system, etc. Until June 2000, the number of customers of China Merchant Bank “online enterprise bank” has reached 10078, and the total transaction amount has reached RMB 170 billion yuan. In Aug. 2000, the China Merchant Bank had its online banking system updated, adding new functions such as online financing, instant transfer and online letter of credit.

China Construction Bank also develops an online banking system which processes 1.3 million dealings every day, and allows 50 thousand customers to visit simultaneously. Bank of China has its online banking system combined with 1 million “Great Wall Card” to a series of online service including online payment. Industrial and Commercial Bank of China opens online banking services in 31 cities including Beijing, Tianjin, Shanghai and Guangzhou, providing 24-hour services.

In a short view, firstly, the services provided by the online banks in our country are generally fundamental in the online banking business, and are extension of traditional business and supplements of banks business, such as the account query, transfer between different card types and deposit books under the same user account, fund transfer between different user accounts, personal online payment. Secondly, the current services provided by domestic online banks are mainly B2C pattern. Furthermore, online banking is available in only a few cities in China. However, the trend of e-commerce is developing definitely and rapidly. The B2C service can be regarded as a kind of advertisements as well as a trial, which will serve as a basis for the impending B2B and B2G. Therefore, the domestic banks are trying hard to advertise their online banking for the sake of future market.

Online banking brings both opportunities and challenges to commercial banks, and it will encounter the following problems in the practical operation:

First of all, there is not a unified and authoritative CA (certificate center). Currently the online banks are depending on the self-built CA directly or indirectly. As far as normality is concerned, only a national and public CA can be neutral and authoritative. Although the People's Bank sent out a bid in Apr 1999 to establish a unified CA, the progress is slow. This situation impedes the pace of the construction of e-bank. If the banks establish their own CA respectively, it results in cross certification, which will tremendously impede the efficiency and accuracy of online service, and incur redundant construction and resource waste.

Secondly, there are some legal problems. Now the rules performed by online banks are agreements contracted with clients, in which the rights and obligations are stated. If there are disputes, they can be submitted to arbitration. Because of the lack of relevant laws, it is difficult to deal with the complicated legal issues.

Thirdly, the network construction is important core of system. The fundamental requirements of online banking service are access to network and credit card, which narrow down the scope of business. Due to the restriction of network, the settlement speed differs as well: China Merchant Bank has been able to provide real-time service, known as the fastest, but Bank of China has to delay one day. In this way some services such as booking tickets will be seriously affected. For example, the booking of train tickets is exclusive; because of the delay, the ticket will be locked for one day correspondingly; if the customer gives up the ticket within the delay, the right of other customers to access to this ticket will be affected. Besides, once the network is crowded and slow; there are not many online shops, which restrict selection range; meanwhile direct display of advertisement cannot be enabled. These factors will affect the extension of online banking services.

Fourthly, there are still some other problems. Taking the receipt problem as an example, Online banking is not able to provide invoices or other receipts. Then consumption concept is another problem. Applying for a credit card to overconsume

is against the traditional concept of China, and it needs various sponsion; online purchase does not have discounts, and customers will have to bear commission charge and postage like EMS; they also have to worry about the merchandise. All these problems indicate that there are still quite a lot of thorny problems that e-banking in China has to face.

E-commerce and e-banking are closely related systems with interactions. Meanwhile, they are not independent of the real world. Their development needs the social identity, well built network, sound law system and powerful government support. Since there are many problems with the e-banking system, we have to develop a sound atmosphere for the e-commerce and e-banking. First, strengthen the construction of the network infrastructure; second, improve the risk prevention mechanism, and speed up the formulation of e-commerce-related standards and laws; third, boost the information development; fourth, nurture more practitioners in this area; fifth, strengthen communications with government for policy support. Of course, these measures are beyond the control of commercial banks. In order to promote the development of e-commerce in our country, commercial banks should make improvements in the following aspects:

Firstly, in the business system, banks should try to be more innovative and attentive to services, and provide supermarket-like services. Under the pressure from capital and technology, traditional banks should reconstruct their business system, using the Internet as a channel for product marketing, and more as a platform for cooperation with financial enterprises engaged in stocks, insurance and funds, which lays solid foundation for a comprehensive business model.

Secondly, in operation models, banking business should combine traditional marketing channels with network marketing channel. On the one hand, while financial products are more and more diversified and personalized and the face-to-face interaction between customers and salesmen is becoming indispensable, highly efficient and standardized online banks are playing a more and more important role. On the other hand, the development of “multi-channel” sales pattern can maintain the original customer sources and facilitates the development of network banks. It has been proved that traditional banks without online services will certainly face difficulties, but pure online banks are not optimal choices either.

Thirdly, as to operational concept, banking business should alter their concept from “product oriented” to “customer oriented”. The core operational concept of traditional commercial banks is “quantity first” and “product driven”, which is marked by extending the terminals and batch production to reduce the cost. However, under the circumstances of network economy, as customers are expecting personalized services, commercial banks are forced to take the customer needs into consideration, and provide “personalized” financial products and services. To realize this change, banks have to attach great importance to client relationship management and understand, analyze, predict, guide and even create the client need using the Internet. They should provide the fittest financial products for the clients to obtain added value from the services.

Fourthly, as to strategic orientation, the banking business has to coordinate the relationship with other financial organizations, trying to become the gateway of network economy. The network economy poses the requirement to integrate and coordinate financial services to share resources and raise efficiency. The financial gateway is the combination of services by multiple financial organizations, which has direct connections with various financial transaction systems. On one hand, it serves to package numerous financial services; on the other hand, it collects client information to share among the members. The process in which its establishment and operation transform the interrelation between various financial organizations from collision to coordination is quite significant in transforming China financial industry.

3.1.2 The Function of Online Bank

Judged from the current operation of online banks, the services provided by online banks can be divided into three categories: first, to provide real-time query, such as balance, currency quotation, gold price and interest of deposit; second, conduct general banking transactions, such as client relation, saving, transfer between deposit accounts, applying for checkbooks; third, handle the procedure of online transactions. The services include the following types:

(1) Basic check business
(2) Interest check account
(3) Credit card service
(4) Basic deposit account
(5) Money market account
(6) Deposit receipt
(7) Macro market financial information service

Online banking not only carries out some traditional commercial banking transactions, but also has very important online payment function, and some new domains of services.

1. Commercial banking business

Online bank can provide 24-hour real-time online services for the clients. First, traditional transactions can be made online, for example, transfer, settlement, exchange, agency fund (water, electricity, gas and telephone etc.), salary payment, and query for personal accounts. When e-commerce is highly developed and currency is electronically used, the clients can deposit and withdraw money without being outdoors. Furthermore, the banks can have more business with the help of the Internet, such as securities settlement (among Securities Company and stock exchanges, and liquidation between financial accounts and saving accounts), foreign exchange business, information consultation, consumption loan, etc.

2. Online payment

It will become the most important part of the financial services of online bank. All the online transactions will be paid by e-banks, including retails such as purchases, booking tickets, stock trading under B2C pattern, bulk transactions under B2B pattern, and capital financing and liquidation among financial organizations.

3. New business domain

Since information can be transmitted online rapidly and conveniently, online banks could open multiple new businesses. For example, group client can enquire the account balance and trade information of its branches through online banks; fund transfer is enabled inside the enterprise on the basis of multilateral agreements (since the transfer is almost real-time, the utilization rate of capital in the enterprise can be greatly improved); financial information query and account management service are provided; international balance of payment can be declared online; issuing electronic letter of credit and making data statistics are also enabled.

Obviously, online bank tends to provide more convenient services to attract more customers, make profit in intermediary business. Moreover, the expenses are reduced greatly in online banking, except the costs for network development, construction and maintenance. Besides, as the Internet and e-commerce become popular, online bank services will be more and more extensive and complete, and enable all participants involved in the transaction to complete payment indoors.

3.1.3 Online Banking Technologies

Payment gateway is the interface between financial system and the Internet, like a device transforming the data to the financial organizations, or instructions to process the payment information. Payment gateway can ensure the safe transmission of transactions between Internet users and transaction processors, without any modifications on the original system. It can process all the conversion of Internet payment protocols, Internet-specific security protocols, message and protocol and local authorization and liquidation. In addition, it can set configurations to satisfy specific transaction processing systems. Without payment gateway, the e-payment function would not be realized. The banks use payment gateway to implement the following functions:

(1) Configure the Internet to realize payment capacity.
(2) Avoid modifications to current host computer system.
(3) Exercise system management with GUI.
(4) Adapt to e-payment means such as e-check and e-cash.

(5) Ensure the security of network transactions by means of RSA public key encryption and SET protocol.

(6) Provide complete payment processing function, including authorization, data capture and balance, verification of account.

(7) Monitor the online activities through online transaction report and track.

(8) Make the online payment process compatible with current business model, ensure the information consistency, and provide opportunities for enterprises to enter online transaction.

As the network market grows, online transaction will become an indispensable function of every payment system. Nowadays enterprises are usually inefficient in data transmission, for they are using fax, or storing data to the system off the Internet. With payment gateway, this problem could be effectively dealt with, which will make banks and transaction processors retain high efficiency under the circumstance that transaction amount swells up continuously.

On May 13 1998, BOC Credit Card (International) Limited and IBM (H.K.) declared to establish the first secure payment gateway in Hong Kong. This payment gateway uses the SET standard, which provides a secure environment to enable enterprises in Hong Kong to carry out e-commerce. As the payment gateway of Bank of China got started in late 1998, it is believed that e-commerce will be introduced to more and more firms in Hong Kong, which will make them more competitive in the market. SET payment gateway established in Hong Kong will surely promote the status of Hong Kong in the international community and effectively meet the needs of local market.

The greatest concern of online banks is security issue. Traditional security measure is to use firewall; but its weakness still exists when the financial transaction is made online. The firewall is a kind of network security product, which ensures the security by supervising network protocols (TCP/IP, HTTP, IPX etc.), communication packets, network services and websites. It actually acts as a watchman to stop inappropriate information and intruders. However, the network is an open environment. Anyone who has applied for a bank account could enter legally. In addition, the firewall could not prevent the insiders from intruding. A research of 428 cases by Computer Security Institute in 1995 indicates that 46.8% of the intruders come from the inside. Moreover, since attacks are executed directly to the latent flaws of operating systems, Web Server and network applications, the firewall could not provide sufficient protection as it belongs to the application. In this aspect, SFNB uses HP Virtual Vault, an application level security system which can offsets the disadvantages of the firewall.

The system security of SFNB consists of two parts, namely, information server and the bank. The client obtains the information about the bank and its service from the information server. If the client decides to open an account in SFNB, they have to fill out a security register form, which is encrypted and sent to the bank server. When the bank receives the application from the client for a new

account, it will send a confirmation mail through US Mail to the client, which contains the password. Then the client establishes connection with the bank through the www browser, and all the communications between the client and the bank are encrypted with public keys.

The bank server of SFNB is running on the security operating system of CMW+, which has multi-layer security platform, providing authorization. The security OS substitutes the root account on UNIX; with corresponding authorization mechanism, it enables the users and processes to be authorized by need, consequently avoiding authorization abuse. There is also information break-off mechanism in this OS, which sets up a wall between the network environment and the inside of the bank. The network receives the requests from the users and verifies the identity, and then a secure forwarding application forwards these requests to the bank environment for inside process. Thanks to the protection, the outside processes could not access to the operations inside the bank. CMW+ also has a sound audit mechanism, which records all suspicious activities, including illegal use of authorization and access.

SFNB also sets up firewall and filtering routers between the Internet and interior of banks. The filtering router checks every packet that is sent to the bank, including its source and destination, and rejects any packet that illegally uses the network service. So the outside users can access the bank server only with http. The working mechanism of the firewall is similar to that of filtering router, that it checks every packet that is sent through the Internet to the service network. All information that passes the firewall has to undergo a mail proxy mechanism to remove all suspicious information. This proxy mechanism changes the IP address of the packet to appropriate intranet address so as to avoid direct access to the interior address.

On the Internet, SFNB uses multi-layer technology to guarantee the security of transactions. The browsers use SSL protocol of the Netscape, providing security service between the information bank servers. Through all these security mechanisms, the online banking transactions of SFNB are technologically guaranteed. In addition, SFNB promises to compensate its clients 100% for all unauthorized fund loss caused by SFNB. This shows the courage of SFNB, and also proves the sound security performance of SFNB.

We should always have been clearly aware of the security problems of online banks. “Security First” is always the top priority of online banks. So we should take this issue into consideration since the construction of online bank is initiated rather than make supplementations after the construction. We have to make the most of advanced and mature technologies to enhance the security of online banks. We have to establish security protocols and backup mechanisms for online banks, as well as corresponding security standard and regulations. We also need to introduce different encryption methods in different situations to cope with hackers from all over the world.

3.2 E-payment Tools

Online financial service is a part of e-commerce, which has already been provided all over the world. Online financial service includes online purchase, home banking, personal financing, online investment and online insurance. These financial services are characterized by timely electronic payment and settlement through online payment tools. In its broad sense, online payment is a kind of money exchange occurring on line. Now users can see all kinds of products/services through the Internet. The online payment is developed on the basis of paying means, such as credit card, e-check, digital cash and intelligent card, which may be extensively accepted by customers, businessmen and banks. Since the payment is carried out on line, the payment information is subject to hacker attack, so the security of payment tools has to be guaranteed.

E-payment is a vital part of e-commerce. The advantage of e-commerce, compared with that of traditional commerce is becoming the driving force that stimulates more and more vendors and people to make online purchase and other consumptions. But how to securely perform transactions online is the top priority people have to consider when they decide an online transaction. We will have a further discussion of the concept, the features and tools of e-payment in the following parts.

3.2.1 E-payment System

As more and more companies are planning to bring their business into a new era of e-commerce, the payment issue is becoming very prominent: how to solve the payment problem in e-commerce all over the world? How to deal with millions of payment problems generated everyday by the network? The answer is e-payment. E-payment is defined as follows: the parties of e-transaction, including customers, vendors and financial institutions, use secure and electronic means to make payment or money circulation. Compared with traditional payment means, e-payment has the following features:

(1) E-payment introduces digital circulation to realize information transmission, so all means of e-payment are all digitalized; but traditional payment is realized through physical circulation such as cash circulation, bill transfer and bank exchange.

(2) The working environment of e-payment is based on an open system platform (namely, the Internet); while traditional payment is operated in a relatively closed system.

(3) E-payment uses the most advanced communication means, such as the Internet and extranet, while traditional payment uses traditional communication media. E-payment has a very high requirement for both software and hardware facilities, generally including online terminals, relevant software and some other

supporting facilities; while traditional payment does not have such a high requirement.

(4) E-payment enjoys advantages for it is convenient, fast, efficient and economic. As long as the user has a computer connecting to the Internet, he will be able to stay indoors and complete the whole payment within a very short time. The cost is even less than one percent of that of the traditional way.

E-payment is based on electronic financial network, and uses various apparatus and cards as media, computer and communication technologies as means to realize circulation and payment by making use of binary data stored in the bank computer systems.

From the definition above we can conclude that e-payment has the following features:

(1) Supported by computer technologies, it realizes storage, payment and circulation.

(2) Multiple functions are integrated together, including deposit, loan and non-cash settlement.

(3) It is widely applied to such areas as production, exchange, distribution and consumption.

(4) It is simple, secure, fast and reliable.

(5) E-payment is usually accomplished through exclusive network for banks.

There are five forms to carry out e-payment, representing the five different phases in the development of e-payment.

First: the bank uses computers to process the business and settlement between banks;

Second: the computers of the bank make settlement with other organizations, such as paying salaries;

Third: network terminals are used to provide banking services for clients, for example, clients could withdraw and deposit money on ATM;

Fourth: POS terminals are used to provide automatic deduction services for clients, which are the principal means of e-payment nowadays;

Fifth: it is the latest phase, in which e-payment enables direct transfer and settlement through network at any place and any time, thus bringing into existence of e-commerce environment. This is a developing phase, which will also be the principal means of e-payment in this century. E-payment in this phase is also called online payment, and the online payment tools include credit card, digital cash, e-check and intelligent card.

3.2.2 Intelligent Card

The earliest intelligent card came into existence in France. In the 70s of 20th century, the Moreno Company of France first successfully developed the IC

memory card by installing embedded memory chips on a plastic card as big as a credit card. After 20 years' development, the real intelligent card, which namely, IC card with embedded microchips installed on plastic card, has been successfully co-developed by Motorola and Bull HN in 1997.

The structure of intelligent card primarily includes three parts:

(1) The program generator that establishes the intelligent card. In the process of developing intelligent card, the program generator is used primarily to initialize the card and create all the personal data.

(2) The agent to process the operating system of intelligent card, which includes the accessories to the interface between intelligent card OS and its applications. This agent is highly transplantable, which enables it to be integrated on chip card reader or PC and C/S systems.

(3) The agent of application interface of intelligent card. The agent is the interface between application and intelligent card. It provides help for management of different intelligent cards and independent interface for applications.

The intelligent card, into which the embedded microchip is installed, can store and process data. The value contained in the card is protected by personal identity number (PIN), so only the user could have access to it. Multifunctional intelligent card with high-performance CPU embedded and independent OS installed can have its functions configured as a PC. This intelligent card also has "self explosion" function, if intruder wants to open the card to access the information illegally, the content of the card will disappear.

The working process of intelligent card is described below: firstly, start the browser on a machine such as PC or a terminal telephone; secondly, use the IC card to login onto the website of the user's bank through the card reader installed on a PC, and IC card will automatically inform the bank the user's account number, and the password along with all the encrypted information. After these two steps, user can transfer fund from the IC card to the vendor's account, or transfer fund from his bank account to the card. For example, if the user would like to buy a flower worth 20 dollars, he inserted his IC card to the computer of the flower store, and logged in the bank that issues the card, entered the password and the account number of the flower store. Then after several seconds, the account of the store will have 20 dollars more, and the account of the user will deduct 20. Of course, the user got the flower.

In e-commerce transaction, the application of IC card is similar to the actual transaction process. The only difference is that after the user chooses the commodity on the computer, he would enter the password and the account number of the online store to complete the transaction process.

IC card generally stores the following kinds of information:

(1) The user's identity.

(2) Absolute location of the user.

(3) Relative location of the user and his geographical location in relation to other apparatus.

(4) Particular environmental parameters, such as light, noise, heat and humidity.

(5) User's physiological status and other biological statistical information.

(6) Specialized timing parameter, such as the frequency of a certain event or the time that it takes for the user to complete a certain action.

(7) Specialized movement parameters, such as velocity, acceleration, physical stance and tracking information.

(8) Information of currency that the user holds.

The application range of IC card covers:

(1) E-payment, such as paying a telephone bill, substituting of credit card.

(2) Digital identification, such as control over access to the chambers or a system, like computers or POS.

(3) Digital storage, as is applied to realize real-time storing and retrieving of data, like case history, tracking information or authentication information.

For example, Olivetti active badge system uses location data to find a staffman inside a building, to execute the functions such as informing who is using a certain room. As another example, ATM can be re-configured to make the user's interface adapt to personal use. With this interface replacing password entry, the user can offer what is required when he is on the movement. The transport system can know the user's identity and the destination and all the user has to do is to get a ride, for example, a kind of "e-ticket". And it knows where the user gets aboard, and then charges the user accordingly.

For users, IC card provides a convenient method. It eliminates disadvantages that application systems may cause to the users, and it can "memorize" some information for the user and provide the information on behalf of the user. The application itself can also be configured according to the need of a certain user, who should not be asked to learn and adapt to the application. Using IC card means that one does not need to remember PIN or password, for instance, to make a call, withdraw money, or make payments. It is of a great advantage.

IC card reduces the probability of cash payment and being defrauded, and affords excellent secrecy as a result. Users does not need to carry a lot of cash with them to accomplish all that can be dealt with a credit card, and it enables higher confidentiality than credit cards do. Therefore it plays the most significant role in the online payment system.

IC card as an online payment tool has the following standards:

(1) Open Card Frame Work standard. This is a standard based on network computer supported by IBM、Oracle、SUN、Netscape.

(2) Java Card API standard. It was proposed by SUN, and is supported by CitiBank, Visa first United Bank, and VeriFone.

3.2.3 E-check

E-check is a form of e-payment that transfers money from one account to another

through the network connecting users and banks. Most e-checks use public key or PIN instead of hand-written signature. The transaction cost of e-check is low, and banks could provide standardized capital information for vendors that take part in e-commerce, thus it is one of the most efficient payment means.

Using e-check to pay, clients can send the e-check to the vendor's e-mail box. At the same time the e-payment notification will be sent to the bank, which then transfers the money to the vendor's account. This process only takes several seconds. However, here is a problem: how to authenticate the e-check and the user? So there should be a specialized authority to make authentication, meanwhile this institution should authenticate the identity and credit of the vendors like CA.

E-check transaction can be divided into the following steps:

(1) Client and vendor agree to use e-check payment.

(2) Client sends the e-check to the vendor and a payment notification to the bank.

(3) The vendor has the e-check authenticated through the CA, and then cashes the check after that.

(4) The bank verifies the check through the CA, and then makes fund transfer or cash the check after verification.

In 1996, the USA passed the "improve debt repayment Method", which became an important promotion to the use of e-check in the US. This Act stipulate that since Jan. 1999 most of the government's debt would be paid off in electronic means. On Jan. 1st 1998, FSTC which was composed of the The United State Department of Defense, banks and technology vendors, paid an e-check through by United State Treasury's financial management services to demonstrate the security of the system.

Recently, PaymentNet, which provides back-end payment and processing services, was planning to deal with e-checks. PaymentNet adopts SSL standard to guarantee the transaction security. Telecheck, the biggest company of check verification, will verify the purchaser's identity through the personal information and risk reliability stored in the database.

Although e-check could greatly reduce the cost of processing, people still take prudent altitudes to online checks. The extension of e-check still has a long way to go.

3.2.4 E-wallet

E-wallet is a commonly used payment tool in e-commerce. It is a new type of wallet to pay small purchases.

The Mondex e-wallet developed by the National-Westminster Bank was the first e-wallet system in the world, and first introduced to Swindon, the "British silicon valley" in Jul., 1995. Initially, it was not well-known until it made a breakthrough in Swindon, and it was widely used in supermarkets, bars, jewelry

stores, pet stores, restaurants, parking lots, food stores, telephone booths and buses. The use of e-wallet is quite simple, and all that one need to do is to insert the Mondex card into the terminal. After 3 – 5 seconds, the card will complete payment from the terminal, which will then produce the receipt. When a transaction is completed, the card reader will deduct the expense of this transaction from the Mondex card. In addition, Mondex card has most of the properties of ready money, such as a measure of commodity, saving, exchange and payment. The money on one card can be transferred to another card through a special terminal. Moreover, once the money in the card is depleted, or the card is stolen or lost, the value of Mondex card cannot re-covered, namely, the cardholder has to be responsible for the card. Some cards can be used by others who happen to access to them, while others written with password are only by the cardholder, and it is safer than the cash. When Mondex card is damaged, the cardholder can declare to the issuer, and will be given a replacement card by the issuer after verification.

Terminal payment of Mondex card is only the early application of e-wallet, which looks very similar to the intelligent card. But today e-wallet has taken no physical form and turned into a real virtual wallet.

Online purchase using e-wallet needs to take place in the e-wallet service system. In e-commerce, the software is generally free of charge. The user can use the e-wallet software from the system server connected with his bank account, or other software on the Internet through an encrypted means. Today there are two primary e-wallet service systems in the world, Visa Cash and Mondex; other systems include MasterCard Cash, Clip of EurlPay and Proton in Belgium.

The clients of e-wallet usually have to open accounts at banks. When using e-wallet, the client has to install the software connecting to the server of e-commerce, and input the data of various e-money and e-card to the service system. If the client needs to pay by credit card such as Visa card or Mondex card when the transaction is being processed, all that he has to do is to click the corresponding item or icon. This way is called click-payment.

Only e-currency can be stored in e-wallet, namely e-cash, e-change, electronic credit card, online currency, and digital currency. All these e-payment tools support click-payment.

The management module set up in e-commerce service system for e-money and e-wallet is called e-wallet administration. Clients could use it to change password or check the bank account. The service system also contains transaction recorder, through which the clients could know the commodities and the amount they have bought. They can also print the query result.

Online purchase using e-wallet usually includes the following steps:

(1) The client uses a browser to search the commodities on the vendor's website, and chooses the ones that he would like to buy.

(2) The client fills out order forms, including item list, prices, total price, freight charge and tax.

(3) Order forms can be transmitted electronically, or created by the client's software. Some online shops allow the clients to bargain with vendors (for example, to demonstrate the certificate of old customer, or offer the price information of the competitors).

(4) After confirmation, the client chooses to pay by e-wallet. He installs the e-wallet to the system, clicks the corresponding item or icon of the wallet, and then the wallet is open. In that case, he has to enter his password and confirm the wallet before he can pay by a credit card chosen from the wallet.

(5) The server of e-commerce will encrypt the credit card number and send it to the corresponding bank, meanwhile the store will receive the encrypted order, and then the store adds the order and returns it to the server. The credit card number is invisible to the store, and the store has no access to the money in it. After the server verifies the validity of the client, it will send the verification to the credit card company and the commercial bank. There will be data exchange about payment and financial data between the credit card company and the bank. The credit card company will process the request and resend it to the bank for confirmation with authorization made meanwhile; the bank will confirm and authorize it before sending it back to the credit card company.

(6) If the bank denies the request, it means that the client's card is under-funded or overdraft. After the denial, the client can re-open the e-wallet to access to another credit card and repeat the above-mentioned operations.

(7) If the bank has verified the credit card and give authorization, the store can then make delivery. Meanwhile the store will keep all the data generated in the whole transaction, and send a copy of them to the client.

(8) After the transaction is complete, the store will deliver the commodity to the client according to the order form that the client previously provided.

Although there are several processes of identity verification, bank authorization, and financial data exchange involved in this process, all these are completed in a very short time. Actually, it only takes 5 – 20 seconds from filling the order form to receiving the electronic receipt. This kind of purchase is simple and fast. Moreover, the whole process is secure. During the process, the client can use any browser to browse and check the information. Since the information in the client's credit card is invisible, it is secure and reliable when the transaction is processed. In addition, it is guaranteed that the client will not be defrauded by the store because of the secure means of e-commerce.

In a word, this purchase procedure has completely changed the traditional face-to-face purchase pattern, and it is a highly efficient and secure process that is quite different from the traditional way.

Ever since the e-wallet came out in Jul. 1995, e-wallet has been tried out in a couple of countries and areas including Swindon of UK, Hong Kong, Toronto and New Zealand. In 1998 Mondex was on trial in New York, and would be experimented in other cities in the form of a franchised chain, and the participant banks including Manhattan Bank, Chicago Bank and Fagobi Bank. National

Australian Bank aimed to introduce Mondex in 1998, and so did South Africa and Israel. In US there is not only Mondex. Actually there are still other e-currencies developed in different technological systems; for example, Visa Card Company issued 200 intelligent cards (valuing $10, $20, $50, $100) during the 1996 Atlanta Olympic Games, and had 2300 franchised stores, with 200,000 payments amounting to 1.1 million dollars. In Japan many organizations were willing to introduce e-wallet, but they did not implement as planned. The reason is that Japan has a financial network different from other countries. If the e-wallet is to be applied, Japan has to invest billions of yens to reconstruct the existing financial network. Such a huge investment is obviously a heavy burden to a country like Japan that is tortured by economic crisis. All the evidences show that the competition on e-payment is just starting. However, e-wallet is much better than other types of e-currency that emerged in the past several years.

3.2.5 E-cash

E-check, e-draft, e-wallet and credit card offer great convenience to the online payments during e-commerce, but all these could not take the place of cash, for they all have the audit trailing function. Using these payment tools will reveal where the money goes. So there may be possibility of leaking your privacy. Sometimes the client hopes to pay online just like paying cash in real life in order to avoid trailing and privacy leakage. So e-cash comes into being.

E-cash is a kind of currency that exists in the form of digits. It transforms the cash amount to a series of encrypted numbers, representing the currency value by the serial numbers. After the client opens an account and deposit money in the bank that provides e-cash service, he will be able to go shopping in stores that accept e-cash.

When the client dials into online bank using a password and PIN to identify himself, and downloads packages of small-valued e-coins, e-cash comes into effect. Then, these e-cash are stored in the client's hardware until he uses them to do online shopping. In order to guarantee the transaction security, each coin is assigned a random serial number and this number is hidden in an encrypted envelope. In this way nobody will know who withdraws or uses the e-cash. Such a shopping mode can conceal the buyer's identity, so it is popular with people who have privacy concerns.

The Digicash Company headquartering Holland is the only company that provides real e-cash system for commercial purposes. And CyberCash and DEC follow suit. Digicash began their trial of an e-cash system named CyberBucks in Oct. 1995 at Mark Twain Bank. Currently about 50 Internet vendors and 3000 clients are using this kind of e-cash. The vice president and market supervisor Frank Trottert said: "The first phase is commercial retail system, but the real

potential lies in the second phase, in which there will be a global commercial payment network." He added that clients felt this e-cash very convenient. Nowadays there are more than 10 banks using this system to issue e-cash, including well-known banks such as Mark Twain, Eunet, Deutsche, and Advance. Mini-Pay system developed by IBM provides another mode of e-cash. It uses the RSA public key with digital signature. The parties of the transaction complete identity verification through certificates, which is valid only for the same day. This product is primarily used in small transactions.

The payment process using e-cash includes four steps:

First, the client opens an account at the bank that issues e-cash, and buys e-cash certificates with the money deposited in the cash server account. Then the e-cash gets value, and is divided into packages of "coins", which can be circulated in the commercial world.

Second, the client withdraws a certain amount of e-cash, usually less than 100 dollars, from the bank with the terminal software and stores it on the hard disk.

Third, the client bargains with the vendor that accepts e-cash, fills the order form and uses e-cash to pay for the commodities purchased.

Fourth, the vendor and the bank make settlement, and the bank will pay the money to the vendor.

E-cash has the following features:

(1) The banks and vendors should have authorization agreements.

(2) The client, vendor and bank all have to use the e-cash software.

(3) The bank takes charge of the fund transfer between client and vendor.

(4) Identity verification is completed by e-cash itself. Digital signature is used when the bank issues e-cash. The vendor sends e-cash to the bank in each transaction, and the bank verifies the validity (counterfeited or used) of e-cash issued by the bank.

(5) Anonymousness.

(6) It has the features of cash, subject to operations like withdrawing, depositing, transfer, and therefore it is suitable for small transactions.

However, e-cash payment also has some problems: the minority of vendors are willing to accept e-cash, only a few of the banks provide e-cash service; high cost; high requirements for both hardware and software; a large database is needed to store the completed transactions and e-cash serial numbers to avoid repeated payment; currency exchange problem. Since e-coin is still based on traditional currency system, German banks can issue e-cash only in Marks, French banks can issue e-cash only in Francs. So, international trades have to use specific exchange software, which means a big risk. If the hard disk of the client is damaged, then e-cash stored on it is lost and cannot recovered, which is a risk many consumers are not willing to bear. Another bigger concern is the existence of counterfeited e-cash. Peter Ledingham of US Federal Reserve Bank said in his "policies of e-payment implementation": "it is probable that the issuer of e-cash

will be trapped by counterfeited e-cash. With some technologies, it is probable that the receiver of e-cash, even the issuer, will not be able to test the counterfeited e-cash. Although the complicated security means lowest probability of counterfeited e-cash, the probability cannot be ignored for it may bring rather high rewards. Once counterfeited e-cash is successful, the price that issuers and some of the clients have to pay will be disastrous."

Despite various problems, the use of e-cash is still on the rise. As much safer e-cash solutions come out, e-cash will become a convenient means for online transaction in the future as predicted.

3.3 Summary

E-payment, based on the network of electronic finance, has made full use of digital devices for commerce, various transaction cards for trade and computer and communication technologies to realize the circulation and payment by transferring digital information stored in the computer network system. This chapter focuses on the function, structure and development of online banks, and then introduces the primary tools and technologies in e-payment, including e-payment system, e-cash and e-wallet.

Compared with traditional payment mode, e-payment has the following features:

(1) E-payment accomplishes information transmission with digital circulation, and all means of payment are digitalized.

(2) The working environment is based on an open system platform while traditional payment is functioning in a relatively closed system.

(3) E-payment uses the most advanced communication methods, such as the Internet and extranet, while traditional payment uses traditional communication media. E-payment has a very high requirement for both software and hardware facilities, generally including online terminals, relevant software and some other supporting facilities; while traditional payment does not have such a high requirement.

(4) E-payment enjoys advantages for it is convenient, fast, efficient and economic. As long as the user has to own a computer connecting to the Internet, he will be able to stay indoors and complete the whole payment within a very short time. The cost is even less than one percent of that of the traditional way.

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4 Security Technologies in E-commerce

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Abstract One of the key issues emerged in the process of transforming a traditional business into an electronic one is the security problem. Compared with tradition paper-aided transaction, information has to be transferred through public Internet network under the electronic environment. The record media of e-commerce has changed from paper to magnetic media. The characteristics that the information recorded on magnetic media can be easily copied, deleted and modified, and the openness of Internet result in that e-commerce information can be easily leaked, tampered, counterfeited and denied. In order to develop e-commerce, the confidentiality, integrity and authentication of e-commerce transaction data must be ensured. The technologies used to handle these issues mainly come from cryptography, and they include such technologies as encryption, authentication, hash, digital signature, firewall, intrusion detection etc. This chapter gives a brief description on those mentioned technologies which gives a basic understanding of how they work so that we can consciously apply these technologies to protect the security of e-commerce during the business process.

Key Words e-commerce, security, reality, encryption, public key encryption, signature, hash function, authentication, firewall, intrusion detection, SSL, SET.

4.1 Introduction to Security Problems in E-commerce

As e-commerce is being rapidly developed and widely applied, e-commerce technology has exerted influence on various aspects of our daily life, and becomes the key factor of a nation's competitive power. The e-commerce information system of enterprises stores a great deal of commercial secrets concerning the long-term development of enterprises. In economic activities, e-commerce systems

can bring convenience, efficiency and low cost to commercial activities. Personal information system usually stores private information of property and accounts; individuals are able to communicate with each other via the Internet, such as inquiring information, getting messages; moreover, there are also other personal consumption such as purchase, ticket booking and e-settlement. E-commerce security is closely concerned about the protection of citizens' privacy, and the survival and development of enterprises. The capability of guaranteeing e-commerce security has become a symbol as well as an ace of trumps of the competitive power of enterprises in the 21st century.

The first and the most important problem encountered in the process of digitalizing the traditional commercial activity is the security problem. A complete security problem includes the response reliability of the e-commerce system when it reacts to various accidents and vicious attacks. This chapter focuses on study of problems that are shown by e-commerce under the malicious attacks and relevant countermeasures. Traditional commercial activities are carried out from face-to-face negotiations, signing contracts to fund transfer via banks and delivery of goods. Traditional commercial process is exposed to tremendous risks; for example, one of both parties might not fulfill the contract after signing it, or fail to provide the required cargo after receiving the payment, or fail to pay after receiving cargo. Problems like these can be controlled within certain limit through careful operations, mutual understanding and relevant legal means; however, negative examples are also very common. E-commerce has transcended the restriction of space and time, making it possible to negotiate and sign contracts at any time and any place. In this process, both parties do not have to meet, and the contracts and payment are digitally made. Thus security problem will become very important. Major issues are listed below:

The authenticity of the identity of both parties is how to know the participant of the negotiation is not counterfeited by someone else. If we are negotiating with some cheater, we might let out some important information, which may cause serious losses. How can we judge whether a document comes from someone really as declared?

The secrecy of information exchange: in the process of negotiation, a tremendous amount of information should be exchanged, which usually includes the names, prices, quality of the commodities, as well as the time and place of the commodity exchange. All such information has great value and needs to be protected. If the information is divulged to the competitors, they are likely to take advantage of what they know so as to cause tremendous losses to the negotiator. Thus it is of great importance as to keep the crucial information confidential.

The integrity of information: how can the receiving party make sure that the information received is the complete message that is sent from the other party? And is the message not replaced by another faked message in the process of being transmitted.

Non-repudiation: If one party wants to invalidate the contract which has been signed because of adverse marketing situations, one of the choices it may make is

to deny authenticity of the agreement. Issues like these are also very important problems encountered in the e-commerce process.

Anti-attack of e-commerce system: when an enterprise has carried out e-commerce, it will heavily rely on the e-commerce system, which in turn will determine the survival of the enterprise. In view of the fatal issue, the problem as to whether the system could stand various attacks is also of great concern.

Privacy protection problem: in the traditional commercial process, when we go shopping, we check the commodity and pay for it in person. The vendor would not know who we are. In the e-shopping process, however, the registration is required all the time, which may reveal a lot of private information such as gender, age, occupation, income, ID number and credit card number. But how can we know that our private information is protected rather than illegally used?

The security problems originated from the Internet itself: First of all, it is because of the openness of the Internet. The Internet is a free and open world, which enables the global information exchange. On the other hand, it provides a convenient way to gather and distribute private data. Secondly, the diversity of the Internet users is also a threat to security. Since the information is transmitted online via the routers while the users cannot know which one of the routers are involved in the process, it is possible that someone will be able to view the user's information by scanning and tracking data. So technically speaking, any online data is possible to be eavesdropped.

Problems mentioned above are just part of the security problems involved in e-commerce. Although some of them can be solved with technical means, many others can only be solved by economic and legal means. This chapter will give a brief introduction to these problems and the technical solutions to them.

The complete security architecture of computer network includes the network's physical security, access control security, system security, user security, information encryption, secure transmission and security management. Between the attacker and the resources multiple security measures should be set up with relevant technologies to baffle the malicious attacks and enable tracking the intruders.

4.2 Reliability of E-commerce System

The reliability of e-commerce system is the foundation of e-commerce security, referring to the safe operation of e-commerce system free of malicious attacks. If a system cannot work properly without any attack from outside, e-commerce security is not worthy of being mentioned. The security problem and reliability problem of the system itself can be divided into several categories.

(1) Data loss caused by absence of backup system. After the traditional commercial transaction is digitalized, information has become the most valuable asset of the enterprise. Any loss of data means the loss of asset. Thus data backup is the first step to do to ensure e-commerce security.

(2) Attack caused by virus. Nowadays virus is on the rise and brings more and more harms. The virus could be transmitted through the disks, or via the Internet. Although the virus is not aimed at a particular enterprise or information system, it might cause unstable operation of the system, or great reduction of the system performance, which will also cause great loss to the enterprise.

(3) Error operations. Error operations may be caused by operators who are unfamiliar with the information system; the most harmful operation is the deletion of important data without possibility of restoring it. This kind of mistake causes losses that are similar to that by failure of data backup.

(4) Hardware failure, network or software failure. The hardware and software used in the system cannot be 100% reliable, system failure caused by hardware or software failure can also affect the normal operation of the enterprise.

(5) System breakage caused by accidents. Accidents such as power failure, fire, lightning and earthquakes might cause the system failure.

(6) Insufficient security configuration and system management. These also can cause many problems in the operation of the system, such as improper authorization, which may cause collision within the system and inconsistency of database.

(7) Fundamental security problems of the communication protocols. The communication protocols being used now do not take security issues into consideration, and direct use of the protocols to transmit the confidential information is not secure even though there is no malicious attack.

(8) Other problems. There are some other problems such as application software based on WWW and FTP, and imperfect service programs.

To solve such problems and ensure the security of the network itself, we need to implement corresponding solutions to enforce the security in response to particular problems existing on the network. The following measures can be taken:

(1) Enhance the data backup and recovery by using data storage technologies such as RAID5.

(2) Install anti-virus software to enhance the integral anti-virus mechanism in the intranet.

(3) Enhance the training of the network operators to reduce the errors; control the use and modification of the important data by means of access control and strict authorization mechanism.

(4) Regularly scan on the network to find out possible security loopholes and make timely modification.

(5) Redundancy technology and backup technology are to be used to enhance the system reliability.

(6) Enhance the security of the host by well setting configuration and installing timely patches to reduce loopholes.

(7) Establish necessary physical or logical isolation for sensitive equipments and data.

Apart from technologies listed above, the decisive element of e-commerce security is the human, or the management. There is no security without security

supervisor and security guidelines. For the sake of security, efforts should be made to formulate security strategies and provide the training program for the staff. Multiple measures such as technological, managerial, legal, and economic means should be used to ensure the security of e-commerce systems.

4.3 Data Encryption Technology

Using data encryption to ensure the secrecy of information can be traced back to very long ago. In the 5th century BC, encryption was used in Greece. However, data encryption had not become a science until the publication of "Communication Theory of Secrecy System" by Shannon. On Jan 15th, 1975, National Institute of Standards and Technology (NIST) published the first national standard for data encryption, DES (Data Encryption Standard), which was a milestone of data encryption. In 1976, the public key was proposed by Diffie and Hellman from Stanford University, who divided key into public key for encryption and private key for decryption. This is a revolution of cryptology. In 1977, Ronald Rivest, Adi Shamir and Len Adleman proposed the first applicable public key algorithm-RSA. This is an algorithm based on large integer factorization. Up to this moment, the two pillars of data encryption had been established-symmetric encryption and asymmetric encryption. The encryption communication system is illustrated in Fig. 4.1, and some commonly used concepts in data encryption are listed as follows.

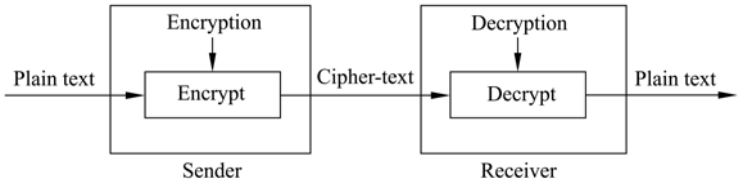

Figure 4.1 Encryption /decryption system with two keys

Sender and receiver: in cryptology, we always postulate that the sender hopes to safely send the message to the receiver via an insecure channel. We usually use Alice and Bob to denote the sender and receiver respectively.

Plain text and cipher-text: in order to send the message securely via an insecure channel, the sender needs to perform certain transformation on the message to make the attacker unaware of the message even if he gets the transformed message. The message itself is called plain text, and the transformed message is called cipher-text.

Encryption and decryption: the process of transforming the plain text to an cipher-text is called encryption. Once the receiver receives the cipher-text, he needs to transform the cipher-text back to a plain text to know the content of the

message. This process is called decryption.

Encryption key and decryption key: encryption is actually a kind of function $f(M)$, which applies the plain text as an independent variable M to the function, and the output value $C = f(M)$ is the cipher-text. The process of transforming cipher-text back to plain text is the inverse operation of the encryption function $M = f^{-1}(C)$, and $f^{-1}(f(M)) = M$. This kind of transformation and inverse transformation can also be called algorithm. We can keep the secrecy of the message by keeping the function f secret, but the problem is: a big or varying organization cannot use this method since f has to be changed once a user leaves this organization; on the other hand, this method cannot be controlled in terms of quality and studied in terms of security since it cannot be public. To overcome the difficulty, cryptologists worked out another method, which is to use a bivariate function $f()$. The encryption needs an additional parameter K_1 besides the plain text M, and then the encryption process becomes $C = f(M, K_1)$. The decryption process needs an additional parameter K_2 as well as the cipher-text C. K_1 and K_2 are kept secret to make the message secret. In this way $f()$ can be studied publicly. If someone leaves this organization, it is enough to change K_1 and K_2. Here K_1 is called encryption key; K_2 is called decryption key.

Symmetric encryption system and public key encryption system: if an encryption system has $K_2 = g(K_1)$ or the reverse, where $g()$ is a polynomial time computable function, we call this system a symmetric encryption system. If $g()$ is not a polynomial time computable function, this system is called public key infrastructure. For the publication of the encryption key will not enable the attacker to know about the decryption key.

4.3.1 Symmetric Encryption System

The symmetric encryption system is commonly used to encrypt a large amount of information. Before the 1970s there was only symmetric encryption algorithm in cryptology. $K_1 = K_2 = K$ is usually used in symmetric encryption algorithm. As far as symmetric encryption algorithm is concerned, the secrecy of the key is the most important; once the key is divulged or pried out, all the system will be of no secrecy. So the symmetric encryption algorithm is called secret key algorithm. It requires a commonly agreed key before the sender and the receiver begin their communication. The security of symmetric encryption relies on the secrecy of the key, for a divulged key will enable anyone to send or receive the message.

The procedure of symmetric encryption communication:

(1) Alice and Bob agree on an encryption system.

(2) Alice and Bob agree on a common key K.

(3) Alice uses the agreed algorithm and key to encrypt her message and gets the cipher-text.

(4) Alice sends the cipher-text to Bob.

(5) Bob uses the same key and algorithm to decrypt the cipher-text and gets the plain text, then reads the message.

The symmetric encryption algorithm can be divided into two categories: stream algorithm, which encrypts or decrypts one bit or byte of the plain text every time; block algorithm, which encrypts or decrypts a fixed length of bytes every time. Now commonly used symmetric encryption algorithms are mostly block algorithms, such as DES and AES. And stream algorithm is usually used for military purpose, so its public literature is less available.

Introduction to DES: DES (Data Encryption Standard) is an improvement of Lucifer algorithm developed by IBM in 1970s. On Nov. 23rd, 1976, this algorithm was formally adopted as the federal encryption standard, and was authorized to be used in non-confidential government communication. The formal document, numbered FIPS46, was published on Jan. 15, 1977, and came into effect six months later. Afterwards, it was taken as DEA-1 by ISO. It was originally planned that DES was used for only 10 years. But because there was no better symmetric algorithm, the deadline was extended continuously. However, as the computer technology develops, the security of DES becomes weaker and weaker. On Jun. 17, 1997, volunteers from all over the world broke DES successfully. This event changed people's attitude towards the security of DES. From 1997 the USA began to seek a new generation of symmetric encryption algorithm, which gave birth to AES. Now the bank system in our country is still using DES.

Introduction to AES: AES (Advanced Encryption Standard): AES was the result of four years efforts made by USA to seek a new generation of symmetric algorithm. Through two rounds of elimination, AES was finally established and published. USA lies in the transitional process between DES and AES. Compared with DES, AES is more clear and reliable in mathematical principle, and it can be used reliably as a result of analysis. In addition, since the algorithm is not designed by American scientists, it is generally believed that it is more difficult to set trapdoors in AES.

The advantages of symmetric encryption algorithm (compared with public key algorithm) are: encryption is fast and efficient, usually $100-1000$ times that of public key algorithm. However, symmetric algorithm also has some obvious demerits:

(1) The key has to be secretly distributed, because knowing the key means knowing the message. So the distribution is quite pivotal.

(2) A problem with symmetric encryption is the tremendous amount of keys, which are difficult to manage. Suppose any pair of sender and receiver have their agreed key, obviously, N users should have $N*(N-1)$ keys, an each user should keep $N-1$ keys. When N is large enough, the possibility of divulging keys will increase for memorizing all of them rather than keeping them seems impossible.

The existence of such problems gave birth to the generation of public key encryption algorithm.

4.3.2 Public Key Encryption Algorithm

We have introduced the problems with symmetric encryption algorithms. But how can we overcome them? In 1976, Whitfield Diffie and Martin Hellman proposed the public key encryption algorithm in their paper "New Directions in Cryptography". Inspired by the safe and mailbox, they imagined the symmetric encryption as the safe, and the key as its code combination. The person who knows the code can open the safe and close it as well. Then can we replace the safe with the mailbox that allows everyone to put in letters but only those who get a key to open? Through an analogical analysis, they proposed a system, in which encryption and decryption involve different keys, and the decryption key cannot be deduced from the encryption key. If possible, the encryption key can be made public, while the decryption key is kept secret. That is to say, anyone who wants to correspond to Alice can encrypt the message with the public key, but the encrypted message can only be decrypted by Alice. This is the concept of public key algorithm.

Ever since the public key encryption was proposed, many encryption methods had been proposed. There are three kinds of systems that are considered secure and valid: large integer factorization system (e.g., RSA), elliptic curve cryptosystems (e.g., ECC) and discrete logarithmic system (e.g., DL).

Now the most commonly used public key system RSA was proposed by Rivet, Shamir, and Adelman, the security of which is based on large integer factorization, which is a famous nut in mathematics and researchers have not found solution yet. RSA system is the most typical method in the public key system, and it is widely found in most products with digital signature or encrypted by the public key.

From an abstract point of view, the public key system is a trapdoor one-way function. A function is said to be one-way function if $f(x)$ is easy to compute for all x in its domain, while $f^{-1}(y)$ is impossible to compute for almost all y in the range even f is known. But if some additional information (trapdoor information) is given, $f^{-1}(y)$ will become easier computed, and then the one- way function f is called trapdoor one-way function. The public key encryption system is designed according to this principle; the additional information is called the key. The strength of this kind of encryption relies on the computational complexity. Now there are two kinds of popular public key systems: one is based on large integer factorization, typically RSA; the other kind is based on discrete logarithm, such as ElGamal system and elliptic curve public key system. Because the capacity of factorizing large integer is becoming stronger and stronger, there is always a requirement of the key length to ensure the security of RSA. Now the 768bit RSA is not safe enough, and usually 1024bit is recommended. However for discrete logarithm, although the security is better, it is not mature yet.

The communication of public key encryption is outlined as follows:

(1) Alice and Bob choose a public key system.

(2) Bob conveys his public key to Alice.

(3) Alice uses Bob's public key to encrypt her message and sends it to Bob.

(4) Bob uses his private key to decrypt the message from Alice and reads it.

Since Alice's public key is not necessarily kept secret, it can be sent via an insecure channel, which is a successful solution to the key distribution and management problem. Furthermore, public key system can be applied to digital signature, which would be introduced later.

The public key system also has its weak points:

- Slow: approximately 1/1000 to 1/100 of symmetric encryption system.
- Vulnerable to chosen plain text attack. Since $C = f(M, K_1)$ in which K_1 is known, if there are only n possibilities of M, the attacker can encrypt all n kinds of possible plain texts and see which one of the results is the same with C, then M is known.

The weak points of public key system make it not suitable to encrypt messages with a very small space or a large amount of data. Actually the symmetric encryption algorithm and public key encryption algorithm are usually combined to serve applicable purposes; the public key system is used to distribute the key, and then the distributed key is used for encryption. That is the so-called mixed cipher mechanism.

4.3.3 Mixed Encryption Technology

The symmetric encryption system only uses substitution and permutation to process the bit combination, so it is fast and simple, but there are some problems concerning the distribution and management of the key. On the other hand, the public key system does not need to distribute the key secretly, so it is very suitable to be used in distributed system. But the weak point is that it needs to perform exponentiation computation and modular arithmetic of $200-300$ digit integers, which is much slower than symmetric encryption system.

To combine the advantages of both systems, a mixed system is proposed, as is indicated as follows:

(1) Bob sends his public key to Alice.

(2) Alice generates a random session key K, and uses Bob's public key to encrypt it as $E_B(K)$, then sends $E_B(K)$ to Bob.

(3) Bob uses his private key to decrypt Alice's message and gets the session key with the function $D_B(E_B(K)) = K$.

(4) They use the same session key to encrypt their communication.

The core of mixed encryption system is: first use the public key technology to transmit the symmetric key used to encrypt the plain text, and then use the symmetric key to encrypt the plain text. Since the public key technology and

symmetric cipher technology are combined, this mixed system promotes the processing speed and computation efficiency, and has become the most widely used encryption mechanism for its enhanced key management and distribution.

After the mixed system was proposed, new technologies based on the mixed cipher system such as identity authentication and digital signature came into being. The research on this system stays in the focus of attention of cryptologists.

This mixed encryption system is gradually displaying its value in application. It may be widely used in network security architecture such as planning of firewall, management of intranet, identity authentication, etc. And it can be well applied to mobile agent and multi-agent mixed encryption system.

4.4 Digital Signature

4.4.1 Sign the Document with Public Key Algorithm

In traditional commercial activities, one usually signs a document to express his agreement with the content of the document, and his willingness to enjoy prescribed rights and assume corresponding responsibilities. Thus the signature should be credible, verifiable, and cannot be counterfeited and reused while the signed document should not be modified or denied. In e-commerce, two parties negotiate and enter into contracts through network. Documents thus formed are mostly in the electronic form. But a problem may arise as to whether we can find a similar way to make both parties sign the electronic documents. To solve this problem, we should first take into consideration the fact that the electronic document is easily copied and reused. Therefore, we must find a new way to sign the electronic document. Now people have found many digital signature algorithms, such as RSA, DSA and discrete logarithmic algorithm, which can solve the above-mentioned problems.

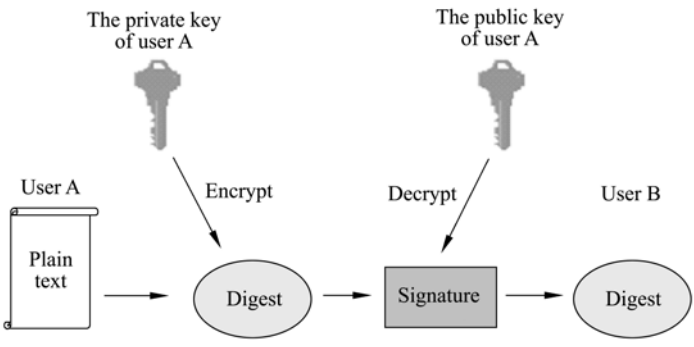

Figure 4.2 RSA digital signature algorithms

In RSA, both public key and private key can be used for encryption, but the effects are different. Encryption with public key and decryption with private key have formed the usual public key encryption system. If encryption is done with Alice's private key, then decryption can be done only with Alice's public key. This can be the reliable evidence that Alice has encrypted this message. If a document is encrypted by Alice only when she agrees with its content, a kind of secure digital signature system is thus formed. The procedure of RSA signature is outlined as follows:

(1) Alice encrypts the document with her private key, which means signing the document.

(2) Alice sends the signed document to Bob.

(3) Bob decrypts the document with Alice's public key, which is the authentication of the signature.

The signature satisfies the requirements of the user as follows:

(1) Verifiable: if the signature is made by Alice, then it can be decrypted with Alice's public key.

(2) Credible: if the message can be authenticated with Alice's public key, it can be assured that the message is signed by Alice.

(3) Non-counterfeited: only Alice knows her private key, and no one else can sign the message with Alice's private key.

(4) Non-reusable: since the signature is the function of the document, the existing signature cannot be transferred to other documents.

(5) Undeniable: if Alice's public key is known, it can be proved that Alice has signed the document.

The aim of signature is to prove that the signer has the responsibility and obligation related to the document, rather than keep the content of the document secret. Thus two most important insecure elements of digital signature are: first, the signer denies having signed the document. Second, the signature might be counterfeited. If the denier or counterfeiter's computational power is presumably finite, then the digital signature is secure. However, if his computational power is infinite, then the signature might be successfully denied or counterfeited. To solve such problems, there have been some new methods, which represent a new direction in digital signature research.

4.4.2 Signature with One-way Hash Function and Public Key System

One-way Hash function: if a function $f(x)$ satisfies the following two conditions, we call it a one-way function:

(1) There exists a polynomial time algorithm A, such that $A(x) = f(x) = y$.

(2) There is no polynomial time algorithm B, such that $B(y) = x$.

The definition indicates that a one-way function is easy to compute but extremely difficult to compute in an inverse way. If one-way function $f(x)$ has

$f(x_1)$ and $f(x_2)$ with respect to any of x_1, x_2, and $f(x_1)$ and $f(x_2)$ have the same binary digit, we call this function one-way hash function. One-way Hash function is a many-to-one function; it cannot be assured that two documents are the same when the Hash values are the same. If the Hash values are different, however, the probability that the two documents are same is very small. For example, if two documents with 120-digit hash values are different, the probability that the two hash values are the same is less than 2^{-120}. Because of this, one-way Hash functions are usually used as the fingerprint of a document or the digest of the message.

Signature with one-way Hash function and public key algorithm: since the digital signature often requires exponential modular computation, and here modules are all 200- or 300-digit decimal natural numbers, the efficiency of digital signature is very low for its tremendous computation. So the digital signature algorithm and one-way Hash function are usually combined. First we should calculate the function value of the long document with one-way Hash function, and the calculated value is much smaller than the document itself. Then we sign this function value to realize the signing of the original document. The signature procedure is outlined as follows:

(1) Alice generates the one-way Hash value of the document.

(2) Alice encrypts the Hash value with her private key.

(3) Alice sends the document and the Hash signature to Bob.

(4) Bob uses the document sent by Alice to generate the Hash value of the document, and then uses the public key of Alice to decrypt the Alice's signature. If the two results match, then the signature is valid.

This method greatly reduces the computational complexity of digital signature.

4.5 Authentication Technology

The concept of Authentication: Authentication is the most important link in e-commerce. It is usually divided into digital Authentication and biological Authentication.

4.5.1 Digital Authentication Technology

Digital Authentication is to use encryption to realize the Authentication. The most common Authentication is password. However, as far as the security is concerned, password is the most insecure Authentication. E-commerce transactions usually use digital signature to implement Authentication, as introduced in the previous part.

Digital Authentication is by now the most reliable and commonly used one, but its weak points are also obvious. The biggest problem is that the digital

signature with public key encryption requires tremendous computation. Generally it is impossible to compute instantly with respect to public key encryption. Therefore on some occasions where the requirements for security are not so high, some simpler Authentication such as password is used. In addition, there are some Authentication methods such as biological Authentication.

4.5.2 Biological Verification Technology

Because of the importance of identity Authentication, aside from the above-mentioned Authentication, there are many other ways based on the user's biological characteristics, such as face ID Authentication, fingerprint ID Authentication, iris ID Authentication, palmprint ID Authentication, voice ID Authentication and manual signature ID Authentication, etc.

1. Fingerprint Authentication

Fingerprint Authentication is one of the oldest biological Authentication, which has been successfully applied to many areas. Fingerprint refers to the lines on the surface of a fingertip. The details of the fingerprint constitute the unique information of the fingerprint. A Authentication procedure includes three parts: pattern extraction, fingerprint classification and match decision. Pattern extraction means extracting details from the fingerprint image; the fingerprint images are classified to promote the Authentication speed; match decision determines if two fingerprints come from the same finger.

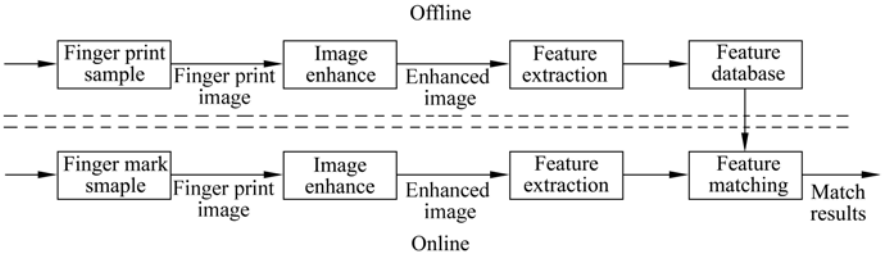

Figure 4.3 Automatic fingerprint identification systems

2. Iris Authentication

Iris is the ring area between pupil and sclera. Compared with other biological Authentication, Iris Authentication is highly unique, stable, anti-fake, and useable. The procedure of iris Authentication includes: iris location, iris alignment, pattern expression, and match decision. Iris location extracts iris from the whole image; iris alignment determines the corresponding relation between the structures of two images; pattern expression captures the unique spatial characters of the iris;

match decision uses the Hamming distance to represent the match degree. This procedure requires little computation, and consequently enables this Authentication to be used in the large database, as illustrated in Fig. 4.4.

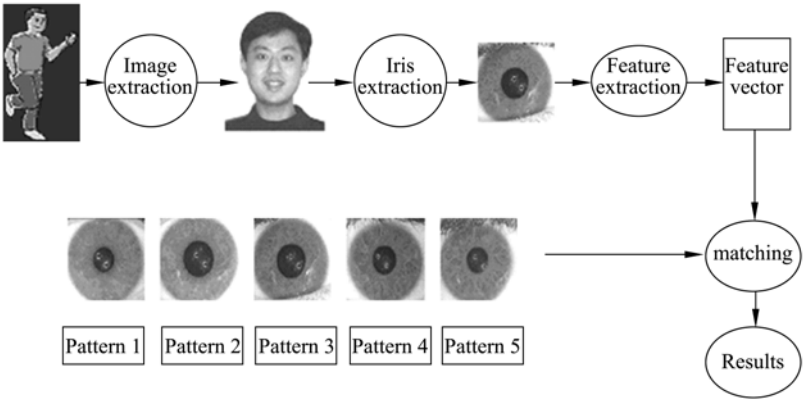

Figure 4.4 Illustration of iris verification system

3. Face Authentication

Face Authentication is an active research domain. Although the accuracy of face Authentication is lower than iris and fingerprint Authentication, it is simple, natural and harmless to the user. So, it has become the most acceptable way in biological Authentication. There are two steps involved in face Authentication: location of the face in the image; pattern extraction for matching decision. In the current face Authentication, the background of the image is usually controllable or nearly controllable, which makes the location of face comparatively easier. However, because of the change of factors such as facial expression, location, direction, and light, the extraction of face is thus quite difficult.

4. Hand Shape Authentication

Hand Shape Authentication is the speediest one in biological Authentication since it is comparatively easy to measure the shape of hand and extract the image of hand-shape. However, characteristics of hand shape do not have high uniqueness, and cannot be used alone for Authentication as a result. Typical characteristics of hand shape include the length and width of fingers, thickness of palm, ration of length-to-width of fingers, etc.

5. Palmprint Authentication

Compared with fingerprint, palmprint Authentication is much highly accepted in that the main characteristics of palmprint are much more obvious than those of fingerprint. Furthermore, the main characteristics of palmprint are more stable

and classifiable than those of fingerprint; therefore palmprint Authentication should be a method of ID Authentication with high potential of development. Current palmprint Authentication basically utilizes major lines and palmar creases.

6. Gait Authentication

Gait Authentication is a new domain of biometric Authentication technology. As a traditional issue of pattern recognition, biometric Authentication is made by means of human physiological features or behavioral characteristics. The first generation of biometric Authentication, which utilizes facial features, fingerprints, and iris and so on, is based on the short-distance perception. As it turns out in the visual monitoring, gait is visible in the long distance, and it can be observed without bothering the person to be observed. These characteristics of gait arouse great interest among many researchers. HID (human identification at a distance) patronized by DARPA is a case in point.

Gait Authentication is a quite fresh direction, which aims at finding and extracting the change patterns from walking behaviors to realize automatic ID Authentication. An automatic gait Authentication system on safety monitoring occasions is illustrated in Fig. 4.5. The system integrates computer vision, pattern recognition and video/image sequence processing.

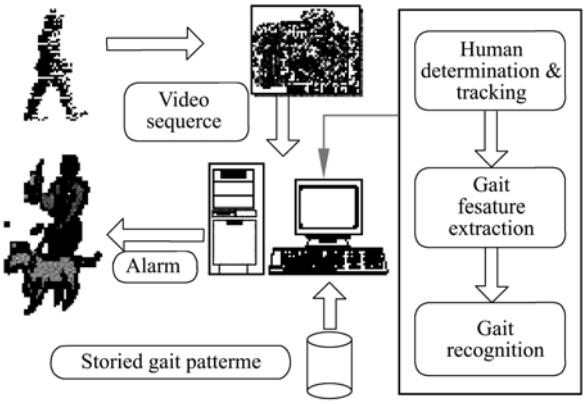

Figure 4.5 Illustration of gait identification system

7. Manual Signature Authentication

Manual Signature Authentication is a behavior Authentication technology. The difficulty lies in that the data is highly variable, even the signature of the same person will not be identical. According to the ways of obtaining data, the verification can be divided into two kinds: offline Authentication and online Authentication. Offline Authentication is to obtain the image of the signature via scanner; online Authentication is to use the digital word-pad or pressure-sensitive pen to record the process of writing (Fig. 4.6).

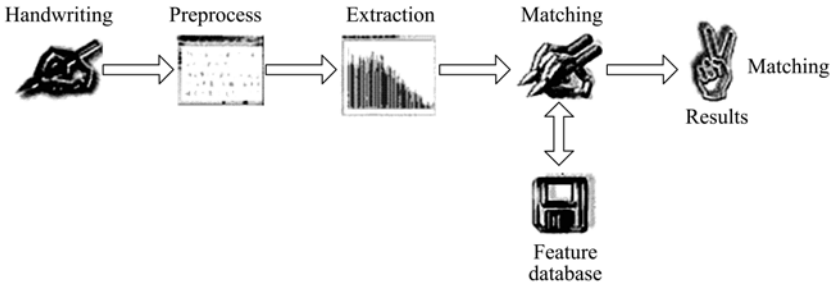

Figure 4.6 Flow chart of online verification system

8. Voice Authentication

Voice Authentication is also a kind of behavior Authentication technology. Like other technology of this kind, the variation of voice is broad, and it is subject to the influence of background noises and the physical and mental status. A voice Authentication system usually consists of three parts: the partition of voice signal, pattern extraction and speaker Authentication. The partition of voice signal is to separate the important vocal part from the signal; pattern extraction is to extract the vocal features of the person to be verified; speaker Authentication is to make a decision based on the comparison between the stored vocal features in the database and the extracted patterns.

The biological Authentication system stores the biological features and behavioral features of the users, and uses these features to replace password input. When the user's features match those stored in the system, the user is verified and given the access to the system.

9. Comparison of biological Authentication technology

Each biological verification technology has its own advantages and disadvantages. The selection of a certain technology mainly depends on the application; none of these technology can surpass other technology in all respects. In this sense, any one of these technology is worth using. The security degree is dependent on the accuracy of these biological features. In practice these technology are usually used jointly rather than separately.

4.6 Firewall Technology

4.6.1 Introduction to Firewall

The firewall builds a screen between an intranet and the Internet, in order to protect the information in the intranet from intrusions of illegal users. It controls

all data flow between the intranet and the Internet so as to control and prevent important data on the intranet from flowing into the Internet, and harmful data on the Internet from flowing into intranet. In the connection with Internet, the firewall is an important technology to protect the intranet and keep its information system safe and secret.

Firewall is a security system built between special networks like the intranet and the Internet, and it can provide access control and interfere with the transmission of information between two networks. It can decide on whether a data group or a link can pass through it.

Secure e-mail protects the communication between two intranet users and secure Web protects the data transmission and exchange between two Web users. But neither of the two ways can protect other resources on the intranet. The firewall ensures that only authorized users can have access to intranet so that the resources and important data will not be let out.

The connection of an intranet and the Internet may pose several threats:

(1) Information may be stolen and damaged.

(2) Resources may be abused or corrupted.

(3) The enterprise reputation may be undermined because of insecure intranet.

Even in the same department, different units should be separated as well for different purposes, which have to be handled with the firewall.

4.6.2 Functions of the Firewall

The firewall has the following functions:

(1) To protect the integrity of data. Access to sensitive information is controlled by setting the user authorities and file protection.

(2) To protect the effectiveness of the network. Effectiveness means a legal user can access the network easily.

(3) To protect the secrecy of the data and encrypt the sensitive data.

The firewall can provide a central controller for the security decisions; all information, both inbound and outbound, has to go through this unique checkpoint. Actually, it plays a role of a traffic cop in response to different needs of the user. It can keep logs of the users' operations, analyze the intrusions and attacks to the network for timely warning, and protect sensitive resources and personal information. However, there are also some weak points with the firewall. It cannot resist threats posed by malicious insiders and careless users, and it cannot prevent the virus caused due to the transmission of infected software or files, either. It cannot prevent data-driven attacks, which seem harmless in appearance but are launched once the data is mailed or copied to the host on the Internet.

1. Defending function

(1) It supports virus scan, for example, scanning DOC and ZIP documents and

discovering dangerous information contained in documents downloaded from or uploaded to FTP.

(2) Content filtering: Content filtering means controlling the information flowing at the protocol layer of HTTP, FTP, and SMTP according to the filtering settings. The possible results are: access granted, access granted after modification, access denied, log recorded and alarming. The filtered information mainly refers to the information carried by URL and HTTP, such as Java Applet, JavaScript, ActiveX and Subject, to, and from domains of the e-mail.

(3) Protection against DoS attack: DoS (Denial of Service) means that the attacker occupies shared resource excessively, which yields to the depletion of the system resource. The firewall can prevent such attacks to a certain degree with testing and alarming mechanisms.

(4) Preventing the intrusion of ActiveX, Java Cookies and Javascript: The firewall can extract Java Applet and ActiveX from http pages, identify dangerous code or virus in Script, PHP and ASP, and alarm the user. When dangerous codes are detected in the CGI and ASP uploaded by the user, the server is also alarmed.

2. Security characteristic

(1) To support ICMP.

(2) Real-time intrusion alarming.

(3) Real-time intrusion protection.

(4) To identify/record/prevent IP address fraud.

3. Management function

(1) To manage multiple firewalls with integrated strategy: firewall management means that the administrator exercises the management over the operation state of firewall. The management involves administrator's identity authentication, security rule compilation, and security parameter configuration. Firewall management is grouped into three kinds: local management, remote management and central management.

(2) To support time-based access control.

(3) To support SNMP supervision and configuration.

(4) Local management: it means that the administrator exercises configuration and management through console or the keyboard and monitor.

(5) Remote management: it refers to the management by administrator through WAN interface or Ethernet interface, which is based on FTP, Telnet, or Http.

(6) To support bandwidth management: the firewall should regulate the bandwidth based on the dynamic flow.

(7) Load balancing: load balance, which can be regarded as dynamic port mapping, maps a certain TCP or UDP port of an external address to a certain port of a group of internal address. It is mainly used to balance the load when a certain service like HTTP is apportioned to a group of internal servers.

(8) Failover: support fault-tolerant technology, such as computer hot standby, failure recovery.

4. Record and report

(1) To process the complete log: the firewall prescribes the way to manage and store the logs.

(2) To support automatic log scan: the firewall should have automatic functions to analyze and scan the logs, which will provide more detailed statistical results.

(3) To provide automatic report and log generator.

(4) Alarming mechanism: the firewall should be capable of giving the alarms when network intrusion or abnormal operation is detected.

(5) To provide brief reports according to user ID or IP address: the firewall should be capable of supporting classified print tasks.

(6) To provide real-time statistics: the firewall should be capable of analyzing the log and displaying the analysis result with tables and graphs.

(7) To list licenses and their serial number, which are the key factor of quality and sale of firewall, include selling license issued by the Ministry of Public Security, the certificate issued by China Information Technology Security Certification Center, and so on.

4.6.3 Categories of Firewall

The firewall can be roughly classified into two categories: packet filtering and application proxy.

(1) Packet filtering: it works on the network layer and transmission layer, and it determines the passage of data according to the packet source address, destination address, port number, and protocol category. Only those data packages that satisfy filtering logic are forwarded to the destination, and others are discarded.

(2) Application proxy: it is also called application gateway. Working at the application layer, it completely "blocks" the communication flow of the network. The communication flow at the application layer is monitored and controlled by means of compiling special agents for application services. Application gateways are actually implemented with special workstations.

1. Packet filtering firewall

Packet filtering is a universal, low-cost and effective security means. It is universal because no special processing will be taken with respect to every network service; it is low-cost because most routers have packet-filtering function; it is effective because it satisfies the security requirements of enterprises to the greatest extent.

Packet filtering works at the network layer and transmission layer. It determines the passage of packets according to the source and destination addresses, port

number and protocol category. The information it relies on comes from the header of IP, TCP or UDP.

The advantage of packet filtering is that there is no need to modify the application programs on the client and host in that it works at the network layer and transmission layer. But the weak points are also obvious: the information it relies on from network layer and transmission layer cannot meet all requirements sufficiently; the number of filtering rules is finite, and the performance is thus affected as the number of rules increases; because of the lack of context linkage information, UDP and RPC protocols cannot be effectively filtered. What's more, most filters are lacking in audit and alarm mechanisms, and undesirable managerial way and user interface pose high requirements for the security administrator, who has to rely on his deep understanding of protocols and roles of different applications to establish security rules. Thus the filter is usually used with the gateway to constitute the firewall system.

2. Application proxy firewall

Application proxy firewall is the separation point of internal network and external network monitoring and separating the communication flow at the application layer, as illustrated in Fig. 4.7. It is working in the highest layer of the OSI model, with all the information concerning the system security controlled.

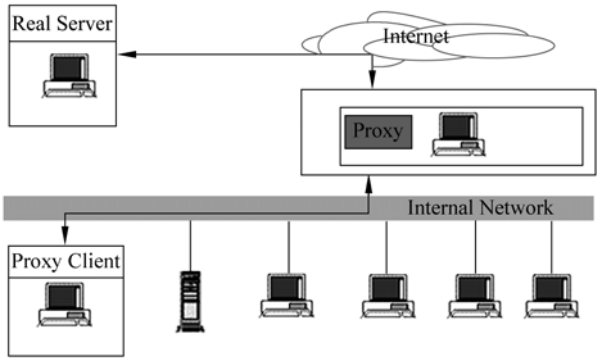

Figure 4.7 Application proxy firewalls

3. Hybrid firewall

The two methods mentioned above are usually combined to constitute the hybrid firewall. This combination is usually implemented in two ways.

(1) Host-screened firewall structure: in this structure, the packet filtering router or the firewall is connected with the Internet; meanwhile a bastion host is installed in the intranet. And filtering rules of the packet filtering router or firewall are set to make the bastion host a unique node that can be reached by other nodes on the Internet, which ensures that the intranet will not be attacked

by unauthorized users.

(2) Subnet-screened firewall structure: the bastion host is placed in a subnet to form a non-militarized zone, with two packet filtering routers placed at the two ends of this subnet, which separates this subnet from the Internet and intranet. In this architecture, the bastion host and the packet filtering router constitute the foundation of the firewall.

4.7 Intrusion Detection Technology

4.7.1 Introduction to Intrusion Detection

The governments, banks and big enterprises usually have their own intranets. As is shown by these networks, their administrative structure is pyramidical, but the network administration is planar. It has become a serious problem that the internal system of the enterprise is intruded, wrecked so as to let out important information. Statistical data indicates that more than 80% of intrusions come from the intranet. On the other hand, abuse of the network resources can also cause great loss to enterprises.

The concept of intrusion: the system is exposed to intrusion when:

(1) Illegal user accesses to the system.

(2) Legal user accesses to unauthorized information or executes unauthorized operations.

It has become an important research subject to detect and prevent intrusion to guarantee the security of the computer system, network system and the whole information infrastructure. Intrusion detection is one of core technologies of security audit as well as an important part of network security maintenance.

Intrusion detection is a technology developed to report unauthorized operations or other abnormal phenomena in the system. It is used to detect insecure operations in the network. Insecure operations include: intrusion-unauthorized operations of illegal users; abuse-unauthorized operations of legal users.

With the audit records, intrusion detection system can detect any unauthorized activities so as to ensure system security. The application of intrusion detection system can detect any attacks before the attack takes effect. When intrusion is detected, alarms will be given and protection system will be initiated to remove the intrusion. After the intrusion is removed, the system can gather information concerning the attacks and add the information to the knowledge base of the system, which will enhance the ability of the system against the attacks.

After several years' development, intrusion detection products began to enter into a fast growing period. An intrusion detection product usually includes two parts: the sensor and the console. The sensor gathers data, such as packets and system logs, and analyzes these data. The console plays a role of central management.

Commercialized products usually provide GUI console, most of which support the Windows NT platform.

Technically, these products are classified into several categories: network-based products and host-based products. A hybrid intrusion detection system can offset the one-sidedness of the network- and host-based products. Besides, the tool to check the integrity of documents can also be regarded as a kind of intrusion detection product.

Network-based products are placed in the comparatively important section of network, supervising various data packets, and analyzing each suspicious packet. If the data packet matches the built-in rules of the product, the intrusion detection system will give the alarm or cut off the connection directly. Currently most products are network-based. Among these products, there are several well-known open-source products, such as Snort, NFR, Shadow, etc.

Advantages of network-based intrusion detection system:

(1) Network based intrusion detection system is capable of detecting the attacks from the Internet, as well as illegal access.

(2) A network-based intrusion detection system does not need to change the setting of the hosts. Since it does not require the installation of additional software to the host, it will not affect the performance if the host takes up its recourses such as CPU, I/O, and hard disk.

(3) Unlike the router, firewall and other key devices, the network-based detection system will not become the critical path of the system. So the failure of the detection system will not affect normal operation. It is less risky to set up a network-based intrusion detection system than a host-based one.

(4) The network-based detection system has manifested a trend of becoming specialized equipment. Now it is simple and convenient to install a network-based detection system. All that is needed is to connect to the network with necessary setting made.

The weakness of the detection system:

(1) Network based system can only checks the network segment which directly connects with. And it has the monitoring limitation when using the switched Ethernet. If more sensors of network-based intrusion detection system are installed, the cost of the system will greatly increase.

(2) Network based system usually employs feature testing for the sake of high performance, which is able to detect normal attacks, but unable to realize large amount of computation and analysis.

(3) Network-based system may return tremendous data to the analysis system, which will generate huge analytical data flow. Some systems use certain method to reduce the back flow of data by making sensors decide on the intrusion, which consequently weakens the cooperative competence between sensors.

(4) It is more difficult for a network-based system to process encrypted session. As IPv6 is more popularly used, this problem will become more prominent.

Host-based intrusion detection products are usually installed on hosts to be

monitored, analyzing the system logs and the real-time connection. If the host activities are very suspicious, the detection system will take corresponding measures.

The advantages of host intrusion detection system:

(1) Host-based system is particularly effective to "possible attacks". For example, it can specify the activities of the intruders: what program they have run, what files they have opened, what system call they have used. Host-based system can usually provide more detailed information than network-based system.

(2) As far as the rate of false report is concerned, the host-based system is usually lower than the network based system, since it is easier to check the command sequence than to check network flow.

(3) The host-based detection system can be installed where the bandwidth between the sensor and the console is not sufficient and the extensive intrusion detection is not required.

Weakness of host based detection system:

(1) Host-based system is installed on the equipment we want to protect. For example, if a database server needs protection, the intrusion detection system should be installed on the server itself, which will reduce the efficiency of the system. Moreover, it will bring extra problems in that the installation of host-based intrusion detection system enables the security administrator to access to the server.

(2) Another problem with the host-based detection system is that it relies on the server's logs and capacity of monitoring. If the server does not have the log function, it should be re-configured, which may bring unpredicted impact to the performance of the host.

(3) It costs much to configure the host-based intrusion detection system for the whole enterprise; so only part of the hosts can be protected with this kind of system. Thus those hosts that are not protected may become the target of the attacking.

(4) The host-based detection system monitors the host alone, and provides no monitoring for the network. The workload of analyzing the intrusion will increase with the number of hosts.

4.7.2 Intrusion Detection Method

1. Technical classification

Intrusion detection system can be classified technically into two categories.

(1) Signature-based detection: also called Misuse detection, this method assumes that the attacker can be represented as a pattern. And the aim of the system is to detect if the activities match the patterns. It can detect any existing attack pattern, but it cannot deal with new attack patterns. The difficulty with this method is

how to design the patterns that can represent the intrusion phenomena without containing normal activities.

(2) Anomaly detection: It assumes that intrusion is different from normal activities. Based on this assumption, an "activity record" is established. And the current activity is compared with the "activity record"; when violating the statistical laws, the activity is considered as an attack. The difficulty with this method is how to establish the "activity record" and how to design the statistical methods so as not to subsume the normal operations to "intrusion" or neglect the true "intrusion".

2. Commonly used detection methods

Commonly used detection methods include signature detection, statistical detection and expert system detection. According to the report from the Ministry of Public Security, 95% of intrusion detection products belong to signature detection products; other 5% belong to statistical detection and expert detection products.

(1) Signature detection: Signature detection makes accurate description of the known attacks and intrusion to form event models. When the current event being audited match the known event, the alarm is triggered. The working principle of this method is the same with the expert system. And its detection method is similar with that of virus detection. Currently the model match based on packet features is widely used. Although this method is high in terms of the rate of correct forecast, it becomes powerless in the presence of unknown intrusion and attacks.

(2) Statistical detection: Statistical model usually uses anomaly detection. In the statistical model the commonly used parameters include: the number of audit events, interval of time and consumption of resources, etc. The largest advantage of statistical detection is that it can "learn" from the habit of a user so that it has a higher detectable rate and usability. However, its "learning" ability provides intruders with the chance to gradually "get trained" so that the intruding events are made adaptable to the statistical patterns of normal operations. There are five commonly used statistical models for intrusion detection:

① Operation model. This model assumes that anomalies can be obtained by comparing the measured results and some definite indexes. Those indexes can be obtained by computing the statistical average in a period of time. For example, trying to login in a short time may probably be a kind of attack.

② Variance. The variance of the parameters is computed to set the confidence interval; when the measured value exceeds the confidence interval, it might be an anomaly.

③ Multivariate model. It is an extension of operation model, which accomplishes detection operation by analyzing multiple parameters at the same time.

④ Markov process model. Each type of events is defined as a system state; the state-transition matrix is used to represent the change of the state. When an event happens or when the probability of state-transition matrix is small, it may be an anomaly.

⑤ Time sequence analysis, the event count and the resource consumption are arranged in terms of time into a sequence; if the probability of a new event happening within this time sequence is very small, it may be an attack.

(3) Expert System: The expert system usually focuses on featured intrusion. So-called rules are knowledge. And different systems and settings have different rules, and the rules are not universal. The expert system relies heavily on the integrity of the knowledge base, which, in turn, relies on the integrity of the real-time audit records. The extraction and the representation of intrusion pattern are the key to expert system. In the implementation of the system, the knowledge of intrusion will be converted into if-then structure, where if-part indicates the features of intrusion while then-part signifies the countermeasures taken by the system. The effectiveness of expert system pivots on the integrity of expert knowledge base.

The intrusion technology has changed a lot in terms of scale and methods. The means and technology of intrusion have achieved progress as well. The evolution of intrusion technology is represented in the following aspects.

Integration and complication of intrusion or attack: The intruder often adopts multiple attack means to ensure the success of intrusion.

Indirectness of intruder: that is both the intruder and the attack objects are hidden. His source address and host location are hidden in the process of intrusion and attack.

Expansion of scale of intrusion or attack: The intrusion and attack against network was originally aimed at some company or website out of curiosity or commercial purposes. Now since war is more and more dependent on electronic technology and network technology, intrusion or attack related to war will surely climb up in terms of scale.

Distribution of intrusion or attack technology: The intrusion and attack are often launched by a single computer, and this kind of intrusion is rendered powerless with the development of preventive technology. But distributed denial of service (DDoS) can make the host breakdown in a very short time, which can be easily detected at the initial stage.

Shift of attack target: The network is usually the target of attack in the past, but recently the target is shifted to the protective system of network. The attacker makes a detailed analysis of the audit mode of IDS, feature description, communication mode to find out the weak points and then launch attacks.

4.8 Secure Payment Technology

4.8.1 SSL Protocol

The SSL (Secure Sockets Layer) protocol was initially developed by Netscape

Communication, and primarily used to enhance the security of data between application programs. The concept of SSL protocol can be summarized as a protocol that ensures the transaction security of any client/server, which is related with all TCP/IP applications.

SSL protocol primarily provides three aspects of services:

(1) Authenticating user and server, which guarantees that the data can be sent to the correct client and server.

(2) Encrypting data to hide the transmitted data.

(3) Maintaining the integrity of data to ensure that data are not modified in the process of transmission.

The operational procedure of SSL protocol includes six steps:

(1) Connection. The client notifies the service provider via network, and the service provider responds.

(2) Password exchange. The client and service provider exchange their authorized password, and RSA is usually employed. Some may choose Diffie-Hellman and Fortezza-KEA.

(3) Session password negotiated. The client and the service provider negotiate about the session password.

(4) Verification. The password obtained by the service provider is verified.

(5) Client authentication. The credibility of the client is verified.

(6) End. The client and server exchange the ending information.

When the actions above are ended, the information being sent will be encrypted and restored after it is received at the other end. Even if the attacker obtains encrypted message, he will not be able to know any information without the pre-compiled encryption algorithm.

SSL protocol is divided into two layers: SSL handshake protocol and SSL record protocol. The relation between SSL protocol and TCP/IP is illustrated in Fig. 4.8.

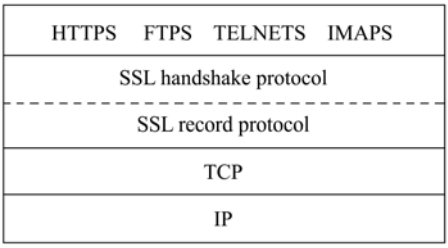

Figure 4.8 The relation between SSL and TCP/IP

SSL handshake protocol is used to establish the secure communication channel between both sides, and the functions it realizes are: (1) Authenticate the server at the client terminal, and SSL protocol uses public key system to authenticate the identity. (2) Authenticate the client at the server terminal (optional). (3) Both client and server negotiate the encryption algorithm and one-way Hash algorithm

that both sides support; the encryption algorithms available include IDEA, RC4, DES, 3DES, RSA, DSA, Diffie-hellman, MD5, and SHA. (4) Generate the session key for symmetric encryption. (5) Establish SSL connection. A typical handshake process is illustrated in Fig. 4.9.

Figure 4.9 Handshake process of SSL protocol

The handshake process is divided into four steps:

(1) Initialize logical connection. The client sends the "Client Hello" message, and the server responds with a "server hello" message; the two messages are used to test the security capability of both sides, including protocol version, random parameter, session ID, exchange key algorithm, symmetric encryption algorithm and one-way Hash algorithm.

(2) The server should send the server certificate (including the public key of the server) and the session key; if the server requests to authenticate the client, it should send a "CertificateRequest" message. Finally the server sends a "ServerHelloDone" message indicating the end of hello, and waits for the response from the client.

(3) If the server requests to authenticate the client, the client should send the "Certificate" message first, and then generate the session key, and encrypt it with the server's public key and encapsulate it into ClientKeyExchange; if the client sends his certificate, he has to send Certificate authenticate to authenticate the certificate as well.

(4) The client sends a "ChangeCipherSpec" message, notifying the server to encrypt the future messages with the agreed security parameter, and then sends an encrypted "Finished" message. After the server receives these two messages, it sends its own "ChangeCipherSpec" message and "Finished" message. Till now

the handshake process is complete, and data can be transmitted between both sides.

SSL establishes appropriate session state information, as illustrated in Table 4.1.

Table 4.1 Session state of SSL protocol

Session state information	Description
Session identification	A dialogue mark selected by a server to signify an active and restarted dialogue
Peer certificate	X509 certificate of peer entity
Hash algorithm	Data hashing algorithm that is used
Encryption specification	Data encryption algorithm and MAC algorithm that are used
Session key	Session key shared by terminals and server
Able to restart	Signify whether the dialogue can be used to initialize the new mark

The data received by SSL record protocol will be sectioned, hashed and encrypted, and then transmitted through the transmission layer. In the SSL protocol, all data are encapsulated into the record, and SSL record protocol prescribes the record header and the data format.

Each SSL record contains the following information: (1) Content type: SSL high-level protocol. (2) Protocol version: there are 2.0 and 3.0 versions at present. (3) Length: the length of recorded data, and the maximum length is 16,383 bytes. (4) Effective load of data: it is the result of processing data with Hash method and encryption. (5) MAC: MAC is computed before the encryption of effective data and placed into the SSL record to check the integrity of the data. If MD5 algorithm is used, the data length of MAC is 16 bytes. SSL record protocol uses the revised version of HMAC in RFC2104, and places a serial number into the message before HASH function works in order to resist the re-send attacks in various forms. The serial number is a 32-digit incremental counter.

In the process of e-commerce transactions, because of the involvement of banks, the purchase information is first sent to the vendor, and then forwarded by the vendor to the bank; after the bank verifies the validity of the information, it notifies the vender of the success of payment, and then the vendor sends the commodity to the client.

SSL is the earliest protocol that is applied to e-commerce. SSL improves the principle of mail purchase. In the traditional mail orders, the client first searches for commodity information and remits money to the vendor, who then sends the commodity to the client. Here the vendor is credible, so the client should pay first. In the initial stage of e-commerce, the vendor is also worried about the fact that the client will not pay after purchase or use overdue credit card. So the bank verification is required. SSL security protocol comes out in such a context.

The foundation of SSL is the vendor's commitment to keep the client's information confidential. But we also notice that SSL is beneficial to the vendor

rather than the customer. The customer's information is indispensable, but the whole process is lacking in the authentication of the vendor. In the initial phase of e-commerce, the vendors are usually big companies with high reputation; however, now it is not the case any more. And the authentication of vendors is becoming more and more imperative. SSL will be replaced by new protocols gradually.

4.8.2 SET Protocol

To overcome the weak points of SSL, Visa and Master-Card jointly develop the SET protocol. This is an e-payment standard based on e-currency. Besides authentication of customer's credit card, SET involves the authentication of the vendor's identity, which is pivotally important to transactions involving payment. Rationally designed, SET has already been supported by big companies such as IBM, HP, Microsoft, Netscape, VeriFone, GTE and VeriSign, and has become the actual industrial standard.

Secure e-transaction is based on the Internet. It uses RSA public key system to authenticate the parties of communication, and DES, RC4 or other symmetric encryption methods to encrypt the transmission, and uses HASH algorithm to identify the truth of the message. In SET system, there is a key organization, Certification Authority (CA), which issues and manages certificates according to X.509.

The aim of SET has five points:

(1) To ensure the secure transmission of information on the Internet, and prevent the data from being eavesdroped.

(2) To ensure the separation between the participators of e-commerce. The customer's information is encapsulated or encrypted and sent to the bank, but the vender cannot see the account or password of the customer.

(3) To solve the mutual authentication problem.

(4) To ensure real-time transaction, all the process is online.

(5) To simulate EDI and regulate the format of messages, promote compatibility of the software developed by different manufacturers.

The participants involved in the SET protocol include:

(1) Customer. Customers fill the order forms of online stores and choose a credit card to pay.

(2) On-line store. On-line stores provide commodities or services and are capable of accepting e-money.

(3) Bank. The bank processes the payment issue of online purchase via payment gateway.

(4) E-currency issuer. E-currency issuing company and the banks that issue e-currency take charge of processing the authentication of intelligent card and payment.

(5) Certification authority. Certification authority takes charge of authenticating the identities of both parties, including the credibility of the vendor and the payment means of the customer.

The technical range of SET includes:

(1) Application of encryption algorithms (such as RSA and DES).

(2) Certificate information and format object.

(3) Purchase information and format object.

(4) Confirmation information and format object.

(5) Transfer information and format object.

(6) Message transmission protocol between session entities.

The data encryption model of SET is illustrated in Fig. 4.10.

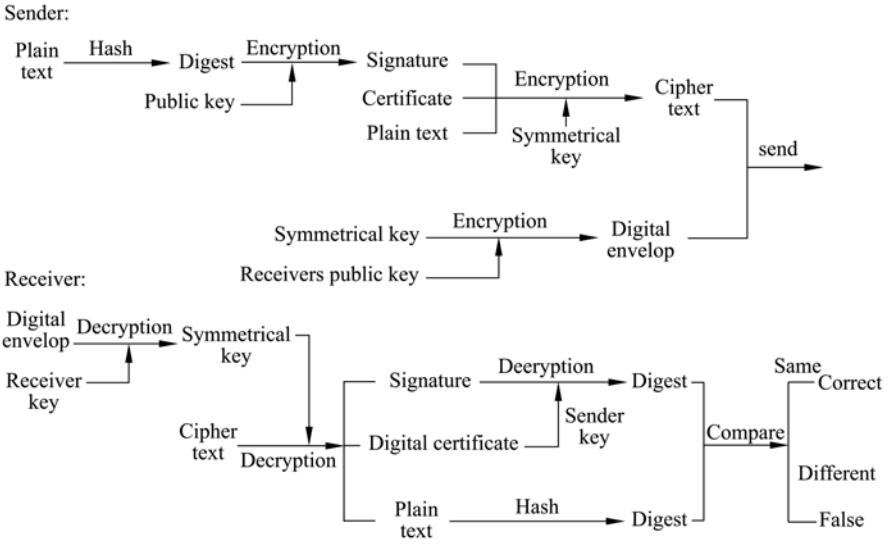

Figure 4.10 Data encryption model used by SET protocol

This model has the following features:

(1) The authentication of Participants' identities is done with digital certificate, format of which adopts the X.509 standard.

(2) The non-repudiation is implemented with digital signature.

(3) The integrity of the data is guaranteed with message digest algorithm.

(4) Since the speed of asymmetric encryption algorithm is very slow, it has to be combined with the symmetric encryption algorithm, which is used to encrypt data; and the symmetric key is exchanged with the digital envelope.

The SET online purchase system is constituted of five parts: card holder, vendor, payment gateway, receiving bank, and the issuing bank. The data exchange process between the five parts is illustrated in Fig. 4.11.

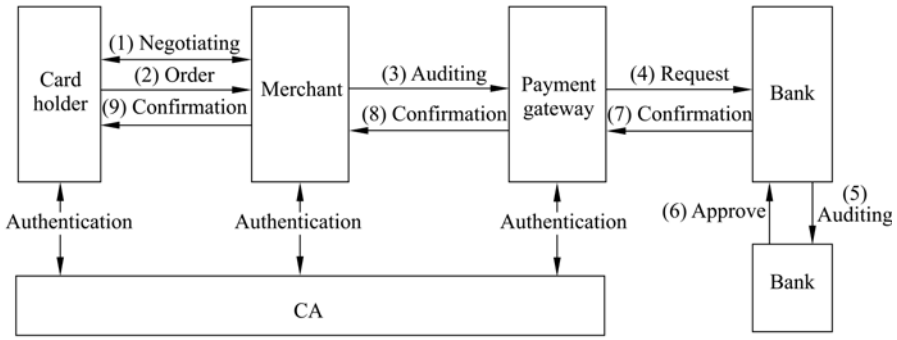

Figure 4.11 Data interchange process of SET protocol

According to the working procedure of SET, it can be divided into seven steps:

(1) The client uses a PC to select the commodity he wants to buy, and fill in the order form on the computer. The order form should include the name of the online store, the name and amount of commodities, and the time and place of delivery.

(2) The customer contacts the online store via the e-commerce server, and the store responds to the customer if all the information is correct.

(3) The customer selects the way of payment, confirms the order and issues payment command. Now SET begins to get involved.

(4) In SET the customer has to put digital signature on the order form and the payment command, and makes full use of dual signature technology to ensure that the vendor cannot see the account information of the customer.

(5) After the online store receives the order form, it will request the user's bank for the payment permit. The information will be sent to the bank via the payment gateway and then confirmed by the e-currency issuing company. Once the transaction is confirmed, the confirmation information will be returned to the store.

(6) The online store sends the information of the order form to the customer. The software at the customer terminal will record the transaction log for future query.

(7) The online store sends the commodity or provides the services, and notifies the receiving bank to make transfer from the customer's account to the store's account, or notifies the issuing bank to pay the bill.

There is usually an interval of time between the verification and payment.

The first two steps have nothing to do with SET, and SET begins to play its role from the third step until the seventh step. In the process, SET has definite prescriptions about the communication protocols and data format. In each step, each party verifies the identity of the communication subject via CA. Simply speaking, therefore, SET gives full play to the role of Certification Authority to ensure the authenticity and secrecy of information.

Ever since the birth of SET in April 1996, it has received support from the industry for its satisfying performance. However, there are also some problems:

(1) The protocol does not specify if the bank has to receive the receipt of the commodity from the customer before it pays the purchase. Otherwise, if the commodity is not up to standard and the customer raise their dissents, who should assume the liability?

(2) SET does not specify how to process the security data after the transaction is completed. This might expose these data to potential attacks in the future.

The limitation of SET has stimulated people to make improvement. China Commodity Trade Center, Bank of China and Shanghai Long-Distance Telecom have put forth their own design schemas.

4.9 Summary

Security is the key element that ensures the development of e-commerce. Although the Internet has its weakness in security, almost all layers of the network have formed security protocols. The security of network is the foundation of e-commerce, and the commonly used technologies include firewall, VPN and anti-virus. The firewall technology protects data in the Intranet with IP filtering and proxy. VPN ensures the security of data between enterprises in the Extranet and access to central system by using IP tunnel technology. Relying on any one of these measures alone is not sufficient. Other security measures should also be taken to provide the users with reliable e-commerce services such as encryption, digital signature, and verification technology and intrusion detection.

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Part 3 Management

5 E-commerce and the Law

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Abstract Dispute seems to be inevitable in commerce process, and the dispute, if any, must be justified by laws and rules. Commercial process must be guaranteed by relevant laws, so is the e-commerce which is just the computerization of traditional business. The disputes that we may encounter during e-commerce process may be very different from that we meet during traditional business process, though some of them may be very similar. So e-commerce needs its specific laws that can settle the disputes arising in e-commerce process. This chapter studies the problems that may arise during e-commerce transaction and possible solutions of them. These issues should be paid more attentions from related departments. Finally, the *Electronic Signature Law of the People's Republic of China* will be briefly introduced.

Key Words e-commerce, law, domain name, intellectual property, copyright, consumers' rights and interests, civil liability, criminal liability.

E-commerce is a kind of business activities that may involve a lot of legal problems. Compared with the legal problems arising in the traditional business activities, these problems to be dealt with in this chapter have their uniqueness. These legal problems cover some areas, such as e-contracts, e-transactions, e-payment and the e-commerce security or intellectual property in e-commerce, consumer rights protection and legal liability involved. Among these problems some have not been paid sufficient attention to while some have already been provided with initial solutions. The Electronic Signature Law of the People's Republic of China has solved some fundamental legal problems in e-commerce, and it will be briefly introduced in the last part of this chapter.

5.1 Legal Problems in E-contract

E-commerce transactions include business activities among enterprises, sales of online businesses and digital processing of financial enterprises. Originally e-commerce transactions are in the form of electronic data interchange (EDI), which now, with the development of science and technology, has got rid of the old expensive network that are limited among companies, and is becoming a part of the Internet. In the new knowledge-based economy era, it has been the tide doing business by means of computer and computer communication network. Accordingly, e-contracts, an important tool and offspring of e-commerce have come into being. E-contract is an agreement that are negotiated through EDI value added net and clarifies the right and obligation of the parties. Sometimes they are also called "paperless contracts", as distinct from traditional contracts. As provided for in Article 11 of the Contract Law of the PRC, the written forms of a contract may be electronic data messages, including such forms as electronic data exchange and e-mail. This new form of contracts, with its own legal characteristics, is quite different from the traditional contracts. However, faced with the traditional legal requirements for signature, seal and written forms in both domestic and international trade, e-contracts are still confronted with rigorous tests in many aspects.

Besides the common features of the traditional contracts, e-contracts, as a brand-new form of contracts, have the following uniqueness: the offer and acceptance of contracts are made and the transfer of the contracts are carried out through computer networks; no written forms are involved in the formation, alteration and cancellation of contracts; no traditional signature is required in the formation of the contracts.

1. True intentions

Laws in all nations require contracts reflect the true intentions of all the parties. The true intentions are one of the important conditions of the effectiveness of a contract. In case there is any misrepresentation or material misunderstanding of the parties' intentions, the contract will possibly be cancelled as invalid. In terms of e-contracts, one of their important features is that the contracts are signed without direct interference from human factors. The decision-making process is automatic, which may add two possibilities: because of the lack of direct control of the machine, the machine might send a contract signing information that does not reflect the true intention of the machine owner; the mistake may exist until the wrong contract with misrepresented intention is executed. This sort of mistake might cause severe results than that in the traditional way. Now some countries and international organizations are seeking ways to solve this new legal problem.

2. The offer and acceptance in e-contracts

In the traditional commercial mode the offer can be withdrawn at any time, as

long as the communication means of withdrawing the offer is faster than that of sending the offer before the offer is accepted. For example, if the offer is sent by ordinary mail, the notification of withdrawing the offer should be sent via express letters, telegrams or telex. In contrast, it is a problem worth investigating whether the offer in e-commerce can be withdrawn. Since the information transfer in e-commerce is fairly fast, and the computer system of the offered will automatically process the transaction upon receiving the offer or electronic orders and send acceptance data message, it will be very difficult to withdraw the offer. So far no special regulations have been formulated in laws of any country concerning e-commerce.

3. The entry-in-force of the acceptance in e-contracts

Acceptance is a manifestation of intent by the offered that is willing to be bound by the conditions in the offer and agrees to conclude the contract. It means that the parties agree with the contract. It is an important issue concerning when the acceptance becomes effective, since, according to laws of all countries, the contract becomes valid as of the acceptance taking effective, and both parties of the contract shall be bound by the contract and undertake all the rights and responsibilities arising thereof. The venue of concluding the contract is of great importance for determining the applicable common practice, the court of jurisdiction in case of litigation and the applicable international private law. Corresponding international commercial laws prescribe that a contract takes effect at the time when the acceptance mail is putted into a postbox near the business location of the acceptance party, and the taking effect place is where the acceptance mail is putted into the mailbox.

The conclusion of e-contracts is completed among the computer systems in different locations. To e-contract, it is hard to apply the principle of taking effect in places of sending the acceptance letters, because the message of e-commerce can be sent at any locations. If the principle is applied, it will render great uncertainty to the locations where the contracts take effect. Comparatively, it is more suitable to follow the principle that a electronic contract takes effect when it is received by the recipient, because it is very easy to determine the place where the recipient receive the acceptance and thus facilitates the place where the contract takes effect.

An offer becomes effective when it reaches the offeree, and a contract is concluded at the moment when an acceptance of an offer becomes effective. An acceptance becomes effect when the recipient retrieves the acceptance. This rules the certainty of the time when a contract becomes effect. Both the time when an acceptance entered into the recipient's information system and the time when the recipient retrieved the acceptance have record in corresponding computer information system. These two times have objectivity, certainty and provability. They can be used to determine the time when a contract becomes effect.

4. The signature

It is provided in the laws of many countries that the transaction certificates have

to be signed to take effect. However, it is difficult to sign in person on an electronic document or certificate of e-commerce. To get over this legal obstacle, jurists and electronic experts from all countries have made active explorations and through their efforts the electronic signature comes into being. Since signature on a document is used to prove the authenticity of the document and the basic requirement for signature is to be unique, it is not necessary that the signatory signed his own name in person. Instead, some unique characters can be used for signature and the electronic signature has this function. With the official execution of The Electronic Signature Law of our country this problem has basically been solved.

The agreements between two parties in the e-transactions have generally no written forms or signatures. Concerning the problem of signature, it is provided in Article 7 of the Model Law on Electronic Commerce as follows: Where the law requires a signature of one person, requirement is met in relation to a data message if: a) a method is used to identify that person and to indicate that person's approval of the information contained in the data message; and b) that method is as reliable as was appropriate for the purpose for which the data message was generated or communicated, in the light of all the circumstances, including any relevant agreement.

5. Paperwork problem

In many countries it is provided legally that certificates should be in written forms to prove the validity of the transaction, or else the contracts will be deemed as invalid. Yet in trade activities by means of e-commerce, what goes on between enterprises is the electronic data interchange. The principal articles interchanged are displayed on the computer screen, without any written forms in the traditional sense. Whether the electronic data can be deemed as documents in written forms and thus acquire the equal effect as other written documents, it is a pending legal question in all countries and has become a great barrier to the expansion of e-commerce.

The United Nations Commission on International Trade Law considers through long-term research that with the development of the electronic certificates between computers, the original intent to have both certificates and other records as required by law can be realized through setting up the same method as computer recording. Thus the foundation is laid that the electronic message in e-commerce is the same as other documents in writing in terms of function, in other words, anything with the function of written forms can be regarded as in written forms, no matter it is paper data or electronic data.

6. The evidence effect of e-commerce documents

Electronic documents are displayed on the computer screen after retrieving the information recorded in the disk. These documents exist in hard disks or magnetic media. Their essence is a series of electronic information, which has gone beyond the definition of traditional documents by law. Compared with traditional

paper documents, electronic documents are unstable to a certain degree in that any external interference on the network will lead to the loss, damage and modification of their information.

Now new security technologies have been developed that make electronic documents undeletable and unchangeable with the growth of computer technologies, so the counterfeit of electronic documents with magnetic media as a carrier is even more difficult than that of paper documents. Therefore, it is safely to say that electronic documents are easier to be reserved and replicated than paper documents.

7. Proof of computer records

There are generally three kinds of evidence regulations in terms of the proof standards: First, all relevant evidence can be freely provided; second, the list of admissible evidence is provided, in which the written certificates are always included as an admissible evidence; third, restrictions are imposed on the admissibility of hearsay evidence in common law countries. As it is difficult to prove the truthfulness of computer records, they are prone to be considered as hear-say evidence in the process of proof. To solve this problem, special terms and standards have been made in most countries to determine whether the computer data can be admitted as evidence for concrete facts in particular cases according to whether it is credible enough.

8. The admissibility of evidence in e-commerce

The admissibility of evidence in e-commerce means whether the records in e-commerce are admissible as legal evidence. It is not difficult to prove the correlation between the evidence and the relevant case under the circumstance of e-commerce, but may be hard to prove the reliability of the evidence. Reliability is concerned with two questions, one being the reliability of the electronic information, the other being that of the electronic information record.

Generally speaking, at least the following steps should be taken to guarantee the reliability of electronic real evidence: (1) Acknowledging the receipt of information to the other party and requesting its confirmation that the information which has been sent is true. (2) Confirming that the e-commerce communication system is reliable. It is generally agreed that the value-added network has been reliable.

9. The submission of originals

In many countries the evidence law requires that the original copy is submitted, which was an obstacle for the expansion of e-commerce. In e-commerce the electronic information is transmitted through computers and all the electronic data is recorded in computers, so it is difficult to tell which the original is. If the evidence law only admits originals and excludes the backup copies, all the data recorded in the computer should not be admitted as originals, which should impede the application of e-commerce.

5.2 Legal Problems in E-banks

The banks, as the ultimate executor of the electronic payment and settlement, play the role of linking sellers and buyers. The e-payment service provided by the e-banks is the key element and at the highest hierarchy in e-commerce and is directly related with the prosperity of e-commerce. With the growth of the e-commerce, the development of e-banks will be an inevitable trend. Yet, like any newly emerging things, the e-banks, though having shown stronger and stronger vitality as adapted to the need of the e-commerce, have exposed the lag of the law.

Since there are a lot of people involved in the electronic fund transfer system, the legal relations will become really complicated when something goes wrong and the fund cannot be transferred for settlement or there are mistakes in the settlement. Meanwhile, as the fund transferred through the electronic fund transfer system is usually very huge, once anything goes wrong, the loss might become tremendous. Thus the loss caused by technology will have to be remedied by law. However, as the Electronic Fund Transfer Law has not yet been enacted in our country, it is not possible to ascertain the liability of the parties when any accidents occur, which makes it hard to guarantee the smooth transfer of transaction fund. Besides, there is no unified management of the elements of the electronic fund transfer like e-currency and security authentication. This has caused a hidden danger in the electronic fund transfer and the lag of law is totally exposed in the field of new technology.

1. Elements of electronic fund transfer

Technically speaking the elements of electronic fund transfer include four aspects: merchant system, e-currency, payment gateway, and security authentication. Among them the latter three are necessary conditions.

E-currency: A tool through which the payment is made invisibly by exchanging the electronic information. It includes three forms, namely credit card, e-cash and e-check. E-currency is the core of e-commerce, which will gradually play an important role in international financial activities.

Payment gateway: A series of servers that connect the bank networks with the Internet, the primary function being to fulfill the communication, protocol transfer and data encryption and decryption between the two, which serves to ensure the security of internal networks of banks.

Security authentication: The key problem in e-commerce is security and how to solve this problem is the focus of enterprises. How to guarantee the safety of the transferred data when the transaction is handled on the open network at a time when the e-commerce has not yet been fully-developed has become one of the most important elements that determine whether e-commerce can be popular.

2. Procedures in electronic fund transfer

Legal problems in e-banking primarily contain the following aspects:

(1) General risks in electronic fund transfer: there are a lot of involvers in electronic fund transfer, the most basic ones including clients, e-banks or other financial institutions, system service, inter-bank clearing organizations, and others such as communication line providers, software providers, computer manufacturers and power providers. Once there are conflicts, the situation will be very chaotic without regulation of laws and no clear clarification of the rights and obligations of each party. Therefore, it is urgent to clarify the legal liability after troubles occur by enacting the Electronic Fund Transfer Law to regulate the electronic fund transfer.

(2) Risks caused by software: the chief condition that banks carry out electronic fund transfer is to make the software guarantee the safe, prompt and effective electronic transfer of the fund. Yet, what if one day there is something wrong with this guardian on whom the e-banks depend for survival?

(3) Risks caused by clients: the clients cannot always be accurate. Risks in electronic fund transfer caused by clients are very common in daily life. For example, if the clients use personal information in insecure environment, the bank might take responsibility for the probable loss. Some clients use e-currency or have their password leaked when recording their account numbers and password in insecure environment without conforming to the operational regulations, or do not report the loss of their e-currency in time—this enables criminals to obtain the clients' confidential information and use it to commit relevant criminal activities. What's more, some customers may deny their transactions though in fact they have been made, but the banks' technical measures may not possibly prove the transactions done, so the losses thus incurred will have to be borne by the banks.

Risks caused by banks or financial institutions: the banks or financial institutions are the core of electronic fund transfer, because they carry out all the electronic fund transfer. Yet due to the complexity of the procedures, problems are most likely to occur. As the technologies are advancing very fast, the employees or management may not be familiar with the technologies of e-currency and cannot effectively use the e-bank systems, which poses potential operational risks. If the mistake is due to negligence, the fault liability principle shall be applicable, that is, whoever commits the fault shall bear the responsibility. If the mistake is made by fraud, and the safety program of the virtual banks is reasonable and reliable in e-commerce, the nominal sender shall be responsible for the sending of the payment directions.

(4) Risks caused by other reasons: these primarily include quality problems of the computers and communication lines and power supply problems. For example, sometimes transactions will be postponed or suspended either because manufacturers fail to provide qualified hardware or software or the broken network cables are not repaired in time.

(5) Risks caused by transnational electronic fund transfer: for e-commerce the Internet is a huge market without restriction of time and space. Meanwhile, the standards of controlling electronic fund transfer vary from nation to nation. The international law opposes imposing objectives and measures of a home country on other countries and restricts application of one country's law to deal with conflicts surpassing the jurisdiction of that nation's territory. However, it is possible that the financial institutions or customers of one country set up a server in another country or locate a homepage in a foreign server. Under such circumstances the effect that law mechanisms will have to prevent citizens from evading the judicial control of domestic will be greatly lessened. The electronic fund transfer laws enacted by each country will possibly restrict the development of e-commerce. Hence it is obligatory to coordinate the laws concerning finance and trade in all countries, especially to prevent the developed countries from infringing upon other countries' benefits.

3. Problems of safety brought by computer crimes

The open network is accessible to anyone, which makes it possible to be attacked by hackers. The transmitted material such as credit card numbers is easy to be intercepted and the operational risks thus incurred will be more severe and banks will face more legal risks. Therefore, safety becomes one of the major legal issues in the e-banking. Besides, for some banks with e-currency business, it will bring them more direct economic loss if criminals counterfeit the e-currency. These criminals come not only from outside the banks, but from inside the banks, which will render more menace to the banks. Furthermore, all the evidence in the criminal investigation is virtual, whose validity is not yet ascertained, and so the cognizance and investigation of the legal liability needs brand-new laws.

4. The issuance and management of e-currency

As mentioned above, the e-commerce goes on in the virtual cyberspace. It can only be settled by e-currencies such as credit card, e-cash and e-check instead of by cash. Therefore, who can issue and manage the e-currency will concern the smooth settlement of the e-commerce.

5. The unity of Certification Authority (CA) and payment gateway

In the process of e-commerce transactions including the electronic fund transfer process, the CA plays an irreplaceable role. It is the third party that provides identity certification and undertakes the supervision over and management of the signing and performance of the contracts by the two parties. Both the seller and buyer are obligated to be subject to the supervision and management of the CA, which is responsible not only for the two parties of the e-commerce but for the transaction order of the whole e-commerce. This is of vital importance to the transactions requiring payment of currencies. Yet so far there has been no CA in China, which will tend to hinder the domestic extension of e-commerce.

5.3 The Legal Problems in the Electronic Fund Transfer

The Negotiable Instrument Law of our country does not admit the payment and settlement by paperless e-instrument even authenticated by digital signature. Hence, how to amend the Negotiable Instrument Law or enact an individual Electronic Fund Transfer Law to meet the development of the e-commerce becomes the fundamental guarantee for the smooth payment and settlement in the e-commerce. The electronic fund transfer involves the following problems:

The definition of the subjects in the electronic fund transfer

In the whole process of the electronic fund transfer there are three parties:

(1) The instructor.

(2) The instructed.

(3) The payee. In the electronic fund transfer there are also intermediate banks and clearing organizations besides payer banks and payee banks. As the intermediate links in the electronic fund transfer, they may not exist or more than one of them may exist. They just act as the instructed of the payer banks and payee banks. The process of the electronic fund transfer is that the instructor signs and issues the payment instructions and the instructed accepts and fulfills the payment instructions. As to the computer manufacturers, communication line providers and power firms mentioned above, they are involved and related to the electronic fund transfer, but do not belong to the parties of the electronic fund transfer itself.

The rights of the instructor are to require the instructed to transfer the designated sum of fund to the designated payee within the prescribed time. In case the instructed fails to perform or only partially perform the duty, the instructor has the right to require the compensation of the losses thus incurred by the instructed, who has the obligation to do so. Meanwhile, the instructor's obligation is to pay the fund transferred and the relevant transferring fees to the instructed, who has the right to require the instructor to do so. The obligation of the instructor to the instructed arises when the instructed accepts the instructor's payment instructions, at which time both shall be bound by the payment instructions and bear relevant obligations and enjoy relevant rights.

The legal relationship between the instructor and the instructed is always contractual, and each party has the contractual relationship only with his direct instructor or instructed. In other words, if the instructions fail to be performed or are performed late or improperly due to the fault of the indirect instructed, the instructor, instead of claiming rights to the person directly responsible, has to claim compensation from his direct instructed, and so on. For the payer and payee, they have no contractual relationship in terms of transfer, but fundamental relationship based on the electronic fund transfer. Their relationship of rights and obligations are not embodied in the electronic fund transfer.

The electronic fund transfer has very special legal characteristics. It is abstract like the negotiable instruments, i.e., whether the fundamental legal relationship of the electronic fund transfer is lawful, the fund transfer will be valid once it is made and the payee enjoy complete right over the fund received. The payment in the electronic fund transfer is irrevocable. The payer or any third party, instead of requiring canceling the transferred fund, has to claim to the payee based on the fundamental legal relationship between them. Even if the criminal to commit laundry of money transfer the e-fund, the electronic fund transfer itself cannot be denied its validity. This is the consideration of safeguarding the transaction safety and simplifying the legal relationship. As there are a large number of people involved in the transfer, if the transfer is invalidated due to the invalidity of the fundamental legal relationship, all the involvers of the transfer will be affected and the relationship between each party will have to be re-ascertained. This will definitely add to the complexity of the legal relationship and cost of resolving the disputes, which is against the legal principles underlying the e-transactions.

5.4 The Intellectual Property Protection in the E-commerce

The transaction objects and activities in the e-commerce will possibly be related to the traditional intellectual property. For example, the online transaction of software, music, articles and VCRs may be related to copyright; besides, there is also the problem of legal protection of the database of network companies. Nowadays, the intellectual property disputes that have occurred or are occurring have fully proved that the intellectual property protection in the e-commerce is an un-ignorable legal field.

5.4.1 Legal Problems Brought forth by Domain Names

At the end of 1960s, with the birth of the Internet, domain names came into being for the convenience of contact between the interconnected computers. With the development of the Internet, as symbols of liaison between people in the virtual society, domain names, just like telephone numbers, become an indispensable part in people's daily life in the civilized society. When the 21st century comes, domain names are honored as the "online trademarks" for their huge commercial value. It is for this reason that the legal problems brought forth by domain names have become the first ones in the study of legal problems in e-commerce.

Domain names are the key to gaining commercial value in the running of the e-commerce websites and their commercial opportunities lie in the netizens who visit to the websites. According to the latest Nelson Weekly investigation, Internet users visit 9.5 websites for 8.5 times and each time for about 29 minutes on average within one week. The websites visited for commercial purposes rank

as follows: Yahoo, AOL, MSN, Microsoft, Lycos, Excite, Go, Times Warner, Alta Vista and Amazon. Domain names are signboards to attract visitors and the commercial value of particular domain names is positively proportional to the domain name click rate. An unknown domain name can hardly arouse visitors' desire to pay any visit. For this reason, how to make their domain names well known to the world becomes a puzzle lots of network companies are racking their brains to solve. Some of them, in order to raise the fame of their websites, take the names of celebrities or the well-known enterprises as their domain names, thus leading to a series of legal conflicts, which are mainly between the domain names and the name rights or commercial mark rights protected by the traditional laws. These legal conflicts include the following:

1. The legal conflict between domain names and name rights

The value of domain names in e-commerce lies in their fame. It needs more time and space to establish the fame of a domain name in the virtual society than in the real life society. In order to grasp the online commercial opportunity in time, many network companies register the names of famous enterprises or people as their domain names. The disputes thus incurred have turned quite common now.

In cyberspace, people illegitimately register other people's names as their domain names, raise the fame of their websites by taking others' advantage, or wait after illegitimate registration for a good price or claim huge ransom. For whatever reasons, they do so just for the seeking of commercial benefits, which shall be taken as the infringement upon others' name rights in real life society.

2. The legal conflict between domain names and enterprise name rights

(1) The conflict between domain name registration and the system of enterprise name registration: The domain name registration administration in our country does not conduct inspection over whether the domain name the registration applicants choose has conflict with others' enterprise names. This not only provides opportunity for illegitimate registration, but also renders difficulty for the judicial departments to judge whether any names of the enterprises registered in China are used as domain names.

(2) The conflict between domain names being global and enterprise names being regional: It is provided for in the Provisions on Administration of Enterprise Name Registration that the registered enterprise names may enjoy the exclusive right within certain areas. The regionlization of the enterprise names can be regarded as the narrowest in the field of the intellectual property. However, the dominating right of the domain names gained in the cyberspace has no regional limit. Thus the domain names' being global has brought forth the legal problems of laws applicable for the protection of enterprise names by all countries based on their characteristics of being regional.

(3) The conflict of domain names being unique and enterprise names belonging to different industries: In our country the enterprise names are registered according

to different industries. Meanwhile the uniqueness of domain names means that the management system of domain names will allocate a unique address code to each computer connected to the net whose external code (i.e., domain name) is also unique. This means that once a domain name is input through a network terminal, the website represented by this domain name can be spotted. Enterprise names are the symbols in real life, while domain names are those of virtual enterprises. Both have the same functions, but in two different environments, two separate legal systems are adopted for the protection of each in our country. Domain names are adjusted by the Interim Measures Governing the China Internet Domain Name Registration, which only regulates the registration and examination and approval of Internet domain names and guarantees the uniqueness of domain names in the network environment, but does not cover the unity of domain names and enterprise name rights in real life society. Due to the peculiarity of domain names, conflicts arise between them and the traditional enterprise names as the latter belong to different industries. The same enterprise names registered in different regions can live in peace, but the right-holders of the same enterprise names in different industries in cyberspace will have to fight fiercely for the registration of the only one domain name. Whoever registers the domain name first will exclude all others from registering the same domain name again.

3. The legal conflict between domain names and trademark rights

The voluntary registration principle set forth in the Trademark Law of our country requires that trademarks enjoy the exclusive right and legal protection only after registration. Without registration the trademarks can also be used, but are not protected by law.

(1) The conflict between the dominating right of domain names globally and the regionalness of the exclusive right of trademarks: The principle of trademarks being regional means when the trademarks are used lawfully within the territory of a nation, they will be entitled to the protection of that country's law. Yet domain names are global, not subject to the restrictions of regions. Therefore, when the trademark registrant uses online a trademark protected according to the regional principle as the global domain name, conflict arises.

(2) The conflict between the uniqueness of domain names and categorization of trademarks. According to the Trademark Law, the protection of registered trademarks is only limited to those registered ones upon verification and the product range verified. It is legal and without infringement of others' legal rights if two enterprises use the same trademark on different commodities which belong to different classification in the classification form. Yet in the Internet environment only one enterprise can use that trademark.

(3) The conflict of domain names and well-known trademarks: The well-known trademarks are protected by the trademark legal system in our country. Yet such protection only adapts to the real society; there are no laws to protect the domain names in network environment. Whether the special protection of well-known

trademarks can be extended into the cyberspace and what barriers there are to extend the legal system protecting the well-known trademarks into the cyberspace become two major issues requiring coordinated solution both by the intellectual property legal circles in all countries and the World Intellectual Property Organizations.

4. The conflict between domain names and other domain name rights

The uniqueness of the administration of domain name registration and the principle of "first come, first served" hinders the domain name registrant from registering the same domain name. However, as computers have much higher sensibility to recognize differences than human eyes have, they can recognize any minute differences between domain names accurately. Therefore, any domain names with the smallest difference from other ones can be registered. By taking advantage of this property, some ill-purposed people register the domain names which have little difference from or very similar to the pronunciation or letter or character combinations of famous trademarks in real life to misguide consumers. This situation, in light of the fair competition in market, should obviously be avoided.

5.4.2 The Coordination of the Conflicts Between Domain Names and Intellectual Property

Domain names have brought forth lots of legal problems, which have led to the most disputes in e-commerce and aroused the attention of all countries and even international organizations which are actively taking measures to solve the problems.

1. Define the legal status of domain names

It is controversial whether domain names shall be protected as a new intellectual property object or as a trademark. It is hard to coordinate the conflicts between the intellectual property and domain names. The American government has proposed a basic legal orientation of "domain names in compliance to trademarks" and classified the dispute between domain names and trademarks into domain name disputes and domain name embezzlement.

2. Establish the communication and coordination channel between the domain name registration mechanism and the legal system of intellectual property protection

Once the legal status of domain names is determined, the coordination between the legal system governing domain names and intellectual property will turn clarified. Presently, the coordination is only restricted to domain names and the

symbolic objects in intelligence property. Facing the increasing conflict between domain name and intelligence property, the international community and organizations are taking active measures to seek solutions.

3. Proposals concerning domain names by the international community

In November 1996, in order to solve the increasingly serious domain name problems, the domain name registration and administration institutions in the international community and the international organizations on intellectual property established the Internet Ad Hoc Committee (IAHC), an ad hoc working group to specialize in the study of how to resolve the problems arising in the field of domain names. On Feb. 4th, 1997, IAHC published a suggestion pamphlet named "Final Report of the International Ad Hoc Committee: Recommendations for administration and Management of gTLDs", which includes the following issues:

(1) Concerning the selection of domain name registrar, IAHC holds that territorial principle shall be applied.

(2) Concerning the problem of new top domain names, it is held that a competition-based mechanism should be established to allow all the domain name registrants to enter the market freely, avoiding monopoly.

(3) Concerning the domain name registration and the solution of domain name disputes, IAHC, whose historical mission is to coordinate and solve the domain name disputes in cyberspace, specifies the contents that applicants should provide in their application, detailed information concerning the communication between the applicants and usage of domain names, a deputy designated for application of the domain name registration and relevant affairs, agreements that disputes which occur between trademarks and domain names shall be subject to designated jurisdiction, and the clauses concerning mediation and arbitration.

(4) About the measures governing the effectiveness of domain names, IAHC advises that the secondary domain names should be renewed once a year, that is, the domain name is effective only for one year and it should be renewed every year. Besides, in the renewal registration application any change of the items shall be verified and updated accordingly, assuring the constant effectiveness of the information of the registrants known to the registry.

(5) Concerning the selection of the dispute solutions, the IAHC suggests that the secondary applicants registering under the general top domain names under the administration of CORE should include in their application a standard clause stipulating that when disputes occur, online mediation shall be accepted according to the mediation rules of the arbitration and mediation center under the WIPO or binding summary arbitration procedures shall be adopted.

(6) Concerning the mediating mechanism of domain name disputes, the IAHC proposes to establish such a mechanism as to ensure that owners of internationally-known intellectual property are entitled to register or empower others to register the corresponding names as their domain names. The court of domain name administration mediation should be composed of experts from the fields of

intellectual property and Internet domain names, and its composition and mediation procedures shall be formulated by the arbitration and mediation center under the WIPO.

Concerning a separate ".tm" domain, the IAHC suggests that such a ".tm" domain shall be added under the ISO3166 national code to be used specifically for trademark registration; and the two systems of ".tm.ISO3166" and ".tm.int" shall be established to ensure the registration of trademarks in this field as domain names.

5.4.3 WIPO's Coordination About the Conflicts between Domain Names and Intellectual Property

WIPO has attached great attention to the conflicts between domain names and intellectual property and performed a lot of relevant coordination ever since 1996. On Apr. 30th 1999, the organization published "The Management of Internet Names and Address: Intellectual Property Issues", which includes the following five aspects:

1. Measures to avoid domain name conflicting in the registration phase

(1) Conclusions of agreements between registration institutions and registrants.
(2) Payment of registration fees.
(3) Retrieval before registration.
(4) Suspension procedure in registration.

2. Measure taken towards inaccurate and insecure information

WIPO suggests that the registration institutions establish automatic data verification systems to verify the information provided by the registration applicants on line, or verify the authenticity of the address provided by the applicants by sending e-mails to the address and request the confirmation from the applicants of the received e-mails.

WIPO suggests to establish domain name cancellation procedures, by which the registration institutions can cancel the registration in case the intellectual property is infringed upon by the domain name registration or after confirming that the information provided is not accurate upon request by the third party to the dispute when the registration institutions fail to contact the domain name owners according to the provided contact information.

3. Measures concerning uniqueness

The uniqueness of domain names is a necessary condition of the Internet. To ensure this, the coexistence of similar domain names may invoke some problems such as trademark conflict. WIPO holds that it is not suggested to mandate the

registration institutions to provide guidance websites or other similar service for those domain names with some common constitutional elements, but it encourages clients to take the initiatives into consideration that the measures solving the problems of sharing similar domain names will be good.

4. A globally unified mechanism to solve domain name conflicts

WIPO has proposed five suggestions concerning this issue: to solve the conflicts with existing judicial action mechanism; to establish an accommodative dispute solving mechanism; to apply mandatory administrative procedures; to malicious registration and to apply voluntary arbitration and mediation mechanism.

WIPO suggests that the remedial methods of the mandatory administrative procedures are restricted in three circumstances: first, cancellation of the registered domain names; second, transfer of the domain names to the third party; third, the sharing of the cost involved in the procedure.

5. Protection of famous and well-known trademarks

WIPO suggests exclusive right be granted to famous and well-known trademarks to avoid registration by others, and meanwhile the exclusive right not only exist when the domain names are the same as the famous or well-known trademarks, but be extended to the case that the domain names are similar to the famous or well-known trademarks. A unique institution in charge of the administrative procedures will, by forming an ad hoc panel made of 3 persons chosen from the expert pool from all around the world, deal with the case to decide whether to render the verdict of granting the exclusive right according to the complaint made by the trademark owner who claims infringement of his famous or well-known trademark. The expert panel should first confirm if the trademark is famous or well-known in accordance with the draft treaty on the protection of well-known trademarks proposed by the Committee on the Law of Trademarks, Industrial Design and Geographical Indication. Then the panel should confirm that the unauthorized third party is trying to register as its domain name the famous or well known trademark or its similar design. Once the expert panel makes a decision of exclusive right, the owner of the trademark can cite this decision in the administrative procedure, and request cancellation of the registered domain name which is similar to the trademark. Of course, if the applicant to register the domain name can raise evidence to prove the legitimacy of the registration, the registration can be maintained.

5.4.4 Copyright Issues in E-commerce

Ever since the birth of the first copyright law in the world—the Statute of Anne in Britain—in 1710, copyright protection has evolved from the protection of publishers to the protection of the author, distributor and users, as printing,

electronic and digital technologies are developing rapidly. That is to say, copyright in its general sense includes the neighboring right connected with it. In our country copyright is also termed as the right of writing, with the same meaning. Because copyright covers wider extent than other intellectual property, there are more complicated copyright problems in e-commerce.

1. Conflicts between services in e-commerce and traditional copyright

The Internet has brought us to the information era. When people enjoy the information service, conflicts between information service and traditional copyright have come with it, which makes the legal circle at a loose end.

Conflicts between online entertainment and copyright: The conflict between the American online entertainment company MP3.com and other traditional entertainment companies have invoked plenty of thoughts concerning online entertainment, the detailed discussion of which can refer to the International Trade and Law.

Online movies and copyright: With the development of technologies, a new technology named MP4 is becoming more mature. Like its counterpart MP3, it adopts a compressive technology; what's different is that it can compress images while compressing sound, which facilitates the propagation of images on line. When traditional copyright comes to the era of network, there should be some integration. The realization and protection of the benefits of movie producers and actors/actresses and the definition of the transmitters' legal status are key problems that should be addressed in the network copyright issues.

2. Online bookstores and copyright

The new publishing mode on line enables the customer to get a new book printed with the high-speed digital technology in the online bookstore in a short period of drinking a coffee, which costs almost the same as the published copy. "We never dare think of making money for printing only 5 or 10 books in the past, but presently it has come true with the electronic books printed immediately for sale. The publishing industry will become more active with this kind of book." The mode of electronic publishing has been a fashion in America, but there's been no solutions to the concerning copyright issues.

3. Copyright protection of databases

Database is an important foundation of e-commerce. All procedures in e-commerce, including query and purchase of raw material, the exhibition, order, storage and transportation of products, involve the support of databases.

The focus of database copyright protection is whether to protect it as a traditional copyright or as a new and independent legislative object. EU committee suggests that the database be protected as a compilation defined by the Berne Convention. This suggestion draft was passed. The European Parliament and the European

Council on March 11th, 1996, which provided it being carried out before Jan. 1st, 1998 in all member countries.

4. Current status of database protection in the US

The US is also seeking new means to protect database as it failed in protecting it as a traditional copyright. The protection means in the HR3531 proposal are similar with that for the database directives in the EU. Then the means in the HR2652 and HR354 proposals are further away from the EU proposals. Yet all these proposals have not passed the final stage of legislation. However, the differences in the legislated protection will be very profound to other countries, since US and EU are both powerful in the database industry. With the development of Internet and e-commerce, there are more and more appeals for the legislation of database protection. However, a single country or only a few countries providly legal protection to the database with the fast-growing Internet in the information era; it needs global cooperation and unanimous acknowledgement of the principle of database protection. Otherwise, any legislation in a certain region or a country concerning the Internet database piracy will be far too much inadequate and useless.

5.5 Legal Problems of E-commerce Security

5.5.1 Security Problems in E-commerce

Now many customers are still in a wait-and-see position toward e-commerce. Why? Because the development of e-commerce is becoming more and more dependent on the Internet, which makes e-commerce very fragile. Once the network is attacked and cannot work properly or even falls into paralysis, the e-commerce of the whole society will be trapped by a dangerous crisis. Thus security problems of the network or e-commerce are being attached more and more importance by consumers of all countries.

The current main hidden dangers of security in e-commerce include: system block, information distortion, information counterfeit, and illegal denial of transaction.

1. Security elements in e-commerce

Security problems in e-commerce have a wide extent. Firstly, it is a very complicated management problem. Secondly, it involves technological problems. Thirdly, it is a legal problem. The final solution of e-commerce security problem has to be ensured by the improvement of relevant laws. Generally speaking, security elements in e-commerce include validity, authenticity. Confidentiality, which means the information will not be divulged to unauthorized person or

entity; data integrity, which requires uniformity of the data and prevent the unauthorized input, deletion, modification or damage of the data. Reliability, undeniability and controllability: reliability means to ensure that authorized user will not be denied illegally of the access to information and resources. Undeniability means to establish efficient responsibility system and prevent the entity from denying its act. Controllability means to control the ways by which the person or entity uses the resources.

2. General situation of e-commerce security legislation

Legislation abroad outline: In order to solve the new legal problems brought by e-commerce, all countries in the world have begun to carry out legislation, e.g. The Model Law on Electronic Commerce by the UN Commission on International Trade Law, the Framework for G1obal Electronic Commerce in America, and so on. Recently the British government has published the opinion soliciting draft of the Electronic Communication Act. This draft has been brewing for a long time whose main objective is to promote the development of Britain's e-commerce and provide legal guarantee for all circles of society to establish their confidence in e-commerce.

To ensure system security in e-commerce system, there are generally two kinds of guarantees both technically and legally. Security technology is not absolute and no single technology can withstand all security risks. When such security accidents occur, there must be some relevant people to be held legally responsible. That means while formulating e-commerce transaction laws we have to establish laws concerning e-commerce security to ensure e-commerce activities can be in proper progress and develop healthily.

3. Current status of e-commerce security legislation in China

In China, the legal protection of e-commerce began from the Regulations for Safety Protection of Computer Information Systems in 1994. To enforce the safety protection of computer information systems, China has formulated a series of laws and regulations according to different circumstances, which make the relevant systems more standardized and systemized. These laws and regulations include the Computer Information Network and Internet Security, Protection and Management Regulations, the Measures Governing the Computer Information System Security Product Quality Test and Sales Licenses, the security Requirements for Computer Field, the Classified Criteria for Security Protection Levels of Computer Information Systems and so on.

5.5.2 Legal Systems Concerning the E-commerce Security

Legal systems concerning the e-commerce security include the secure level systems of computer information, systems of prevention and controlling of damageable

data, systems of sales license for security products and systems of Internet management.

The grade of computer information system security refers to the grade of information system protection ability ascertained by the state supervision and administrative department of information security based on the sensitivity, nature of application and importance of the information processed by the computer information system and according to the relevant state criteria.

Damageable data refers to the information harmful to both computer systems and society in the forms of computer program, image, character and sound in the computer information systems or its storage media. Damageable data is characteristic of being invisible, detrimental, illegal and expandable and of various representations.

Laws and regulations concerning the prevention and controlling of damageable data detrimental to computer information system includes the Measures on the Prevention and Control of Computer Virus, the Rules for the Protection of Computer Information System Security and the Evaluation Criteria for Anti-virus Products of Computer Systems.

Security products sales license refers to the legal certificate issued upon examination and approval by the computer administrative and supervision department under the State Public Security Administration which allows the license holder to sell software and hardware products specifically for the protection of computer information system security. The state has already promulgated the Measures Governing the Computer Information System Security Product Quality Test and Sales Licenses. The security products feature legality, security and technology.

The systems of sales license for security products: The License Management Measures provides that the license system applies when the security-specific products within the territory of PRC come into the market for sale. Before the products come into the market, the producers must apply for the license of the security-specific products of computer information system.

Other relevant laws and regulations include the Measures Governing the Examination and Approval of the Undertaking of Open Operation of Telecommunications promulgated in 1993 by the Ministry of Posts and Telecommunication, the Rules for the Protection of Computer Information System Security, the Interim Rules for the Internet Management of Computer Information Systems, the Measures for Implementing the Interim Rules for the Internet Management of Computer Information Systems, the Measures Governing the Internet Entry-Exit Channels of Computer Information Systems, the Measures of the Internet Management of Public Computers in China, the Measures of the Management of China's Public Multimedia Communications and so on promulgated in 1994 by the Ministry of Public Security. These administrative rules and regulations constitute a law system of the Internet of computer information systems in China.

5.5.3 Legal Responsibilities for the Violation of E-commerce Security Laws

In a wider scope e-commerce security laws belong to one of the administrative laws, with the public security organs at all levels as their governing departments. To a certain extent, law is a discipline concerning responsibility; without the guarantee of legal responsibility, laws cannot be executed well. In administrative laws, administrative responsibility takes a particularly important role.

1. Administrative penalty

Administrative penalty is a kind of administrative action taken by some particular administrative organs of the state to punish the individuals or organizations that violate administrative orders and it falls into the category of administrative sanctions.

2. Administrative responsibilities for the violation of e-commerce security systems

(1) That for the violation of damageable data administrative systems: fine; deprive the offender of the qualification of testing anti-virus products for computers.

(2) That for the violation of security products systems: warning; suspension for amendment; fine; revocation of sales license; confiscation of illegal gains.

(3) That for the violation of Internet security administrative systems: warning, confiscation of illegal gains, fine, stop connecting to Internet and suspension for amendment for no more than six months, revocation of sales license or getting rid of the qualification to connect to Internet. If the act violates the administration of public security, the offender shall be punished according to the Regulations of the PRC on Administrative Penalties for Public Security.

(4) That for the violation of the Interim Rules for the Internet Management of Computer Information Systems: ordered to stop connecting to Internet; warning; fine; confiscation of illegal gains.

(5) That for the violation of security protection level regulations: warning or suspension for amendment.

5.6 Consumer Rights Protection in E-commerce

5.6.1 Impacts of E-commerce on Consumers

Consumer rights protection in the 21st century is confronted with two problems: one is how to deal with the conspicuous problems since the promulgation of the Consumer Rights Protection Law and the other is how to deal with new problems brought by the development of science and technology, especially by the new transaction means of network economy and e-commerce to the protection of

consumer rights. As the technology develops rapidly, the conflict between the emergence of large numbers of new products and the lag of consumers' knowledge about the products is becoming more conspicuous. The production, manufacturing and sales of products no longer concentrate in one place. Therefore, it has become more important that international cooperation is reinforced to protect consumers' legal rights effectively.

1. The change of roles of consumers promoted by network

Network enables the consumers to have more subjective initiatives, their actions more rational and personal, and their requirement for consumption quality higher. ICDT model has replaced the old four elements of marketing. ICDT model divides the online market space into: information space, communications space, distribution space and transaction space. In this model, marketing takes place in the forms of information exchange, communication, distribution and transaction.

2. New legal problems of consumer protection initiated by e-commerce

Since the trading pattern has undergone fundamental changes in e-commerce, there are a lot of unprecedented problems concerning the protection of consumer rights. Among these problems there are information security problems, incomplete information and confidentiality problems and legal problems concerning online advertising.

3. Problems about e-commerce websites

In complaints cases concerning Internet, most of them are about ISP and online purchase. The complaints against the ISP are primarily about charging and insufficient online service. Besides, online auction is also a hotspot of consumers' complaints. Online stores generally have not provided sufficient information to ensure the rights of the customers are protected.

A recent published report about China's first survey of online purchase indicates that now the online shopping still has some nonstandard problems. This report is based on an investigation on 200 netizens who did shopping in 25 online stores. This report indicates:

Firstly, the online commodity prices are quite different and the largest price difference of the sold commodities even amounts to 40%. Secondly, services differ with regions. Thirdly, invoice problem. Fourthly, distribution speed cannot be guaranteed. Fifthly, response speed to orders differs. In view of more and more junk mails in free mail boxes, some customers wonder whether free mailbox users are consumers and whether their rights can be protected according to the consumer right protection law once violated.

4. Responsibility cognizance

E-commerce primarily involves such entities as manufacturers, sellers and distributors and some links like commodity information communication, online

payment and goods distribution. If anything's wrong with any one of the links, the consumers' rights will be harmed. Once there is an act causing harm to consumers' rights, it is difficult to determine the responsible entity. That is because network is only the carrier of information and tool of communication, the web operator and the commodity or service provider may not be a single entity. Moreover, because of the fast updates of websites, online information is transient and information about online products is abundant and easy to alter or copy. Thus it is easy for online stores to delete any material that constitutes the misrepresentation of commodity quality, which makes it difficult for consumers to collect any evidence. On the contrary, if the ISP controls the network, it can collect evidence easily, but the admissibility of its evidence is susceptible.

5. Responsibility investigation

In commerce it is inevitable that disputes arise between the two parties of transaction concerning commodity quality, which may include multiple situations. First, consumers may have misunderstanding of the commodity; secondly, there may be different judgment due to different regions or different habits; third, there may be damaged or faked commodities. It is of great importance for the protection of consumer rights that what means can be adopted to define the responsibility in all disputes in e-commerce and what means shall be used to investigate the responsibility and impose relevant penalty.

6. Jurisdiction problem

E-commerce realizes the transition of trading means from three-dimensional space to the fourth dimension on network. It breaks the restriction of national boundaries, jurisdiction, time and space. Transactions go on between consumers from any country in any website with the advantage of new time and space based on the computer networks. Sometimes a real e-commerce trade may concern multiple countries or territories. Yet consumer rights protection may be influenced by the difference between legislation, jurisdiction and local protectionism. It remains a problem whether it is fair that consumers lose the protection from their domestic laws when they consume on line. The consumers are familiar with their domestic laws concerning the consumer rights protection and their application, but they have no idea of the laws in other countries. When they do online shopping and buy products from a distant country, they generally have no knowledge of the law of that country. They may enjoy no remedy due to the travel expenses, time span or no knowledge of local laws or remedies.

5.6.2 E-commerce and Consumer Privacy Protection

Privacy is the personality right of a citizen whose personal life and private information are legally protected and shall not be infringed upon, known,

collected, taken advantage of and leased to the public illegally. In the 1990's, with the rapid development of e-commerce, consumers, in order to do online transactions and accept online service, have to provide their personal information to all kinds of operators on line. Moreover, the footsteps of the consumers (such as the websites they visit, their consumption habits, surfing habits and even credit records) may be tracked and recorded without notice, while the collector to other commercial organizations may sell all this information. Under this circumstance, consumers are greatly concerned whether their involvement in the e-commerce will make their privacy exposed.

1. Main contents of consumer privacy protection

Consumer privacy protection primarily concentrates on three aspects:

(1) Personal information protection: Personal information protected mainly includes specific personal information (name, gender, birth date and ID number), sensitive information (religious faith, marriage status, family, occupation, medical record, income, and experience), e-mail address, IP address, username and password.

(2) Communication secrecy and freedom protection: Communication secrecy and freedom are constitutional rights of citizens. E-mail is now the most common communication means in the network, in which the safety depends on e-mail servers, e-mail transmitting network and e-mail receiving systems. As the safety of e-mails is tightly related to them, the protection of e-mails has become increasingly complicated and urgent. Apart from technological measures like encrypted e-mails, it becomes most important to adopt legal methods to restrict the peeking and exposure of operators and hackers.

(3) Personal life peace protection: Promotion of products via e-mail ads has run rampant due to the low cost. Consumers are heavily burdened by a great number of junk mails, which cost them much time to clear, and even affect the normal transmission of e-mails because of the occupation of mail space.

This has constituted infringement upon consumers' peace of personal life. Besides the self-discipline of the trade, legal means are necessary for the treatment of junk mails.

2. Legal strategies to protect consumer privacy by all countries and international organizations

(1) USA: The "Framework for G1obal Electronic Commerce" has profound analysis to personal privacy problems. The first federal law about online privacy in America, the Law for the Protection of Children's Online Privacy took effect on April 21st, 2000. From then on, it becomes illegal to collect the personal information of children under the age of 13 and the offender may be inflicted a fine of over 10,000 dollars for such behavior.

(2) EU: On Oct. 25th, 1999, the EU announced statutes concerning online personal information protection. These statutes are aimed for the protection of online personal information of 15 member states from being infringed upon. Personal information mainly includes personal ID, residence, property, health

condition and other information possessed by an individual, among which the most sensitive ones are credit card number and password. The statutes prescribe strict clauses for personal privacy protection in order to guarantee free communication of personal privacy on Internet among the 15 members.

3. Problems to be discussed: the balance between privacy protection and the benefits of e-commerce operators

Law shall protected the privacy of consumers, but the protection is not infinite in which there is a conflict between privacy protection and commercial benefits of operators. The protection of consumer privacy means duties are inflicted upon operators, so it is of utmost importance to determine the protection range and create a win-win situation for both consumers and e-commerce operators.

4. Strategies to protect online consumers rights by all countries and international organizations

(1) Organization of Economic Cooperation and Development (OECD): It enacted the Standard for the Protection of Consumers in e-commerce Environment. In its general principle, it emphasizes the protection of consumers, rather than the protection of enterprises from consumers' fraud. It also enacted the Action Plan for e-Commerce, which emphasizes the establishment of trust of users and consumers. OECD also formulated some measures to protect the personal privacy of consumers, including: supporting member states to exchange information about protection of personal information on the global network, report their efforts and experience in realizing the "Declaration" and providing practical guidance for the problems that have appeared in the execution of OECD's "Guidelines for Personal Privacy" on the global network, cooperate with industrial and commercial lines when they provide personal privacy protection and cooperate with relevant international and regional organizations.

(2) Europe: EU is going to enact new laws about e-commerce to protect consumers and the relevant draft has been framed with an updated version of the 1968 Brussels agreement. That is, if the consumer would like to engage an international lawsuit, there is no need for him to go abroad. Currently this draft, though passed by ministers of law in EU countries, is still pending to be formal before consultation with the European parliament.

5.7 Legal Liability in E-commerce

5.7.1 Civil Liability in E-commerce

1. Concept of civil liability in e-commerce

Civil liability means the legal consequence a civil entity has to undertake if it

commits any violation of civil obligations. Civil liability is based on civil obligations; it is legal sanction against violation of civil obligations. The primary components of civil liability in e-commerce include facts of damage—only when there are facts of damage can the actor bear the civil liability; faults, i.e., the subjective intention or negligence; cause-effect relation, i.e., there is cause and effect relation between illegal actions and facts of damage, and only when the damage is caused by the illegal action can the actor bear the civil liability. The entity has to satisfy all the necessary conditions mentioned above to take civil liability.

(1) Principles of civil liability in e-commerce: As a totally new commercial form, e-commerce has many differences compared with traditional transactions. In e-commerce there are some social relations common in all traditional business while there are also some peculiar social relations of it. Yet no matter the common social relations or the peculiar ones, they have not changed the fundamental property of e-commerce as a commercial activity. Therefore, once there is violation of civil laws that infringes upon the legal rights of the country, legal persons or individuals, the liability principles of general civil laws also apply in this situation. On the other hand, e-commerce has some peculiarities that distinguish it from traditional commercial activities, which means the general provisions of civil law cannot all be applicable and some laws need certain changes to adapt to the development of high tech.

(2) Classification of civil liability in e-commerce: Civil liability as the legal consequence for violation of civil obligations or infringement upon civil rights is classified differently according to different criteria. For example, civil liability can be classified into contract liability and non-contract liability according to the basis on which the liability comes; it can be classified into fault liability, nonfault liability and fair liability according to the principle based on which the liability is to be borne. Disputes in e-commerce primarily include commercial disputes arising centered around e-transactions and non-commercial disputes arising based on e-transactions, so civil liability in e-commerce mainly refers to contract liability and tort liability.

(3) Means of assuming civil liability: There are ten primary means to assume civil liability, including cessation of infringements, removal of obstacles, elimination of dangers, return of property, restoration of original condition, repair, reworking or replacement, compensation for losses, payment of breach of contract damages, elimination of ill effects and rehabilitation of reputation, and extension of apology. The main means to assume contract liability include payment of breach of contract damages, continual performance, return of property and compensation for losses. The main means to assume tort liability includes cessation of infringements, removal of obstacles, return of property, restoration of original condition, elimination of ill effects and rehabilitation of reputation, and extension of apology. The violator of civil law in e-commerce has to assume one or more than one liability means according to the concrete circumstances so that the liability means can be given full play to better safeguard the legal rights of entities

in e-commerce and guarantee the safe and rapid development of e-commerce.

2. Contract liability in e-commerce

Contract liability is the civil liability for violation of contract, also termed as liability for breach of contract. It is a kind of civil liability, which plays an important role in contract relations and has the function of safeguarding the contract credit and maintaining social economic order.

There are generally two kinds of principles for contract liability: one is the strict liability principle and the other negligence liability principle. Strict liability principle is also called non-negligence liability principle or objective liability principle, that is, the actor shall assume civil liability if his act causes damage, no matter the actor has any fault or not. In our country the liability principle for breach of contract is the strict liability principle, but there are still many named contracts applying the fault liability principle, such as bestowal contract, storage contract and lease contract.

The application of strict liability principle in contract liability in e-commerce on one hand can guarantee the proper performance of e-contracts and on the other hand is beneficial to protect the parties in the e-commerce contracts.

(1) Components of contract liability in e-commerce

The breach of contract defined in e-commerce law refers to the non-performance, partial performance or improper performance of the duties agreed upon in the e-commerce contract by one or both parties to the contract.

(2) Forms of contract liability in e-commerce

The forms of contract liability in e-commerce refer to the forms of assuming contract liability after the contract parties commit breach of contract. They mainly include payment for breach of contract damages, compensation for losses, mandatory actual performance and other remedial measures.

3. Tort liability principle in e-commerce

The tort liability principle for violation of e-commerce law refers to the choice of which standard and principle to determine the actor's tort liability when his behavior causes others' damage. From the current legislation, the tort liability principles in our country mainly include the principles of fault liability, fault presumption liability, strict liability and fair liability.

4. Torts of violation of e-commerce laws

Torts in e-commerce primarily include those in violation of intellectual property, honor rights of individuals and legal persons and consumers' rights and interests.

Intrusion of privacy: privacy in the network space is more difficult to protect and control than in the real world. With the practical use of computers and Internet it becomes an important part in people's daily life to send e-mails, do online shopping, work at home, and have distant diagnosis. A great deal of personal information, such as correspondence, income and expenses, educational

background, health medical history, marriage status and family background, address, birth date and ID number is usually stored in people's personal computer systems. This information can be easily copied and collected on the Internet, since it is no longer a technical problem to intercept personal letters and collect personal information by Internet monitoring. When you do online shopping you will leave such personal information as your name, address and telephone number in order to receive services after the purchase; in order to have distant diagnosis, all your medical material will be transmitted to hospitals scattered in all regions; when you are surveyed consciously or subconsciously you will provide your true information and data about yourself or your family. Once this information or data is collected and sorted by others, you may lose control of them forever, what's worse, it may be broadcast on the Internet and republished or copied endlessly, which is a particular menace to personal privacy from the abuse of information technology and the degeneration of network morality. Hence how to protect personal privacy has become a problem demanding prompt solution. Compared to the communication security and personal data security, the peace of personal life is more important for a citizen. Once their e-mails and their personal information is thus leased, their personal life will be damaged.

5. Several major torts in violation of personal privacy

(1) Illegally enter into others' personal computer systems; intercept, browse and have other's e-mails without permission; announce others' personal data without permission or divert others' personal data for other uses; obtain others' personal data without permission and by unfair means. Data users must use their personal data within the approved or agreed limit; commercial mails sent to network users shall be identified and may not entice or mislead the users to open any e-mails of no use to them at all.

(2) Torts against copyright: The two substantial conditions of the object protected by the copyright law are "originality" and "replicability", and there is no requirement on the form and media of works. Since the online information is shared, once the works in traditional media are digitalized, they can be transmitted on line freely, and leave the works and information protected by copyright law in danger of being infringed upon. As works protected by copyright laws are easily used on line and there is great flexibility for their modification, it is easy for them to be modified, copied, deleted, changed, damaged or intercepted, and the personal property rights such as the rights of authorship, alteration, and integrity of an author are extremely difficult to be protected. Many developed countries and international copyright organizations such as world copyright organizations have modified the clauses not suitable to network environment in the current copyright systems and made provisions for the special problems concerning copyright of network works to protect the rights and interests of copyright owners. These laws include the World Intellectual Property Organization Copyright Treaty and the World Intellectual Property Organization Performance and phonograms Treaty.

Since the torts of copyright of online works are different from those on the traditional media, they are classified into three kinds, namely "down load", "on line" and "up load". "Down load" refers to download the online works and publish them in newspapers without permission. The second kind refers to the infringement upon the copyright of online works by other networks. The "up load" means the tort of copyright of traditional media by networks. Some websites publish others' works on line without the permission of the authors in order to gain benefit, and while other netizens read these works by visiting the websites, economic benefits are created for the websites in the process.

(3) Torts against domain names and trademarks: E-commerce has to involve domain name registration. Domain name is the address of the computer connected to the Internet, and is designed to facilitate the interconnection and communication between online computers. Because it is easy to be remembered and convenient to be used, it has been widely used as a commercial mark. The torts against domain names mean that some people register other people's trademarks and enterprise names with certain popularity for ill purpose.

(4) Other torts: Apart form what has been mentioned above, there are other forms of torts such as infringement upon citizens' rights of name, portrait, reputation and honor and upon legal person's right of name, reputation and honor. The direct consequence of infringement upon these rights is to make the victims' reputation, credit and status under attack or be in other disadvantageous situation, make the social environment where they live unfavorable to them and lead to their spiritual suffering and financial losses.

6. Tort liability forms in e-commerce

The tort liability forms in e-commerce primarily include cessation of infringements, removal of obstacles, elimination of dangers, return of property, compensation for losses, elimination of ill effects and rehabilitation of reputation, and extension of apology.

5.7.2 Administrative Liability in E-commerce

Administrative liability means negative legal consequence caused by violation of administrative laws or by other legal facts. As an important part of legal liability, it includes two aspects: one is the legal liability assumed by citizens, enterprises, institutions, social organizations and administered for violation of administrative laws and regulations or non-performance of administrative obligations, and the other is the legal liability assumed by state organs and their staff for illegal or improper behavior.

1. Administrative liability in e-commerce

Administrative liability in e-commerce refers to the negative legal consequence

assumed by the participants in the e-commerce caused by their illegal administrative behavior or some legal facts. It includes the following two aspects: one is the legal liability assumed by the state organs and their staff for their illegal or improper behavior in administering the e-commerce, and the other is the legal liability assumed by the administrative participants for their violation of relevant administrative laws and regulations or non-performance of relevant administrative obligations. Some main administrative liability in e-commerce is as follows:

(1) Administrative liability in e-commerce taxation: The act damageable to e-commerce taxation is mostly the administrative illegal act. The State Compensation Law shall be applicable for the illegal administrative act of taxation organs, all forms of administrative sanctions shall be applicable for the illegal administrative act of the individual taxation collectors, and the relevant laws such as Law of the people's Republic of China on Administrative Penalty and the Law on Tax Administration shall be applicable for the act against rules and regulations of taxation organs.

(2) Evasion of tax and refusal to pay tax in e-commerce. "Evasion of tax" means that a taxpayer or a withholding agent fails to pay or underpays the amount of tax payable through the adoption of the means of forging, revising, concealing or destroying without authorization accounting books or supporting vouchers for the accounts, or of overstating expenses or not stating or understating income in accounting books, or of filing fraudulent tax returns. "Refusal to pay tax" means refusal to pay tax payable by using violence or menace. In accordance with the relevant provisions in the Law Tax Administration, if the act does not constitute a crime, the tax authorities shall pursue the payment of the amount of tax the taxpayer or withholding agent has failed to pay or underpaid, and impose a fine no more than five times the amount of tax the taxpayer or withholding agent has failed to pay or underpaid.

2. Administrative liability about intellectual property involved in e-commerce

Administrative liability involved in domain names: Order the actor to stop illegal act, confiscate the illegal gains, fine, or revoke the business license.

3. Administrative liability about copyright involved in e-commerce

Besides civil responsibilities, the administrative sanctions can be imposed by copyright administrative authority in the form of public warning, injunction in relation to the production and distribution of infringing copies, confiscation of unlawful gains and seizure of infringing copies and equipments used for making infringing copies, as well as fine.

4. Administrative liability about customer rights protection in e-commerce

The consumers enjoy wide rights, including: right of security, right of information

access, right of independent selection, right of fair trade, right of compensation according to law, right of association according to law, right of consultation and obtaining knowledge, right of maintaining dignity and right of supervision and criticism. In case the operator's act infringes upon any of the above rights and interest enjoyed by the consumers, the industrial and commercial administrative departments shall order it to make amendment and inflict separately or concurrently a penalty of warning, confiscation of illegal gains and a fine of not less than one time and not more than five times the illegal gains. If there are no illegal gains, a penalty of not more than 10,000 yuan shall be imposed. If the circumstances are serious, the operator shall be ordered to suspend business for amendment, revoked its business license. Besides the above traditional act that infringes upon consumers' rights, one particular phenomenon in e-commerce is the infringement upon consumers' privacy. Yet there have been no definite applicable laws concerning this aspect.

5.7.3 Criminal Responsibility in E-commerce

Crime is the prerequisite of criminal responsibility, without crime there will not be criminal responsibility. Criminal responsibility has to meet three fundamental elements: First, the occurrence of act damageable to society. Second, this damageable act shall be forbidden by the criminal law. Third, the act forbidden by the criminal law shall be punished by the criminal law. A large fortune has been rapidly accumulated in the field of e-commerce, which, while bringing infinite commercial opportunities to society, has as well brought serious social problems such as the outflow of crimes. Thus criminal problems in e-commerce have drawn wide attention of the society.

1. Phenomena and features of crimes in e-commerce

There are usually three phenomena in e-commerce crimes: Computer crimes in e-commerce, which only requires the damage of computer systems. E-commerce crimes related to computer crimes. Traditional commercial crimes in e-commerce with nothing to do with computer technologies.

Crimes in e-commerce have their own features, mainly including: clear aims, that is, they are intended crimes and the main difference between e-commerce crimes and computer crimes or network crimes is that criminals have direct criminal aims. Illegal gains. High intelligence. No spots, that is, no matter for the transaction or settlement of the e-commerce based on the virtual space on Internet, the transaction parties do not have to do the business on the spot. High occurrence of crimes. Low risks for crimes and high difficulty of prevention and control.

2. Crimes and criminal responsibilities in e-commerce

Many criminal responsibilities in e-commerce can be punished according to

Articles 287, 286, 264, 266 and 215 of the "Criminal Law of PRC", including the crimes of damaging the data and applications of computer systems, of making and spreading devastating computer programs, of illegal intruding computer systems in e-commerce field in order to steal commercial information, of committing fraud by usurping others' e-commerce ID and of infringing upon commercial secrets, computer-related e-commerce crimes and corresponding criminal responsibilities, crimes of counterfeiting and using online payment accounts and its corresponding criminal responsibilities and relevantly traditional commercial crimes in e-commerce.

3. Problems and challenges in the application of criminal laws

The crimes in e-commerce have become more and more common and complicated nowadays. However, how to apply the criminal law and deal with the situation that there is no specialized legislation concerning e-commerce crimes have been big problems in terms of cracking down on crimes and investigating the criminal responsibilities.

(1) Application of current criminal laws: A fairly large number of crimes in e-commerce can be punished according to the current criminal law. However, there are some problems in concrete practices. Some crimes do not satisfy all the constitutional elements of a crime defined in the criminal law as it covers narrowly; some crimes do not have the same description as in the special provisions of the criminal law, which leads to the inappropriateness in application.

(2) The application of criminal law concerning the computer-related crimes: The computer-related crimes have taken a large part in e-commerce crimes. The suspect commits the e-commerce crime by taking advantage of his skillful or even superb computer expertise or the knowledge of interior computer resources. This kind of crime has dual harmfulness. On one hand, it causes harm to computer systems; on the other hand, it causes harm to the whole e-commerce system. This crime ought to be punished by the criminal law. However, in practice this crime cannot be established, since the crime object is quite complicated. So the effect is not so clear after it being cracked down upon.

(3) The application of the criminal law to the relatively traditional e-commerce crimes: The current criminal law is more applicable to situations involving relatively traditional crimes in e-commerce; however, there are some new problems like the conviction of theft crime. The theft in e-commerce is primarily carried out using digital information and the crime succeeds by transferring fund from an account to other virtual spaces. Furthermore, online money laundry is also difficult to identify because the flow of fund is hard to track.

4. Blind area of current criminal law

(1) Crimes concerning intellectual property in e-commerce: In e-commerce, illegal interception and copy of data is particularly serious. The criminal suspect illegally intercepts or copies the data of the parties in the trade by taking

advantage of the open network and intercepting of data in online transmission in order to gain benefit. This kind of crime mainly involves commercial confidentiality, which would cause tremendous loss to the right-owner. However, the provisions about theft of commercial secrets in the current criminal law cannot cover this kind of act, thus making it difficult to investigate the criminal responsibilities upon such acts seriously damageable to the e-commerce transactions.

(2) Tax evasion problems in e-commerce: Tax evasion in e-commerce is a very urgent practical problem faced by all the governments in the world nowadays. The transaction amount involved in e-commerce is tremendous, but there have been no laws and regulations concerning taxation in this new mode of trade. Therefore it has become a legal loop. Traditional regulations concerning tax evasion is hard to fit in the new tax evasion crimes, which has become a legal dilemma to all the countries in the world.

5.8 Brief Introduction to the "Electronic Signature Law of the PRC"

The "Electronic Signature Law of the PRC" was promulgated on Aug. 28th, 2004 and become effective on April 1, 2005. It has solved many problems mentioned above, such as what time shall be deemed as sending time, what time shall be deemed as arrival time, when to take effect, the sending place, the receiving place, whether the electronic text sent automatically by the system can be deemed to represent the true intention of the system owner, and such questions. Its promulgation will have profound impact to the development of e-commerce and electronic political affairs in our country. This law aims to confirm the legal validity of electronic signature as that of manual signatures or stamps, and is applicable to the e-commerce and electronic political affairs in our country. The enactment of this law will be a great matter in the economic and social life and symbolizes that our nation has become one of the advanced digitalized and network countries in the world. It will greatly promote the smooth development of our e-commerce and electronic political affairs, the level of informatization, the improvement of our national economy, and the increase of management benefits and quality of banks. This law can be safely considered in its true sense as the first law in China concerning information technology.

The law includes five chapters and 36 articles, including general provisions, electronic data messages, electronic signature and authentication, and supplementary provisions.

The general provisions include the aim of enacting this law, the definition of electronic signatures, and its applicable and inapplicable range. The aim of this law is to regulate the behavior of digital signature, establish the legal validity of electronic signatures and balance the legal rights and interests of parties involved.

The electronic signature is defined as the data included or appended in the electronic data messages in the form of digital writing used to identify the identity of the signatory and show his approval of the included content. The law also adopts the principle of independent decision by the parties, i.e., the parties can agree whether to use electronic signatures or electronic data messages in the contracts in civil activities or other documents or instruments. There are also some exceptions, including: (1) Concerning personal relations such as marriage, adoption and heirdom. (2) Concerning rights and interest transfer of estate such as land and house. (3) Concerning suspension of public utility services such as supply of water, heat, gas and electricity. (4) Other cases where electronic documents are inapplicable stipulated by laws and administrative regulations.

In the part of data messages it is prescribed that the electronic data messages satisfying certain conditions can be regarded as the written form provided by laws and regulations or used and restored as the original form. The elements to be considered to determine the truthfulness of the data messages are also provided. The law in particular provides that the message automatically sent by the information system of the sender is regarded as sent by the sender, regardless of whether it is out of the true intention of the sender himself. Concerning the reception, if the law or administrative regulations provide or the parties agree that the data messages will be considered as received after confirmation, such provision or agreement shall be followed. When the sender receives the confirmation of the receiver, the data messages is considered as received. The time shall be considered as the sending time when the data messages go into a message system out of the sender's control. About the receiving time, if the receiver has designated a particular system to receive the data messages, the time is regarded as the receiving time when the electronic data messages enters this particular system; if no particular system is designated, the time is considered as the receiving time when the electronic data messages initially enters any system of the receiver. About the sending and receiving places, the principal office of the sender is considered as the sending place and that of the receiver as the receiving place, if there is no principal office, and then the habitual residence is considered as the sending or receiving places.

The electronic signature and authentication part has provided that reliable digital signature has the same legal validity as that of manual signatures and stamps, the ascertainment, storage and cease of the electronic signature, condition needed for providing the electronic signature authentication and the content of the authentication certificates.

The legal responsibility part has provided the responsibility that shall be assumed when the electronic signatory, the party dependent on the signature and the electronic authentication provider violates the relevant provisions, when anyone counterfeits, uses as his own or usurps others' electronic signatures, and when the staff of the departments in charge of the supervision and management

of electronic authentication service commits negligence or abuses their power.

The supplementary provisions provide the legal definitions of some terms in the law and the execution time of the law.

5.9 Summary

The transition from traditional commercial activities to e-commerce has posed great challenge to the current legal system. Due to the special characteristics of this technical means, it is hard for the current law to solve the legal problems occurring in the e-commerce activities. Yet without the resolution of these problems the e-commerce will not develop healthily.

This chapter concentrates on the possible legal problems in e-commerce, some of which can be overcome by amending or expanding the current laws while others, however, have to be dealt with in a completely new legal framework. The "Electronic Signature Law of the PRC" is an instance of solving the validity problem of electronic documents and electronic signature in e-contract by enacting a new law.

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6 E-commerce and Tax

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Abstract Tax is the main fiscal revenue source of a nation, and it gives the government sufficient resource to management, macro-control and stabilize the economy. E-commerce makes it more difficult to identify the tax jurisdiction, tax base, taxable items of an e-commerce company. E-commerce tax is more difficult to manage, but it makes it easier for enterprises to evade and avoid tax. While bringing great development chance and economic benefits to enterprises, this issue brings challenge to tax management department at the same time. This chapter investigates the challenges that e-commerce brings to tax management departments, and the countermeasures that governments could implement, and the proposals that researchers presented.

Key Words e-commerce, tax, jurisdiction, global jurisdiction, territorial jurisdiction, bit tax, Tobin tax.

Tax revenue is the primary fiscal income of a nation, and also one of the principal means to administer economy and regulate the market macroscopically. The development of Internet brings both opportunities and challenges to tax. In addition, the development of e-commerce and the change of trade form bring tremendous economic benefit to enterprises, which, however impacts the traditional tax theories to a large extent and presents a common problem to the governments: in e-commerce, how will the traditional tax system adapt itself to the development of e-commerce, to which all countries are actively seeking solutions. This chapter will cover the challenges that e-commerce brings to tax, and legal problems in e-tax as well. Finally some feasible strategies and suggestions will be introduced.

6.1 An Outline of Tax in E-commerce

Tax is a specific distribution relation formed by forcibly collecting practicality or currency according to the national laws.

1. The categorization of traditional tax revenue

(1) In terms of collecting objects, it can be divided into income tax, transfer tax, estate tax and action tax.

(2) In term of tax jurisdiction, it can be divided into domestic tax, foreign tax, international tax. According to the jurisdiction of government, tax can be divided into national tax and local tax. Taxes can be classified into direct tax and indirect tax, according to whether the nominal payers being real payer.

2. The concept of tax jurisdiction

Jurisdiction, a very important concept in the international tax law system, refers to the right that a government collects tax from individuals. Tax jurisdiction means complete independence of a sovereign nation in tax revenue administration and tax legislation. Moreover, it stands for denial to any foreign interferences or controls.

There are two principles concerning jurisdiction: location principle and person principle.

(1) Location principle: The nation is entitled to tax on all income generated within the boundary of the nation and all property on the territory, no matter whether the income receiver or the estate holder is the citizen of the nation.

(2) Person principle: The nation is entitled to tax on all income and all estate belongings to its citizens (including natural and legal persons) all over the world, regardless of whether the income is generated inside or outside the nation. Citizen jurisdiction is also called nationality jurisdiction.

It is distance and time that give e-commerce advantages over traditional trade. That is, anyone with a computer, a modem and a telephone will be able to participate in international trade through Internet, which makes e-commerce moveable. Meanwhile, more and more trades are paperless or anonymous without invoice. With the disappearance of account books and invoice, the paper vouchers of taxation invalidate audit. So e-commerce possesses the feature of the concealment. These two features bring about the following problems:

① The loss of tax revenue. As e-commerce is bringing more convenient trade mode and less cost, more and more multinational enterprises are employing e-commerce. The development of e-commerce makes the tax departments unable to carry out corresponding levy strategies, and work out corresponding systematic laws to regulate the e-commerce behaviors of enterprises, which results in a lack of tax management and great loss in tax revenue. Theoretically, tax losses on e-commerce are primarily customs, consumption, value added tax, income tax and stamp duty, etc. Since it is effective to avoid tax by e-commerce, some enterprises try to avoid tax by making trade online, which causes chaos in the market.

② The difficulty of tax administration and check caused by digitalization of tax credence. Traditional tax administration is based on physical credence, accounting volume, and various report forms, auditing the validity and authenticity. But the report forms and credence in e-commerce are all transmitted electronically, which can be easily modified or deleted without leaving any traces. Thus it is very difficult to carry out tax check in the traditional way. So in the long term view, the existing tax system should be improved to be adapted to the development of e-commerce; however, at present, more effective measures shall be taken to administer e-commerce.

③ Loss of tax. Owing to the flourish of online trade, more and more enterprises, especially the multinational corporations move their business online, and accordingly traditional trade decreases. However, corresponding strategies and law system have not been carried out to regulate the online trade, which leads to a loss of tax revenue. It is conservatively estimated that our country had lost 1.3 billion RMB from online trade in 1998, and the rate is increasing by 40% per year.

④ Increase of audit difficulty. Traditional tax administration has to depend on account volumes, but online trade is carried out without paper media, the account volumes and invoices can be filled in computers; and the credence can be easily modified, thus the tax administrators generally could not perceive the details of the business, and it is easy to cheat on tax. In addition, because of the development of encryption technologies, tax payers can protect their information using password, which brings about the difficulties in collecting information.

⑤ Possibility of avoiding paying tax caused by Internet. The global Internet enables the enterprises to gain more benefit from business, at the same time, enables the enterprises to avoid taxes as well. Moreover, the application of network and encryption technology makes bargaining easier and concealed. Thus the competition of tax administration and tax evasion will be fiercer.

⑥ Chaos in tax administration. As the boundary between physical products and information service online becomes more obscure, tax administrators find there is nothing to do with intelligence property sales and paid consultations. Many trade products have been transformed into “digital information” and transmitted on the Internet, making it difficult to determine whether a certain income is a sale income, a service income or a license fee. Due to the confusion in this categorization, the tax administration becomes a mess. Online trade occurs in a cyber space instead of a specific location, so it is impossible to associate an income with a specific location, and it is difficult to identify the tax payer.

⑦ Inclination to a jurisdictional conflict. The national jurisdiction is a key problem in tax, and currently most countries are exerting both location jurisdiction and citizen jurisdiction, and the duplicated taxation is usually exempted by a two-side tax convention. However, both methods in Internet trade will face challenges. First, the development of Internet will undoubtedly weaken the location jurisdiction. Foreign enterprises only need to install intelligent authorization servers to trade digital products, but the behavior of servers is hard to classify or

analyze, and the buyer of the products is also hard to identify. Internet enables the service industry to break through the restriction of territory, and the service provider could be anywhere. As a result, e-commerce has made it controversial to judge the location. Moreover, citizen jurisdiction faces challenge as well. Now it is the administration center that determines citizen identification. However, some unprecedented situations may become real as e-commerce comes into being. For example, the administration center of an enterprise may exist in several countries or no country at all. In this case, the tax administration will be unable to levy tax according to person principle.

⑧ Difficulty in collecting information resulted from the multinational trade on the Internet. One of the most promising domains of Internet is international trade, and anyone involved in the trade will expect to reduce the cost to domestic trade, financial service being a necessary condition to this. To stimulate the development of online trade, Internet has begun to provide tax protections for some districts. Domestic banks are the primary information sources of tax administration; administrations can retrieve information by checking the bank accounts to get information of the tax payers and judge if the declaration is true. Even if the administration does not impose frequent inspection, the potential tax evaders will realize the risks. If the information source is located abroad, this supervision mechanism will be discounted largely, which makes tax evasion possible.

The rapid development of online trade imposes great challenges to traditional tax jurisdiction, but it is not insuperable. Since online trade is still at its initial phase, it is not late to take measures.

6.2 Features of E-commerce Tax

E-commerce is based on the Internet, which is quite different from traditional trade patterns in form and means, so the problems caused also have their uniqueness.

Virtual: virtual behavior, virtual tax concept, and virtual tax information.

Multinational: it is easier for tax evaders to succeed because of this feature.

Concealment: tax administrations cannot have a clear view of the actual situation of the anonymous vendors and customers.

Convenient: since the e-commerce trade is completed online, e-tax provides new ways of tax jurisdiction.

Because the adoption of modern computer network technologies has realized the transmission of such electronic information such as declaration, invoice, tax settlement among tax payers, banks, cash offices and enterprises. Therefore, declaration and tax payment can be completed at one time, which speed up the transfer of documents and shortens the flow of the taxation so as to realize the timely taxation. Declaration without paper is realized by electronic declaration to facilitate information exchanges between tax payers and tax administrations and it is the same with tax payment by electronic balancing to facilitate capital

exchange between tax payers and tax administrations. Compared with traditional tax collection, e-tax is not restricted by time or space, which makes tax collection convenient, simple, and time-saving at a low cost.

6.3 Problems in E-commerce Tax

1. Problems concerning international tax distribution and domestic tax revenue

(1) Exemption of e-commerce customs. US first set up an exemption of customs of online intangible goods (e.g. electronic publications, e-journals and software etc.). At present American enterprises constitute 2/3 of all the e-commerce network companies all over the world, and the US also takes a primary part in digital products around the world. If the customs of digital products is exempted, the American enterprises will be able to go over the tariff barrier and benefit a lot in this trade. The EU members announced the "Report on Protection of Tax Revenue and Stimulation of e-commerce" in June, 1998, and achieved agreement with the US on exemption of e-commerce tariff. However, EU also forced the US to agree to impose indirect tax on digital products on the Internet, and insist that the tax be levied inside EU countries. On the other hand, most developing countries hoped to impose tariff on e-commerce (digital products) to protect their own industry and defend state sovereignty.

(2) Favorable taxing on e-commerce. Internet Tax Freedom Act passed in the US in October 1998 prescribed that Internet Access Taxes are temporarily exempted (or called deferred taxation) in 3 years to 2001. Moreover, multiple or discriminating taxing on e-commerce should be avoided. As for tax on long-distance sale, the nations and states should not impose tax on such sellers who visit the long-distance website (their server is in another country), which is regarded as a factor to impose tax. On one hand, this avoids unfavorable effect on e-commerce caused by unnecessary taxing and speeds up the development of US E-commerce (as for the avenue loss of state and local government caused by exemption of e-commerce can be covered by means of the transfer payment of federal government); on the other hand, the relevant laws inside the US could not carry out fair and effective supervision on e-commerce, thus the US government insists to impose favorable tax policy on e-commerce.

Based on this, we should begin to carry out our own favorable policies for e-commerce (according to international convention, the tax exemption on e-commerce generally lasts for 2 – 3 years. According to operation and development of e-commerce, our taxation will not be shocked intensely by global e-commerce. We can still make tax administration of tangible goods trade involved in e-commerce by customs, and make tax administration of digital products such as software, databases products and audio-video products etc.). The guideline is to formulate favorable taxation polices for both e-commerce and hi-tech industries closely related to e-commerce with the premise of defending state sovereignty

and guaranteeing national revenue. These favorable polices will not influence our national revenue but speeds up the development of e-commerce.

(3) New tax imposed on e-commerce. In 1998, some governments and experts proposed in UN conference, that the new tax on e-commerce, "Bit (denomination of electronic information flow rate) Tax", should be imposed on e-commerce except the tax, which is strongly objected by the US and EU on being put forward. At present, most countries have reached an agreement on not imposing "Bit Tax" on e-commerce. In 1999, the UNDP still insisted on collecting bit tax on e-commerce, namely, 1 cent for every 100 e-mails more than 10,000 bits, which will be used to make up the expenses of network construction in under-developed countries. This measure is understandable but actually with many problems: the behavior of e-commerce, price of goods and services and profits as well cannot be identified on the basis of information flow (at present, Internet boasts some free services.). To summarize, Bit Tax does not go with the "fair and neutral" principle. Furthermore, if a company is with large network flux (information flow), it indicates that the company pays more, including tax, to make use of the communication line for a longer time.

2. Restatement about the taxation

(1) Identification of standing body. In international tax law, the standing body is a very important concept in tax jurisdiction. If the citizen of a contractor nation does not maintain a standing body in the other contractor country, the other side will not be able to impose tax on the citizen. That is, taxing power goes to the country where he lives. Otherwise, the source country will impose tax on the standing body for its profits and other incomes. There are three standards to determine the standing body:

① Business location standard. In the prototype of OECD and UN, standing body is defined as the fixed place that an enterprise carries out all or part of the business. The enterprise engaged in e-commerce usually rents a space in the server (that is, a website) provided by the Internet Server provider of a country to trade on the Internet, fixed business places and staff in such country, while some enterprises set up a website at home or in a third country. Thus some countries proposed that the website or server should be the standing body, and should be taxed on. Some even proposed that the website with any profits, whether in the enterprise country or the third country, should be taxed on.

② Deputy standard. If a non-citizen has an independent deputy within a tax jurisdictional area, this dependent deputy has the right to sign contracts in the name of a non-citizen, the activities of this dependent deputy should be deemed as a standing body. It is still controversial whether an ISP can become a dependent deputy or not. If a certain ISP is outside a national jurisdiction, but its activities are inside this jurisdiction, it cannot be deemed as a standing body (namely, a dependent deputy); if the activities that ISP performs for clients are only a part of the normal activities inside a jurisdiction, this ISP cannot be a standing body

(dependent deputy); only when the activities of the ISP completely represent those of a non-citizen, can the ISP be considered as a standing body.

③ Activity standard. If a person does not have the right to sign contracts on behalf of a non-citizen, but always provides, reserves, and delivers goods/commodities within a national jurisdiction for non-citizen, we should consider that this non-citizen has a standing body within a national jurisdiction. Then, does it constitute a standing body with a server within a national jurisdiction? OECD thinks that if the business of the enterprise is primarily by automatic equipment, and the activities are restricted to setting up, operating, controlling and monitoring the equipment, it can be considered as a standing body. According to the documents of US Department of Treasury, e-commerce will not become a standing body, since it does not qualify the standard of it. Or it is the exception of the standard. In terms of American tax conventions, a warehouse or storage does not constitute a standing body. Since the computer server is like a warehouse or storage, the existence of a server within a national jurisdiction will not become a standing body, for it is not a stationary business location, nor complies with the standard of a standing body.

(2) The property of income. Most tax conventions and corresponding laws have different prescriptions of different types of taxes. But the international law of income property is suitable for e-commerce. Given the tax pact, if a non-citizen has business profits from sales of goods in sourcing country, profits can be taxed by sourcing country only when the profits are obtained from standing body. As for the non-citizen's royalties and compensations of personal services obtained in his sourcing country, the sourcing country can impose withholding tax. However, in the e-commerce era, the difference of the three profits mentioned above has become vague, and the software sale is a case in point. As for the income from services, traditionally, a service provider should go to the client location, but currently a service provider will not have to go to where the client resides to provide service, many of which can be provided online, such as online medical diagnosis.

(3) Taxation compliance. The problems mainly result from Electronic Money, the identification of e-commerce participators, the disappearance of go-betweens and the storage of accounting records.

① Electronic Money (EM). EM, a convertible currency, is electronic and digital, which can be transferred rapidly at a low cost. Meanwhile, EM, a systematic currency, can be tracked and stored. Moreover, it requires high security and an intermediate to initialize the system. There are two kinds of EM systems. The first one is an account system, similar to an auditor, which is usually maintained by the third party such as a bank, and provides a way of keeping track of the currency flow in an entire economic activity; the second kind is a non-account system, similar to cash currency, which cannot be tracked. From the perspective of taxation, EM transfer is not easy to supervise, for EM cash can be transferred abroad at a low cost. In virtue of the maturity of technology, EM (non-account

EM in particular) can be used as payment over long distance via Internet, which may impose a tremendous strike on taxation. Traditional tax evasion is limited since the amount cannot be too large. In EM, however, because the amount is usually huge, and it is stealthy and free of tracking, the chance of tax evasion is very significant. Thus the tax administrations in some countries are trying to solve potential tax evasion by adopting new technologies to improve the tracking mechanism of EM.

② The identification of participants of e-commerce. For tax administrations, the identification of participants of e-commerce is of vital importance for the execution of taxation laws. For example, the identification of an online trader has a bearing on jurisdiction. Currently, EC is exploring a solution: the e-commerce companies make a kind of digital certificate (DC), issued by a committed intermediate, which can be used to identify another person online. The committed intermediate will be responsible for identifying the involvers' identities and taking background investigation. DC will generate a trace, which will facilitate the tax administration to track the online trades and accordingly out down the falsification of account books by traders on the Internet.

③ Disappearance of intermediates. In an e-commerce trade, product or service provider can provide the products to customers directly without intermediates (e.g. agents, wholesalers and retailers), which may exert an influence on taxation in the following three aspects: ⓐThe tax originally imposed on the intermediates may disappear. Internationally, some countries may have more tax while others less. ⓑThe disappearance of intermediates will complicate taxation. The original substantial tax taken from the minor intermediates has to be imposed on major consumers with petty tax. ⓒTax declaration will be weakened. Tax administrations can audit the intermediates that can provide information concerned and withhold tax, but once they disappear, many inexperienced tax payers will become a part of e-commerce, which adds load to tax administrations. The US has proposed two solutions concerning this problem: on the one hand, confirm jurisdiction according to international common understanding and bilateral taxation pact. On the other hand, the stakeholders co-develop software or equipment to deal with withholding taxation and other declarations.

④ Storage of record. In e-commerce, tax payers engaged in sales and services may not create a paper record. The trade has become digital, and all these records may take the electronic forms that can be alerted easily. Moreover, tax payers engaged in tangible goods sales may also receive electronic order and issue electronic invoice. Therefore, electronic records and documents concerned must be investigated and verified to minimize tax evasion.

3. Taxation Jurisdiction

(1) Transfer pricing problem. According to persons in Europe, US and OECD, the current international transfer pricing criterion basically fits e-commerce. However, as e-commerce is not restricted by space, the tax administration has faced growing difficulties in tracking, identifying and confirming international

trades. Therefore, as all nations have been supplementing, revising and perfecting the current transfer pricing criterion, the construction of facilities (hardware, software, and standard included) tax administrator shall be reinforced to improve the quality of data check in e-commerce.

(2) The identification of digital products property. How to identify the property of downloadable digital products (electronic publications and software etc.)? In the conference of OECD in October 1998, EU proposed that because most countries adopt value-added tax revenue, and the supply of digital products is regarded as supply of labors and the digital products be imposed value-added tax, which the US was forced to accept.

(3) Taxation jurisdiction problem. In e-commerce taxation, tax administrations could not easily track and identify the tremendous transaction data as the proof of tax. Then it is proposed by European and American countries that an e-commerce tax collection mechanism should be established based on the supervision paying system. The two sides (the buyer and the seller) in e-commerce have to balance through banks with all orders and data stored in computers, the participators cannot be completely anonymous. With the paying system as the supervision emphasis, tax administrations could conveniently take control of the e-commerce transaction data to determine the ratal. Our country can refer to the new model, developed by European and American countries, in selecting e-commerce models.

4. Common matters in domestic e-commerce

(1) The primary income source of the network company and probable taxation

① Network charge, the charge taken from customers in terms of time and fixed amount is the primary income source of network companies. The network service belongs to communication business, which should be taxed at a 3% rate.

② Network advertisement charge, namely, the charge taken when one publishes advertisements on the Internet. Advertisement publication belongs to advertising business, which should be taxed at the rate of 5%.

③ Domain registry charge, the charge taken from applying for domains home or abroad for clients. This belongs to factorage in service industry, which should be taxed in dual channels. On the one hand, 5% of agency charge in all with no deduction of registration fee shall be taxed as sales tax. On the other hand, 10% of registration fee shall be taxed as withholding taxation before paying websites of other countries.

④ Charge from web page manufacture and maintenance. Web page, a form of electronic document on the Internet, is primarily for introducing enterprise culture, products and business, and collecting feedback from customers. This sort of charge should be taxed at 5% in terms of service industry.

⑤ Server rent. This kind of charge should be taxed at 5% in terms of leasing in service industry. All incomes of network companies should be strictly differentiated, for not all of the business should be taxed at a rate of 3% in terms of the communication business.

(2) The content of e-taxation service

① E-taxation service. It functions in the following two aspects. First, it provides access to taxation documents, such as rules, and policies. Second, it provides the submission and handling of taxation by way of electronic information. For instance, various deferred declaration reports, and e-mails can be dealt with by telephones, faxes, and Internet etc. Processing transactions concerning taxes could be via network, such as submitting a delay report via e-mails or faxes.

② Electronic declaration. Tax payers transfer declarations to tax administration directly by making use of various tools (e.g. telephones and computers) in such communication network as telephone network, packet switch network and DDN etc. This realizes the exchanges of electronic information between tax payers and tax administrations and the electrification of declaration. This form of declaration best suits on the condition that the legal and technical conditions are complete.

③ E-taxpaying means taxation balancing of tax administrations, banks and cash offices via computer networks, which realizes the payment of taxation (cash flow) without paper, but the prerequisite is a good e-paying system.

④ Other forms of service. For example, there are the integration of electronic declaration and taxation system, which collects and use of data of financial statement and invoices.

(3) Networking schemes of e-taxation

Since different tax administrations and banks use different computer systems, the networking might have several patterns: ① taxation systems establish connections with other units by equipment of Internet and software distribution of batch files connected by public data exchange network (such as X.25, DDN, FR) or routers. For the security reason, independent routers and static routing scheme should be employed, and the secrecy of FR address and router configuration should be enforced. Data transfer can be carried out either by FTP, e-mails or multi-platform IBM Message Queue management software. This method requires less investment and low-cost maintenance, but cannot support real time access. ② Establish intranet among departments. Different departments and units can share information and data while outside departments cannot login in. Bookstores and banks can have unified and authorized data format to facilitate data exchange. The departments interconnected by networks and large-scale databases establish integrated management system with high-speed and reliable DDN or FR line and the technology of distributed database to realize data sharing by database backup. They can also use TCP/IP protocols to realize the sharing of functions and data among tax administrations and banks. The exterior network has a high degree of data sharing, but requires investment and high-standard maintenance; while batch data switch is relatively easy to manage. ③ VPN technology. Though it is up to date and undergoing a rapid development, it is not mature and widely applied and not suitable for platform development.

(4) Commitment on banks to pay tax directly

If tax payers sign an agreement with banks and taxation administration, the tax administration will compute the amount of tax due, and inform the bank to make

balance in the tax payer's account. These actions are done by the bank under the commission of the tax payer, thus it is named direct bank commission taxation. After finishing taxation declaration, the tax payers will notice the bank, the toll unit (tax office), bank account of receipt and payment banks and tax, and then the payment bank keep balance between the tax payer's account and the receipt. This action can be done on the condition that the tax payer notices the banks initiatively, thus it is called "notice to tax".

(5) The domestic e-commerce taxation

At present, differences of laws and financial systems in our country and those in other countries (the developed ones in particular) lead to the differences in taxation involved in e-commerce. Therefore, e-commerce in our country has the following problems.

① Administration of Value-added invoice in e-commerce transaction. Currently the income of the domestic e-commerce companies comes from the service fees proportional with the total trade amount of B2B and B2C business. In order to gain sufficient service fees, e-commerce companies usually require the enterprises(mainly sales between enterprises) to transfer the payment deducted by the service fee to the account and then to the account of the other enterprises with the added value tax invoice discharged by online companies. This results in the difference between the amount on the invoice and on the enterprise bank account. In this case, value added tax should not be imposed on in terms of regulations of value-added tax management. Thus some e-commerce companies one after another apply to be general tax payers of value-added tax, and "change" the original business mode, that is, purchasing goods from an enterprise and then selling them out. Actually, the commodities are also transferred from one firm to another, with the payment transferred to an e-commerce company. Thus, the e-commerce company has to make a fake storage ("virtual storage"), but this behavior does not accord with administrative regulations. However, if the e-commerce company establishes physical storages, it will lose the advantages of reducing cost. In light of proposal of tax administration, e-commerce companies have to establish a sound commercial credit to solve it so as to solve the problems mentioned above.

② Invoice generated by computer in e-commerce trade. Most programs in e-commerce trade of some network companies are run online, while invoice is generated off line, which requires five or six employees specializing in writing invoices. This, accordingly, increases business cost on the one hand, and decreases trade speed on the other hand. Some service companies propose that taxation companies should make some trials on computer-generated invoice, and carry them out in practice after acquiring experience, which is considered as a beneficial and feasible technology by tax administration.

③ Multiple accounts in e-commerce companies. Now the bank accounts opened by clients (consumers and enterprises) in e-commerce are spread throughout the commercial banks and urban credit corporations. However, the commercial

banks (including urban credit corporations) are not completely interconnected, so the fund transfer usually needs 3 to 7 days, which is a great impediment to the development of e-commerce. Thus taxation administrations point out that the best solution to this problem is to establish a sound, secure, fast and convenient financial system. Before the system is established the national administration of technical supervision can register the enterprises using universal enterprise code. In this way, even if the enterprise has several accounts, the tax administration can administer the taxation of the enterprises according to the registration number.

④ The legal validity of the e-commerce transaction. The experience of e-commerce laws proves that, the legal validity of e-commerce data is the prerequisite of the establishment of e-commerce legal systems (now the network technology can guarantee the security and validity of e-commerce data). In current laws, the regulations concerning digital data usually require that electronic data (Bit) be restored to paperwork, which is the same with traditional commercial management. This is not suitable for the development of e-commerce and leads to the lack of legal instrument in business, tax management and administration of law. For example, some online transactions (mainly not extensive transactions) involve execution after the payment is due.

⑤ The foundation of taxation lies in that tax administrations can control the tax payers' property via certain means, for example, the accounts and commodities of the tax payer can be closed, frozen or auctioned. However, with the flourish of intellectual industry and the e-commerce, the property of tax payers is not easy to be tracked by tax administrations. Thus, this brings about a new problem in the taxation. If the taxpayer sells his intellectual products by electronic information, e.g. selling the software/program developed by him by downloading and has an account abroad, it will be very difficult for the tax administration to execute any measures, for the tax payer does not have anything that is concrete to be executed by the tax administrations. In addition, the universal cooperation between tax administrations is in great need when freezing bank account and transferring tax need. In that case, it is doubtful whether lien security claim for tax and imposing on tax mean something to tax payers in the intellectual industry.

6.4 E-commerce and Tax Administration

In tax administration, e-commerce has imposed many new problems:

(1) Because of the mobility caused by e-commerce, it is difficult to track the transactions.

(2) If the computer server is considered as a permanent institution, is it supposed to be taxed? If it does, which part of the revenue should be attached to this institution?

(3) The paperless transactions in e-commerce have the result that the certificates of the transactions are easily modified, which makes the traditional way of

taxation inspection baseless, and increases the difficulty in tax collection and check.

(4) The direct transaction via Internet yields the diminishment of the power of commercial intermediate and the intermediate-based taxation.

(5) Stamp tax is a traditional tax of all countries, the base of which is the paper certificate provided by all the parties involved in the transaction. Thus the paperless transactions on the Internet make the tracking audit baseless, as well as the certificates for the stamp tax meaningless.

(6) International tax evasion administration evoked by e-commerce: E-commerce is highly fluid and hidden, which leads to various new means of tax evasion—some by taking the advantage of the hidden property of e-commerce, some by making use of its fluidity and some by its erosiveness.

All the problems listed above need careful consideration from the tax administrations. The way that they are dealt with has a lot to do with the development of e-commerce and the national tax.

The principles of taxation in our country on e-commerce:

(1) Justice: E-commerce, though a digital commercial form, has not changed the essence of trade and still should be subject to the administration of traditional taxation regulations and be imposed on in terms of the principle of justice. The justice principle means that the existing tax regulations need to be modified in order to adjust e-commerce to the existing framework of legal regulations.

(2) Neutral principle: Though taxation policies are effective in strengthening and preventing tax drain, they should not become the impediment of the development of e-commerce; neither influences the choice of trade types of enterprises. Now many countries in the world are trying to cancel the barrier of e-commerce. In the case of the initial phase of e-commerce, we should not impose new taxes on e-commerce, but use primarily the existing regulations to deal with taxation problems in it.

(3) National taxation sovereignty principle: Some countries in the world, such as the US, propose that local jurisdiction should be replaced by civil jurisdiction, the aim of which is to maintain the benefit of advanced technology and deprive the developing countries of their power to tax. Under this circumstance, we should unite all the developing countries to make better regulations and maximize their own benefits by attaching equal importance to person principle and location principle. Moreover, we should take a close study on standing institution and its essence, revise the scope of intangible assets and make definite the laws concerning the ownership transfer of intangible assets.

(4) Financial income principle: The establishment and development of e-commerce taxation regulations should always conform to the financial income principle and the national benefit so as to guarantee the national normal expenses. In the case of e-commerce, the requirements are: ① The taxation on e-commerce and other industries can satisfy the need of the public payout in a certain period. ② The taxation on e-commerce should be flexible. For instance, if the flexibility

is equal to or more than one, it will ensure the synchronized augment of financial income and citizen income.

(5) Convenience principle: The taxation policy should take into account the cost and technical features of the Internet.

Appropriate discount principle. It is advisable to impose relatively lower tax on e-commerce in our country to speed up its development and explore a new tax source, which is in agreement with many countries. For instance, the former US president Clinton publicly approved that the state governments should not impose taxes on online commodities before the year 2000. To shorten the process that e-commerce become more mature, the US government even proposed that the online transactions such as computer software and service online are tax-free.

6.5 Strategies in E-commerce Taxation

The problems caused by online transactions have drawn attention of the governments and the international society. Many experts proposed various solutions via conferences, media, and articles. Some of them are listed as follows:

1. The scholars' perspective: open new taxes. New taxes proposed include bit tax and Tobin tax

(1) Bit Tax: It means to impose taxes on each digital unit, including data collection, voice communication, and image transmission. Currently, bit tax remains controversial, for there might be many problems in this solution. Actually, this solution will seriously impede the development of network. However, the advocates think that those flaws can be overcome by making some websites tax free. The bit tax solution is objected by the enterprises, the reason being that this solution is too aggressive. As for this, the governments agree with the enterprises.

(2) Tobin Tax: It means that imposing tax in proportion to the currency flow of online transactions. This solution also has a lot of problems, for instance, the Tobin tax will decrease the amount of stock investment and impulse tax base. Moreover, this solution does not consider the currency flow is interest or bonus. Thus the tax payers will try to minimize the taxation.

Although the two solutions mentioned above have great influence, many countries and organizations do not adopt them when making policies.

2. The US perspective

The US published the e-commerce outline "*A Framework For Global Electronic Commerce*" in July 1997, in which five principles were proposed: the development of the Internet should be lead by private entities; the government should avoid imposing inappropriate restrictions on e-commerce; if the official interference is necessary, it should support a predictive, uniform and simple legal environment

of e-commerce; the government should recognize the essence of the Internet; the development of e-commerce should have a global base. According to these principles, the relevant taxation principles should include: no impediment or discrimination against any specific trade; simple, transparent and executable; reducing the cost of maintaining the records; accustomed to the domestic taxation system. With respect to customs, the report thinks the digital commodities or services transmitted via Internet should be free of taxation. Since the Internet has no definite boundaries, the online transactions should be classified into two categories, the digital commodities such as software, music and movies should be tax-free; on the other hand, the commodities that are transmitted in traditional ways should conform to the existing taxation regulations even if the contract is online. Moreover, in this report it is said that the online commercial activities have no definite and fixed geographical routes, which is historically the characteristic of the commodity trade. Therefore, although it is possible to make orders online, the commodities should still be imposed tax. Now many countries are seeking new sources of income, maybe they will try to impose tax on the global e-commerce. Thus the US government proposed that the WTO and other organizations should declare that the Internet is a tax-free zone. This issue should be dealt with timely to ensure that this principle is established. Furthermore, the US government believes that e-commerce suits the existing tax regulations, and no new tax should be imposed on e-commerce. E-commerce taxation should conform to the principle of international taxation and should be easy to carry out by governments and avoid double tariffs.

Later, in the conference among OECD ministers and the conference among WTO ministers in 1998, the participants all agreed not to impose tax on e-commerce. The global standard conference in Oct. 1997 supported the US perspective that Internet should be private-oriented. In 1998 the US and Japan promised not to administrate e-commerce. And the France and US also came into common understanding to maintain fluent information. The US and EU stated that they made no governmental management of network. And afterward, the US, Holland, Korea, and Australia all made declarations to support the US policy of e-commerce.

In 1998,the US promulgated Internet Tax Freedom Act. (The 1998 Internet Tax Freedom Act.) and a series of tax-free policies about online transactions. However, with the flourish of Internet and e-commerce, more and more consumers have defrayed more and more money which leads to the dispute on imposing taxes on e-commerce becomes aboil. In 1999, a report published by the Jupiter Communications of the US indicates that most of the retail of e-commerce ($400,000,000,000 that year) is produced at the cost of the traditional tradesman. Since it is not prescribed that taxes should be imposed on online transactions, consumers can now shop online without being imposed. But the government is worried about the loss of taxes and the necessary retail taxes imposed from the traditional tradesman. They say that the earning of taxes will decrease and then the infrastructure and service expense will have to be cut, unless the taxes are

imposed on online transactions. On the contrary, the opponents sneer at the above worries and point out that online transactions account for a little proportion of the total consumption expense and taxes will restrain the increase brought by Internet.

In a word, as the advocator, pioneer and beneficiary of the development of Internet and e-commerce, on the one hand, the US carried out a series of effective policies and laws on e-commerce development. For instance, the policy that governments should interfere the development of e-commerce speeds up the development of e-commerce and Internet to a large extent. On the other hand, there are unsuccessful aspects, for example, it is the loose management of Internet and e-commerce that results in hidden trouble in management and law. Nevertheless, we should recognize its stand and measures to safeguard its own interests. Take the fact that e-commerce are exempted from tariffs as an example. Of course, we also admit that imposing on e-commerce completely is indeed very difficult from the perspective of technology and management. However, it is beyond doubt that the United States is the biggest beneficiary by announcing tax exemption of e-commerce before conducting a thorough study on this issue with other countries. Because the object of complete e-commerce is simply software, books and audio-video products most of which are exported by the United States. With the flourish of Internet and e-commerce, there will be more and more digital products, and it is very likely that United States will be in a dominant position all along. Therefore, as to the idea proposed by United States that tariff should be exempted from e-commerce, but some countries expressed disagreement or made no comments on it. In addition, it is very difficult to refer to some practice of the US because countries vary greatly in Internet assess tax, and service tax.

3. Solution to e-commerce taxation by OECD

At the conference in Finland in November 1997, OECD came to an agreement as follows: any motion on taxes should ensure the neutrality and reasonable revenue distributing to avoid double taxation and excessive implementation costs; the taxes implement is more exigent than that of taxes policy; the government and businessmen should jointly work out the solution to tax; international cooperation is of great importance; the tax system should be based on the global trend; the taxes should not be the barrier for the e-commerce development; e-commerce should not undermine the tax system and should avoid “Bit Tax” as much as possible.

At another meeting on e-commerce taxation in October 1998, OECD further clarified: revenue should be built on neutral, effective, reliable, simple, fair and flexible principles; it is not practical to set up another tax system under the current system. If the traditional business involved in entity transaction was force to adopt policies of the e-commerce, it would lead to inequality such as double taxation and so on.

4. Canada

In April 1997, Canada Taxation Bureau set up the e-Commerce Advisory

Committee to study the domestic and international e-commerce development. The Committee, in April 1998, completed a report, "*E-commerce and the Canadian Tax*", on how to ensure the integrity of Canadian tax system. As to Canada's policy on e-commerce, the report recommended that:

The private sector should be in a dominant position in e-commerce development, management and promotion.

To ensure the growth of e-commerce, the government should create an enabling policy and legislative environment, and recognize the importance of removing all obstacles to e-commerce as soon as possible.

Though different in forms, electronic transactions and traditional transactions have the same tax levy.

The government should avoid excessive regulations, limits and taxes to e-commerce.

The government should understand the Internet, and should be a model in the use of Internet and e-commerce.

Economic policies in revenue should be neutral, equal, simple and feasible to avoid multiple taxations and realize rational distribution of taxes.

In addition, the report also suggested: "Bit Tax", the consumption tax imposed on digital information transmission, breach the principle of not imposing taxes on electronic transactions. Although some foreign jurisdictions had brought forward or started testing "Bit Tax", the Committee believed that "Bit Tax" would hinder the growth of e-commerce. The Commission also believes that some major issues are from the jurisdiction conflicts of collecting multiple transactions jurisdiction. The proposed solution would be international jurisdiction on the competition between reasonable revenue sharing and mutual cooperation. They also considered whether Canada should advocate for income tax, benefits and the international distribution or not. One of the possible ways is that commercial enterprises, in several jurisdictions, apply the global income distribution formula. And a global distribution formula should include the following three main points: recognition of the tax levy, including the branch offices and branches of the enterprises; recognition of global interest income, particularly different criteria for the calculation of profit and loss of different jurisdictions; recognizing the jurisdiction of competition between the distribution of its benefits formula.

As to the income tax returns on e-commerce issues, the Committee compartmentalized them into intended ones and unintended ones.

For the former, measures that could be taken are as follows: ① Canadian tax authorities should work out a set of methods that can recognize online commercial activities, for example, network search software to track tax evasion. ② Checking the existing tax law to find rules that provide penalties for failure to comply with the law to ensure its effectiveness. ③ Financial institutions must report the certain amount of cash or cash equivalent of transactions to the tax authorities.

For the latter, the measures are: ① Informing taxpayers of elementary tax rules on online commercial activities. ② Implement the website links on revenue to expand education and manage.

With regard to multiple jurisdiction on e-commerce taxation, the Commission holds: any enterprise in Canada shall be imposed on taxes and the location is the base of Canadian taxes. As it is more difficult to distinguish the location of an e-commerce company, the Committee recommends that the Department of Finance Canadian and the tax treaties signed should jointly work to deliberate how to shorten eligibility authorization process to reduce the impact of double taxation on taxpayers and should issue a notice to stress the importance of modern telecommunications living. In addition, the springing up of e-commerce makes it difficult to judge whether the commercial activities take place in Canada. Meanwhile, it is more difficult to judge whether the business operating outside, whose central management organization is not in Canada, has reported timely and appropriately the interest from their international transactions. Accordingly, the Committee recommends that tax authorities should check whether the income tax law on "commercial" defined appropriately in the e-commerce environment and emphasize the impact of modern telecommunications technology on "residence" and "engaged in business outside Canada". In addition, the report also pointed out: in an electronic environment, whether the concept "permanent positions" is effective? If so, how much does this concept influence e-commerce; if not, whether it should be replaced by another concept? Since relevant international treaties formulated partly by Canada stipulates that non-Canadian residents engaged in business in Canada pay tax if and only if their income are from business permanently in Canada.

As to tariffs on e-commerce, the Committee found: Canadian legislative policy demands that various states of every import transaction in tax calculation and reporting needs, including the original, the import and export transactions, and so on shall be made clear. The policies prescribe that rules shall be observed in obtaining records and appropriateness of the import and export transactions to ensure Canadian financial institutions information to confirm. As to e-commerce, tax authorities, together with the relevant, should formulate a set of e-commerce standards, the establishment of a standard format for storing information about the identification and qualification authorization in particular. In Canada, it is generally thought that the tariff applies only to tangible commodities, and because goods in electronic transmission are not material entities so they were not within the scope of taxation. The Committee did not comment on this phenomenon, but they held that tangible goods or commodities transferred in electronic transactions and goods or similar goods that are still trading traditional should not have different tax treatment.

Finally, the report also put forward the constructive proposals on the record-keeping, record encryption, digital signature and digital bill. On the record encryption, the report figured out that if the taxpayers do not provide the decryption key, it is difficult for Canadian tax authorities to learn and use those encrypted information. So if the original proposals were not declassified document encrypted or decryption key were not provided to the Canadian tax authorities,

Canadian tax authorities could deny the existence of such information in Canada or seek judicial relief.

5. Method of EU to solve the problem of e-commerce taxation

EU thinks that revising the existing taxation principles will be better than introducing new taxes and levies; European Commission proposes imposing a capital gains tax on the European consumers doing e-commerce on the Internet. The EU is not prepared to increase new tax on e-commerce activities, they do not want to remove the existing e-commerce taxes. E-commerce activities must fulfill tax obligations. Otherwise it would lead to unfair competition.

6. Strategies of ECTSG

ECTSG thinks that the taxation policies should conform the following standards to fit the development of e-commerce: neutral principle, the transactions involved in different purchase ways and by various applications should be equally treated; avoiding dual international taxation, import/export should conform a uniform standard; reducing the administrative cost.

7. Strategies of developing countries

The developing countries still have disagreement with proposal by US Department Treasury that taxation should be based on citizen jurisdiction, since by doing so the developing countries will suffer a great loss from importing technologies. Thus, with regard to taxation jurisdiction, there is great need for coordination between the developing countries and developed countries in the problem of taxation jurisdiction.

8. The strategy of e-commerce taxation in our country

Presently, our view on taxation shall be updated gradually and the legal system of taxation shall be perfected.

(1) Establish specific e-commerce taxation registration system. That is, the tax payer should go to the tax administration to register after completing the online transaction. First of all, the tax payer applies for registration of e-commerce taxation fills in forms and submits relevant materials, especially the key backup of the super user password. Moreover, the tax administrations audit the materials submitted by the tax payer carefully. Moreover, keep the information secret and had better set up a management system for passwords.

(2) Establish a favorable tax rate to enable separate taxation. E-commerce can help the enterprises reduce cost and promote efficiency, thus should be favorably taxed on the condition that the enterprises balance separately.

(3) supplementing items concerning about e-commerce taxation to improve the existing law system. When it comes to establish our taxation regulations, for the sake of national benefits we should stick to both person principle and location

principle because the fact that we are still a developing country. Meanwhile the characteristics of e-commerce in China shall be taken into consideration when stipulating supplementary terms on e-commerce in our existing value-added taxes, consumption taxes, income taxes, and tariff.

(4) Upgrade tax collection and management system with functional improvement. Increase tax collection and inspection by making use of computer network technology. There is a temporary method by placing software of tracking statistics taxation in the wisdom server so that it automatically calculate taxes in each transaction in terms of type and the amount of taxable income from the transaction. However, in the long run, it is necessary to develop a powerful e-taxation system to store documents and statements to complete a paperless tax. This will not only improve the taxation management of the traditional trade, but also meet the requirements of the development of electronic commerce taxation.

(5) Train the financial professionals with knowledge of information and tax. In the Internet era, the development of taxation cannot do well without talents. E-commerce and tax collection, tax evasion and leak stoppage, tax avoidance and the anti-tax avoidance are attributable to the competition of technology and talent. Currently, most of China's tax departments are lack of network technicians and related personnel are lack of the necessary knowledge of e-commerce. Therefore, in order to conform to the trend of the times and e-commerce revenue control at the front of e-commerce, it is necessary to make great efforts to train compound talent both mastering taxation and information knowledge.

(6) Actively promote international cooperation and coordination. Strengthen tax administration by collecting, handling, and storing information. The focus of e-commerce management is to strengthen exchanging international information and intelligence, because e-commerce is a network-based, open trade and it is difficult for tax department of a single country to fully grasp the information of transnational taxpayers. Tax evasion through online business can be prevented on the condition that tax departments make close cooperation to collect information and intelligence of the distribution sites of taxpayers in the rest of the world, especially sites located in tax havens from all over the world.

(7) Set up a special body to carry out extensive, and thorough research on issues involved in e-commerce. As China's e-commerce started relatively late, facing the problems derived from the development of e-commerce, particularly the challenges posed by e-commerce on the traditional tax system, tax policy and the current international tax arrangements, it is necessary to conduct research to understand, grasp the latest trends in e-commerce and international development trends, and in light of China's specific conditions and changes in the taxation system and raise plan of our country. In the view of author, China should set up a special body to study electronic commerce so as to speed up the development of e-commerce by tax regulations and polices and to speed up our economic globalization to promote the steady economic growth of our country.

6.6 Summary

The taxation problem in e-commerce, an economic, legal and international problem is involved in how and who to tax. Different principles will have different effects on e-commerce, impeding or promoting the development of e-commerce. Different jurisdiction principles will affect the benefit of different countries. Thus, the taxation problem is an international problem which needs the attention of the countries all over the world. All the countries should try to come up with appropriate policies to balance the benefit of each other.

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7 Network Enterprise Management

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Abstract Network enterprise management can be viewed as an extension of traditional enterprise management theory and practices, therefore, most of the traditional management theories and practices can be applied on e-enterprise. Yet, network enterprise itself has its own characteristics, and these characteristics are embodied by supply chain management, logistics management and human resource management within the network enterprise. These characteristics appeal unique management theory and practice so as to manage network enterprises efficiently. We must extend traditional enterprise management theory or develop new management theory. This chapter investigates the characteristics that a network enterprise posses, hoping that they can attract the attentions of management researchers. It is very important for the researchers to explore new management theory and practice for network enterprise.

Key Words e-commerce, network enterprise, virtual enterprise, supply chain management, logistics management, human resource management.

Network enterprise management is the natural extension of enterprise management theory applied to network enterprise. Because network enterprises have their own characteristics, the management theory and methodology of traditional enterprises cannot be completely introduced into this new field. This chapter mainly narrates how to effectively manage network enterprises and expounds strategic management, supply chain management, logistical management and human resources management of network enterprises.

7.1 Overview of Network Enterprises

7.1.1 Background and Basic Characteristics of Network Enterprises

Various descriptions about virtual enterprise had appeared since the notion of "Virtual Organization" was promoted in *Virtual Corporation,* the first monograph published by Kenneth Preiss, Steven. Goldman and Roger.N.Nagel in 1992. John. Byrne pointed out in February, 1993 that the virtual enterprise is a temporary organization made up of human and capital by means of modern information technology, and disbanded when a mission is completed. Without clear organization architecture, it is a temporary organization constituted of individual corporations connected through information technology instead, sharing technology, cost and market of the partners. In March of 1994, Micha Malone from America pointed out that a virtual enterprise is a temporary alliance based on common trust by associating individual units in a "transformed enterprise", as a common corporation does. It consists of manufacturers, suppliers, retailers and customers without formal organization chart, saying nothing of multilayer organization structure as traditional enterprises. According to Taiwan *Economic Times,* the basic spirit of virtual enterprises lies in breaking through enterprise limitation, extending enterprise intention, conforming to exterior resources and advocating managers to distribute his/her affairs to other members as much as possible. Enterprises should become miniaturized and decentralized. The internal investment should be as lowest as possible in order to respond quickly to market, thereby having an edge in global competition. Some scholars in China were of the opinion that virtual enterprise referred to a union of two or more enterprises or projects with core capability achieving common benefits by sharing core capability together relying on information network resources, in the form of full business responsibility to complete part mission of the strategic alliance individually. Share of the core capacity was achieved by strategic alliance and business outsourcing. This core capacity is a kind of competitive, distinct and inimitable capability owned by enterprises in the knowledge economy and is the organic amalgamation of enterprises technology or capitals such as production, technology, management, sale, service, trademark and patent.

After World War Ⅱ, Japan surpassed USA in manufacturing in the form of "Lean Production" and was in the van of manufacture. In the late 1980s, USA endeavored to regain the advantage in manufacturing and keep its international competitiveness. Therefore, the US Congress and Department of Defenses entrusted Iacocca Institute in Lehigh University with the task to establish an infrastructure of long-term program for manufacture technology in 1991. In the report *21st Century Manufacturing Enterprises Strategy*: *An Industry-Oriented Viewpoint* submitted by scholars Goldman, Nagel and Preiss in the institute in 1994, they put forward the new Agile Manufacturing pattern on the basis of

dynamic alliance after drawing the ideas from successful enterprises in the modern world, and creatively summarized the new type of enterprise named "Virtual Organization". They pointed out that the so-called virtual enterprise could make the enterprises succeed in the rigorous market competition by integrating the entire manufacturing resources of society with dynamic alliance.

The intrinsic requirements of market economy development and the maturity of the corresponding technology lay a solid foundation for the emergence of the new-style enterprise organization.

(1) The new characteristics of market competition demands enterprise to implement flexible strategy. The social development diversifies and individualizes customers' demands. The competitiveness of enterprises lies not only in product quality, price and after-sale services but mainly in its quick-reaction capacity to market changes, that is, the productive flexibility to meet special requirements of customers, which obviously cannot be achieved by the traditional large-scale, massive, single-functional rigidity production fashion. It is necessary for an enterprise faced the ever-changing market to implement an agile, brand-new strategy to seize the evanescent market opportunities, and to integrate original dispersive technology resources, human resources and management resources quickly and effectively, which can only be carried out by corporations with a new enterprise form. The initiator of the virtual enterprise theory owed the reasons why virtual enterprises came into being to the needs of enterprises to respond to agile competition.

(2) Information technology provides technical foundation for the forming of such new enterprise organizations. With the uprising of optical fiber communication technology and computer network technology, it creates a communion manner that gets away from the restriction of time and space for enterprises, eliminates barriers in information communication, and greatly changes the communication method within enterprises and between enterprises. At the same time, it influences manufacturing deeply and furnishes technical conditions for deep sharing and exchanging of product information.

In a word, in the era with changes within a short time and the trend for enterprises for speed, innovation and flexibility, the coming up of virtual enterprises will mark a new revolutionary epoch in enterprise organizations, and virtual organization seems to be the "optimum solution" for enterprises to response to environmental impact. In reality, many world-famous enterprises became tremendous success by adopting virtual organization.

7.1.2 Knowledge Management

Knowledge Management, which is on the basis of comprehension and perception of knowledge, is becoming an important paradigm in the management domain in China. Knowledge is an important resource which, together with matter and

energy, constitutes the world. Currently, the world economy is transforming from industry-dominant to knowledge-dominant, which can be summarized felicitously by "Knowledge Economy".

Knowledge, taking rising proportion in the economic development and creating rising value, has become the inner core element in economic growth. Moreover, the determinant of enterprise competitive capability increasingly consists in the productivity of knowledge which gradually substitutes the productivity based on physical workers. Because of the following reasons, knowledge, as an economic resource, possesses the advantages to which traditional substantial resources cannot compare—it is non-consumable, and can increase in the process of usage; it is not exclusive and can be shared by many people; it is non-scarce and extremely abundant and can be replicated and spread at very low cost; it can expand infinitely and can be enriched in use; the value of knowledge is gradually recognized by society and attached importance to by enterprises. Therefore, knowledge management is becoming the core matter of enterprises and organizational management.

In recent years, economists, enterprisers, scholars and media all began to pay attention to knowledge management, a management field with very prolific content. Different from any other traditional management, it improves enterprises' capability to deal with an emergency and build up enterprises' competitive power through exerting collective wisdom by identifying, acquiring, sharing and using knowledge. However, different from ordinary physical resources, knowledge has unique characteristics: it is indeterminate, hard to estimate and difficult to manage; there is an aging problem with it, that is, it will become out of season along with the development of science and technology; dissemination of it and extension of its use value cause prompt decline of the economic value of knowledge; it is implicit, that is, it cannot be separated from the person who masters it.

Since knowledge management had come into existence in the ancient times, it is inevitable that it will become an item on the agenda for both an organization and an individual with advent of knowledge economy, intense market competition and the development of knowledge itself:

(1) Knowledge management derives from "knowledge axiology". Knowledge is valuable and may create value. The essence of knowledge management lies in that it could improve capability of individuals and organizations to create value by making use of knowledge more efficiently.

(2) Knowledge management is a brand-new management pattern. The start point of knowledge management is to view knowledge as the most important strategic resource in organizations, and to take command and utility of knowledge as the key to advancing competitive power of organizations. It coordinates human resources in enterprises with information technology, market analysis and even management strategy to service enterprise development and create the effect that the collective is stronger than individuals.

(3) Knowledge management is with information technology as the tool. The fast development of information technology promotes quick derivation of information and knowledge. For instance, advanced information system, groupware and global information network provide technology foundation and communication platform for knowledge management.

(4) The core of knowledge management is to advance the capability of meeting an emergency and innovation. In the times of knowledge economy, the quick-reaction to external requirements and the innovational capability constitute the key factor to determine the enterprise's future.

(5) The introduction of knowledge management is the necessary demand of organization survival and development. Knowledge management and innovation become the focus and spotlight of enterprises because capital assets bring less value daily, while the competition of survival and development of organizations gradually turns to management practices. The key to enterprises' survival lies in the orderly management of enterprise knowledge and the creation of special knowledge.

To make full use of knowledge management at the lowest cost, it requires enterprises to master three principles—accumulating, sharing and communicating.

(1) Accumulating principle: Whether for organizations or for individual, knowledge accumulation is the foundation to implement knowledge management. The process of knowledge accumulation is just the growth of enterprises, and also the determinant factor of fast enterprise development. It is the gradual information and knowledge accumulation that forms enterprise culture, value and core capability.

(2) Sharing principle: Sharing knowledge refers to opening internal information and knowledge of enterprises as well as possible, which could make every employee have access to and use enterprise knowledge and information. Knowledge sharing could make new project operate on the basis of experience and knowledge of the whole corporation.

(3) Communication principle: Knowledge communication is the key to the embodiment of knowledge value. On the basis of accumulation and sharing, knowledge communication can inspire potential implicit knowledge of knowledgeable talents, and furthest inosculate organizational knowledge, which makes knowledge communicator better study, use and innovate knowledge. It's just the topmost pursuit of knowledge management to sparkle innovative idea in knowledge communication.

It does not mean that knowledge management embodies everything. With accurate understanding of knowledge management, its core function includes the following four parts: conforming information resources, increasing reactive speed, strengthening innovative capabilities and improving enterprise core competitive power.

(1) Conforming information resources. Conforming information resources is the fundamental function of knowledge management. Knowledge is taking effect

in usage. Accumulating, communicating, sharing and increment of knowledge are all built up on the basis of knowledge management. The so-called "integration" is just to resolve the problems of knowledge "unfound", knowledge drain and selection by making knowledge in order, increasing repertory, and decreasing redundancy so as to achieve sharing and collaboration of knowledge.

(2) Increasing reactive speed. The market competition depends on the competition of reactive speed to exterior, which determines the efficiency of enterprises in studying and managing external knowledge to a very great extent. It's not only the demand of reducing cost for enterprises, but also reflects the impact of information and communication technology on management. Hereon, we can borrow the concept of "digital nervous system" introduced by Bill Gates. According to him, the data network and feedback system built by simulating human's central nervous system makes internal resources orderly and conformity based on applying knowledge management and founds expert network to reply to clients, market and emergency, in order to increase external reactive speed. This kind of quick reaction is reflected in the internal of enterprise department, between departments, between enterprises and clients, between suppliers, and all places where the "nerve" of enterprises could touch.

(3) Strengthening innovative capabilities. The innovative ability of business enterprise includes every aspect of capabilities, such as technology innovation, product innovation and mechanism innovation, etc., but the basic headspring of carrying out these abilities lies in creative ability of the knowledge of business enterprise. The knowledge innovation comes from the knowledge backlog of every little bit. In the ages of knowledge-based economy, innovation of knowledge is especially important. According to Schumpeter theory, the "innovation" can be viewed as resetting of the knowledge management elements or the new knowledge elements in the production and the service processes. Peter Drucker expands the "innovation" to the management, puts forward the concept of "society innovation", and regards innovation as the capacity to create new wealth by new resources, "not only a kind of economic mechanism or the technical processes, but also a kind of social phenomenon".

(4) Sharpening the business enterprise edge. In the knowledge-based economy times with intense and unstable competition between enterprises, the key to enterprises success rests on its core competitive power. The fundamental reason why the market value of many new and old business enterprises attain geometric growth by breaking the traditional economic growth laws lies in the increase of its core competitive strength, all of which is based on innovation abilities of enterprises.

Though knowledge management can be defined in different ways, it is neither an infinitely generalization concept, nor confined to knowledge management in the narrow sense. As for knowledge management, great importance shall be attached to the following five aspects: organizational knowledge, knowledge coding, processing, and knowledge platform and innovation.

(1) Organizational knowledge

The object of knowledge management is organizational knowledge, which is difficult to define. If an enterprise is concerned, it should include interior knowledge and exterior knowledge. The internal knowledge of business enterprise shall cover the knowledge materialized in the machinery, the coded knowledge within the book, data, manual, reports and sense knowledge within employees' brains. The exterior knowledge of business enterprise mainly refers to knowledge and information concerning the business enterprise management and existing in the exterior of the enterprise.

The exterior knowledge of the business enterprise is infinite. The organization knowledge involved here refers to enterprise interior knowledge and internalized exterior knowledge. In this sense, the knowledge management belongs to the internal enterprise business.

The classification of the organizational knowledge is very important. According to the classification of OECD, knowledge can be divided into four categories: know-what, the knowledge concerning facts; know-why, the knowledge concerning natural principles and rules; know-how, the knowledge about technical skills and ability; know-who, the knowledge about who knows and who knows how to deal with some matters.

(2) Knowledge code

In the organizational knowledge, recessive knowledge possessed by individual is the most difficult to dig out and make use of. The effect of knowledge coding just lies in effectively storing this knowledge and presenting to users concisely, which makes it easier for other people to use the knowledge of business enterprises and individuals.

① Knowledge coding: The knowledge coding is to digitalize (computerization) entities, relationship and processes in the realistic world. The coding within the inner business enterprise is trying to visualize the implicit and explicit knowledge, to change implicit knowledge into explicit knowledge as much as possible, and to accumulate exchange and to share knowledge conveniently. Knowledge coding lays the foundation for organizations to carry out knowledge management.

② Explicit knowledge coding: Explicit knowledge refers to the structural and non-structural information that can be explicitly presented by languages, words, numbers and diagrams etc. It is the exterior and tangible knowledge.

③ Implicit knowledge coding: The implicit knowledge refers to the implicit experience knowledge in the employees' brains or in the structure and cultures of organizations and difficult to describe accurately by languages or written materials and to learn and code by others. The difficulty of knowledge coding is to code the implicit knowledge because it usually is materialized in the machinery equipment, contained in value culture of business enterprises, and exists in the employees' brains, which is invisible and hard to master, much more difficult to code. However, it plays an important part in the growth and development of enterprises because it is of high portion and valuable in the enterprise knowledge, accordingly, it is necessary to code implicit knowledge.

(3) Knowledge flow

① Knowledge chain: According to Michael Porter, an American strategic management expert, all different but connected production and management activities in enterprises constitute a dynamic process that creates value, thus forming a chain to create value, namely value chain. It is the same with the flow and updating of organizational knowledge, namely knowledge chain. It refers to knowledge flow in the people-centered business process, which is usually closely related to problems in the business process. Knowledge, the organizational wealth, accumulates along with the growth of the organization. The essence of the knowledge management is to manage the knowledge value chain and continuously increase the value of the organizational knowledge in the movement.

② Knowledge and business flow: A successful knowledge management lays both in managing each link within the value chain and in optimizing the correlation between links, in order to speed up the flow velocity of knowledge. The organic integration of the knowledge process and core business process is the key to effective knowledge management.

Among the relations of the knowledge process and business flow, one is consistent with problem solving. Knowledge flow is determined at some time by the implementation plan of business process. Knowledge seekers and knowledge providers are all employees who participate in one part of the business process. For example, in the semiconductor designing and manufacturing process, design engineers (knowledge providers) arrange product design according to business process, and then transfer the knowledge to the manufacturing group, thus completing knowledge flow.

③ Working point of knowledge: Knowledge, a huge, extensive intersectant network system, creates value in the process of flow. The uneven distribution of working point of knowledge results in parallel increase of the value of all links in an enterprise, but mainly on some particular value links, and it is impossible to control all links that create value. Therefore, it is of great importance to take into serious account those links that have intensive knowledge points, and to maintain the competitive advantages of the strategic links by its own special knowledge assets.

(4) Knowledge platform

The knowledge platform refers to sets of tools and methods provided for employees to use, share and create knowledge in business enterprises. This general concept is not designated for certain knowledge management software or concrete tools and it also includes places, things and software etc. for employees to use, create and share the knowledge. The knowledge coding emphasizes the foundation of knowledge management, and the knowledge process emphasizes the process of knowledge operation and conversion, while the knowledge platform emphasizes the tools that promote knowledge usage. According to its functions, knowledge platform can be divided into three types: knowledge foundation platform, knowledge application platform and management platform.

① Knowledge foundation platform: The knowledge infrastructure platform provides tools to store, present, categorize and update knowledge. For example, knowledge managers categorize on-file knowledge according to the knowledge of enterprise classified catalog and store coded knowledge into database.

② The knowledge application platform is for knowledge users: Users can acquire the knowledge quickly, retrieve knowledge needed very expediently, deliver the knowledge to other employees quickly, and convert knowledge to the format needed by means of the knowledge application platform. For example, an employee can obtain knowledge in the headquarters' repository anywhere through digital portable devices, or obtain the work experience summarized by other people in the reference room. Both digital portable devices and reference rooms are part of the knowledge application platform, which can help users to obtain knowledge quickly.

③ Management platform: The management platform is for managers, and is the tool and method to manage knowledge for managers. For example, the manager process documents with the text file in order to put knowledge under control, decide the knowledge that should be removed by the check machine, and judge what faculty training is needed by means of basic management in order to improve knowledge of an organization.

(5) Knowledge Innovation

The innovative process of knowledge includes knowledge creation, detection, application and value-creating. The knowledge innovation occurs in the course of knowledge processing.

① Knowledge creation: In the progress of heading into the knowledge society, characteristic knowledge and demand for knowledge turn out to be more and more obvious, and the capability to create the knowledge becomes the most fundamental source of the wealth of organization and society. Knowledge creation is the creation of new knowledge and re-combination, and committed to practice, which is the most challenging in the knowledge management and the important symbol of knowledge management success.

② Knowledge detection: Knowledge detection, the recombination and use of knowledge derives from the foundation of knowledge management. It is a knowledge expressing process which drives valid, novel, potential, useful and ultimately apprehensible knowledge that is represented by pattern from the database. After accumulating a great deal of data, the knowledge detection identifies the valid, novel, latent, useful and ultimately apprehensible knowledge, by which people can improve work and improve efficiency and performance.

③ Knowledge application: The knowledge application is the important process to realize the value of knowledge.

④ Knowledge creates value, which is the ultimate meaning of knowledge innovation: Karl Erik Sveiby, the famous knowledge management master, defined knowledge management as the "art of creating value with organizational intangible assets" from the epistemological angle. Chinese government and Chinese theories

circles pay attention to the development of knowledge-based economy and knowledge management theory increasingly, and many high-tech parks, represented by Zhong Guancun, have practiced the knowledge-based economy and knowledge management. These all indicate that, much attention shall be paid to the role of knowledge in the social economic development, and strengthening the research into the knowledge management theories and practices.

7.1.3 Virtual Enterprise

What is a virtual enterprise? When "virtual" was used in the management mode in 1991, the phrase of "virtual enterprise" came on the scene. Currently there is neither specific definition about it in theory circles nor universal definition among scholars. According to the current available reference, the definition of the virtual enterprise can be classified into two major types:

From the angle of the information network, virtual enterprise is the immaterialization of enterprise organizations and organizations connected by information network, such as online stores and online banks etc.

From the angle of organization, it refers to a temporary network organization that is composed of two or more enterprises by application information network technology to achieve an anticipatory object. Each member is mutually non-interfering in the cooperation process, and shares the risk and benefits together; once the expected object is attained, the organization will soon be disintegrated.

Actually there is an obvious difference between the first definition and the second: the first refers to an individual enterprise body; whereas the second the enterprise group constituted by several actual entity enterprises. Compared with the first, the second is more meaningful and more promising.

As a new organization form, virtual enterprise differs from traditional enterprises in the following ways:

(1) Networking: Production and operation of the virtual enterprise is based on computer network. Generally the virtual enterprise is not confined to geographic boundaries, that is to say, enterprises with different core capabilities form a network in a certain way and communicate through the information superhighway. Therefore, the virtual enterprise then could gradually become the mainstream enterprise form on the condition that enterprises could make full use of the computer network to reduce the cost of trades cooperatively in network economy.

(2) Sensitive: The reaction of the virtual enterprise for the market information is extremely sensitive, because it will integrate every aspect such as management and technology to react to the changes of the market quickly. Moreover, the virtual enterprise, the support for the existence of organization, could feedback to the center and organizes production and sale quickly as soon as the market changes.

(3) Dynamic: Properly speaking, the virtual enterprise is not a real enterprise, which does not exist all the time. Its appearance is on the condition that a market

opportunity appears and will disappear when a certain market task is completed and the corresponding virtual enterprise is also disintegrated. This characteristic of the virtual enterprise can more effectively and optimally configure the resources, and be advantageous to reduce the cost.

(4) Virtual: The virtual enterprise and the traditional enterprise differ in its form such as the virtualization of function and region. These virtual characteristics are actually networking and sensitiveness etc.

(5) Parallel management: The traditional enterprise management is like a pyramid, while the modern enterprise management is like a parallel network. The virtual enterprise can explicitly reduce the management levels and personnel from the value-generated process to value-confirmed process by adopting computer network. Therefore, this organization is flat-pattern.

Apart from the characteristics (namely the function/process characteristic, the organization characteristic, the physical system characteristic, the information system characteristic, the logistics/information flow/funds flow characteristic etc.) of the general enterprise, the virtual enterprise still has some characteristics such as the global fellowship characteristic based on public networking environment, enterprise cooperation characteristic, process optimization characteristic, agile PRS (refactorablity, reusability and scalability) characteristic. Therefore, the establishment and operation of the virtual enterprise in particular, need the guidance of corporate model.

The Virtual Enterprise's Model (VEM) composed of workflow view, organization view, physical view and information view can describe the virtual enterprise with concrete information, which is the base to analyze, imitate and optimize the process, activity, function and action of the virtual enterprise, as shown in the Fig. 7.1.

It can be figured out from the analysis of VEM that the workflow view is the core of the enterprise model. Enterprise model cannot only analyze and design the virtual enterprise from different aspects, but describe the whole virtual enterprise through integrating other views with workflow view. In addition, because the process is the core content of the workflow view, the process modeling is the key to workflow modeling and virtual enterprise modeling.

The set of virtual enterprises includes many interaction relations and some processes that the member enterprises does not have, for example, monitoring partner's performance, coordinating partner relation and benefit analysis and distribution. In addition, owing to some other characteristics of the virtual enterprise process, such as dominance, provisionality, refactoring and distributivity, the composing structure of virtual enterprise process is different from that of the member enterprises, as shown in Fig. 7.2.

The virtual enterprise process can be divided into two parts: one is the process particular to the virtual enterprise, which is not in any individual member enterprise; the other is provided by member enterprises, which is the processes that is independently undertaken by member business enterprises in virtual enterprise.

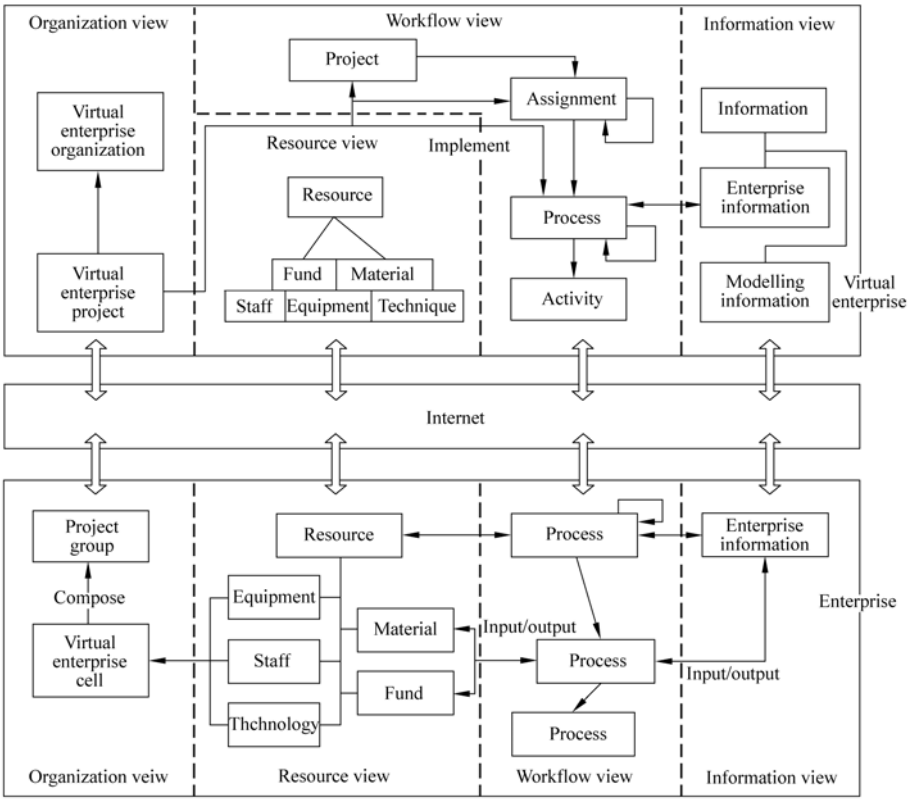

Figure 7.1 VEM

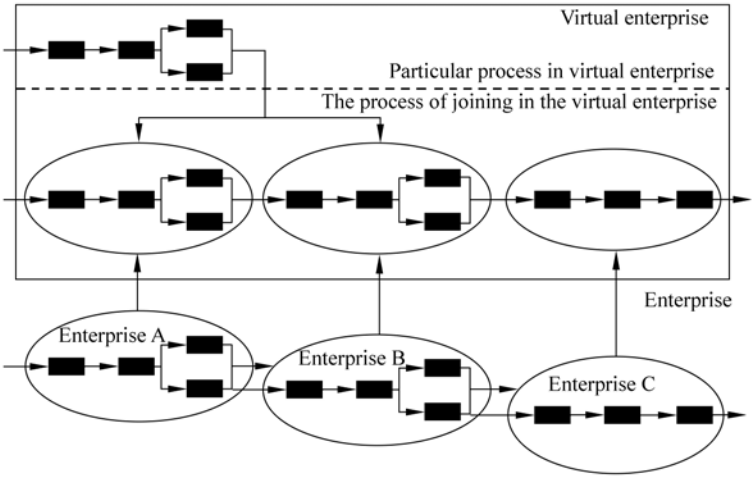

Figure 7.2 Process structure model of virtual enterprise

The contents of the network enterprise management mainly includes: strategy management, operation management, stock and production management, marketing management, logistics management, organization management, human resource management and coordination and control. This book deals with the following three aspects in details: supply chain management, logistics management and human resource management.

7.2 Supply Chain Management of Network Enterprises

7.2.1 Overview of Supply Chain Management

Since 1990's, as various automation and information technologies have been continuously applied in manufacturing enterprises, manufacturing productivity has already been greatly improved, while the potential of technology means themselves in the manufacturing processes to raise the whole competitive capabilities of products has been diminished. To further tap the potential to lower the product cost and to satisfy customers' needs, people begin to turn from managing the internal production process of enterprises to the supply links in the whole product life cycle and the whole supply chain system. Many a scholar points out that, the ratio between the cost of products in supply links of the whole life cycle (for example, storage and transport costs) and the total cost becomes higher and higher. Michael · W, a professor in the business school of English Columbia University in Canada, thought, as concerns to the enterprises, the stock expenses take about 3% of the sale, transport cost about 3%, and the purchasing cost about 40% – 60% of the sale. As to a nation, supply system is above 10% of the GNP, and the related labor force is also above 10% of the total. Moreover, along with the global economic integration and the development of information technology, the cooperation between enterprises increasingly has been strengthened and the trend of cooperating manufacture across regions even nations is increasingly obvious. More and more manufacturing enterprises continuously outsource a great deal of regular business to the developing countries in the world except the core business (such as the market, the key system design and system integration, total assembly and sale). For example, the manufacture of Boeing 747 airplanes needs more than 4,000,000 parts; however the majority of these parts are not produced in Boeing but by 1500 large enterprises and 15,000 medium and small enterprises in 65 countries.

Therefore, as a new academic concept, SCM (Supply Chain Management) was—firstly proposed in the west, which was researched by many people and practiced by enterprises. *Fortune* has listed the capability of supply chain management as an important strategic competitive resource in enterprises. In the

times of global economic integration, it is of great significance to consider the whole production and management activities of enterprises from the perspective of supply chain management and form core capability of this aspect, which will be very important for raising competitive capabilities of business enterprises.

The process from purchase of raw materials and parts, transportation, processing and manufacturing, distribution and delivery to customers in enterprises is viewed as a connected chain, that is, the supply chain. The concept of the supply chain is developed from the concept of extended production, which extends the production activities of enterprises. For example, the Lean Collaboration of the Japanese Toyota Company views the activity of suppliers as the organic components of the production activities to control and adjust. This is forward extension. Backward extension refers to extension of the production activity to the sale and the service stages. Therefore, the supply chain is the interface formed between customers and suppliers through some activities such as plans, acquisition, storage, distribution, and service, thus to satisfy the needs of the interior and exterior customers. The supply chain and the concept of the sale channel in marketing have both differences and similarities. The supply chain includes all corporations and enterprises involved in supply, production, distribution and sales before the product reaching customers. Therefore its definition contains the concept of sale channel. The supply chain regards equally the upstream suppliers (supply), middle producers (manufacture) and transporters (storage and transport), and downstream consumers (distribution).

Therefore, the supply chain management refers to the various activities and processes to plan, coordinate, operate, control and optimize the whole supply chain system, whose object is to deliver the right product needed by the customer to the right place in the right time, with the right quantity, the right quality and the right state, meanwhile to make the total cost minimum.

7.2.2 Construction of Supply Chain Management

It is very important for each manufacturing enterprises to design and operate an effective supply chain, because it is advantageous to improve consumer service level, attain effective balance between cost and service, raise the enterprise competitive ability, flexibility, and soak into the new markets and improve working efficiency through declining inventory. But it also leads to waste and failure due to the bad design of the supply chain. Fisher thinks that the design of the supply chain should focus on products and first figure out consumers' needs of the products of the enterprise. Product life cycle, requirement forecast, product diversity, ahead of schedule and market standard of service are extremely important and affect the design of supply chain. It is required that a supply chain should be coherent with the product characteristics, that is so-called Product-Based Supply Chain Design (PBSCD) strategy.

Different product types have different requirements of the supply chain design. The design of the supply chain of the high marginal profits, instable requirement innovation products differs from that of the low marginal profits and the stable requirement functional products. The comparison of the two different types of products is shown in Table 7.1.

Table 7.1 Comparison of two different types of products (in requirements)

Requirement Characteristics	Functional Products	Innovative Products
Product life circle (year)	>2	1 – 3
Marginal contribution (%)	5 – 20	20 – 60
Product diversity	Low (10 – 20 per catalog)	High (Above thousands per catalog)
Predictive average marginal error rate (%)	10	40 – 100
Average OOS rate (%)	1 – 2	10 – 40
Season end depreciation rate (%)	0	10 – 25
Ahead of schedule of product as order	6 months – 1 year	1 day – 2 weeks

It can be figured out from Table 7.1 that, the functional products are usually used to meet the basic requirements of consumers, which seldom change and have the stable and predictable requirements and longer life cycle, but lower marginal profits. In order to avoid low marginal profits, many enterprises reform in pattern or technology to stimulate consumers to buy, thus acquiring higher marginal profits. The requirements of this kind of innovative products are generally unpredictable and have short life cycle. Just because of the differences of these two kinds of products, it needs different kinds of the supply chain to satisfy the different management demands.

Product-Based Supply Chain Design Strategy

A supply chain consistent with product requirements could be designed after knowing the characteristics of products and supply chains. The design strategy is shown as Table 7.2.

Table 7.2 Design of supply chain and product type strategy matrix

	Functional Products	Innovative Products
Validity Supply Chain	Matching	Mismatching
Reactivity Supply Chain	Mismatching	Matching

The four elements of the strategy matrix represent the four probable combinations of products and the supply chain, from which it can be figured out the characteristics of products and the supply chain. Managers are able to use it

to estimate whether the design of the supply chain process of the enterprises is in accordance with the product types. This is Product-Based Supply Chain Design Strategy: the validity supply chain is applicable for functional products, while the reactivity supply chain process is applicable for innovative products, otherwise problems will arise.

7.2.3 Cooperation Management of Supply Chain

The highest level of supply chain integration is the strategic cooperation between enterprises. It opens out a cooperation countermeasure process when the enterprise joins the supply chain in the form of dynamic alliance. It seeks a win-win goal through a consultation mechanism. Since 60's in 20th century Shark researched multilevel repertory, many scholars have concentrated on solving the optimal question of multilevel repertory, but few scholars studied cooperation of the supply chain from the strategic perspective. In the study of marketing and industry organization theories, people notice this problem earlier, and study it from the perspective of price consultation and resource allocation. Just as pointed out, integrating supply chain management based on logistics is different from traditional supply chain management of individual enterprise based on logistics. It gives priority to the cooperation mechanism between enterprises, especially the supply chain of the dynamic alliance. While it becomes a member of a certain supply chain, the enterprise would carry out the research of cooperation countermeasure from its own interest, and form a collaboration negotiation mechanism and entrusting agency mechanism between entrusting enterprises and contracting enterprises.

Since the 90's in the 20th century, owing to the emergence of advanced manufacture patterns such as the global manufacture, agile manufacturing and virtual manufacturing, a new enterprise organizational form appears characterized by the dynamic alliance, thus greatly changing the original enterprise production organization and resource configuration form, which can be clearly reflected by supply chain management. The integrated supply chain is the integrated enterprise network (extended enterprise model) characterized by external usage of resources. It transits from the original portrait integral whole mode to the transverse integral whole mode. The market competition is not the competition of the individual enterprise any more, but the competition between alliances, the competition between supply chains. Therefore, the original single-handed enterprise competition strategy does not fit the world economic development, and the enterprise needs to learn the category and skill of how to cooperate with other enterprises; at the same time, it still needs competitive advantages and strategy in the process of competing with other enterprises and joining some supply chain alliance, which is the cooperation-competition mode in the process of the supply chain alliance. This kind of competition is the competition of the core capability. The Americans C.K.Prahalad and Gray Hamels think that the core capability is a set of harmonious

assembly of advanced technology, including science, technology, production and organization management, such as the product development technology, the manufacturing technology, cost control technology, the marketing technical ability and after-sales services and market-responding capability. As a brand-new management idea, the supply chain management emphasizes on how the enterprise pool its own core ability to create tactic cooperative relation with other enterprises by strategic cooperative relation, and that each enterprise should concentrate the energy to consolidate and develop its own core capability, and build up strategic cooperation relationship, and make good achievements in key business that could create value and be dominative and better than other enterprises by making use of its own resources advantage. Win-win is the final purpose of the supply chain mode of cooperation.

The research and practice of the supply chain management reveal that: the key to implementing the supply chain management is to make each link of the whole supply chain be able to clearly observe the logistics, the capital flow, information flow and workflow, in order to coordinate better, lower the supply chain cost, lower the latency time of each link, and remove the effect of amplification of the information distortion by increasing contact and cooperation between the supply chain nodal enterprises, raising the information share degree, and replacing decision-making system that lacks of flexibility and badly-integration with the decision-making system that covers the whole supply chain. It provides the basic assurance for the operation of the enterprise supply chain through creating the MRPII (or ERP) agile supply chain system that is supply-chain-oriented and based on Internet/Intranet. Currently the research on the supply chain management (integrated and agile supply chain) basically follows a general research path which also has an emphasis: regarding the internal mechanism of the integrated supply chain management system as a network which is composed of cooperating intelligent agent modules, each agent module of which implements one or more functions of the supply chain and also cooperates with other agent modules.

From the prospect of enterprise integration mode of strategic colleague relationship, however, this can only make the supply chain attain the medium and micro integration, but does not present resource configuration, cooperation game and entrusting implementation mechanism in the macro aspect. Medium integration (information flow integration) can be implemented through MRPII/ERP, and workflow integration can be implemented through DRP or LRP (Logistic Resource Planning). As for implementing negotiation agent and cooperation game, it needs creating the high-level-decision-making-oriented management system EIS/NDSS (Executive Information System/Negotiation Decision Support System).

From the prospect of economics and marketing, since the 90's in the 20th century, enterprise management strategy evolved from the original hostile competition to the cooperation competition, which is the world competition trend. The cooperative game is a hotspot problem in the game theory currently. The new enterprise management objects (in the form of group team and self-managing team), cooperation, competition and independence have become issues faced by

the future enterprise administrators. Constructive controversy and group negotiation will play a strong role in the management mode. A few problems about how to effectively exert the effect of group negotiation in supply chain management still need resolving currently.

(1) Confidence in the enterprise alliance. Thoreli emphasizes the cooperation colleague's firm honesty and keeps the promise using emphasis on reliability anticipation as a standard, and deems the real difference between the trust and distrust consists in the leap of both parties' confidence: they mutually believe that the other party is concerned about its interest, and no one will take an action before clearly considering the mutual influence, which actually emphasizes the significance of the cooperation negotiation.

(2) Communication. Though the member of the supply chain alliance has gained mutual useful information resources through Internet/Intranet which guarantees information communication, it cannot guarantee individuals conceal private information for its own benefits, so the information asymmetric problem is another hard nut to crack in the negotiation theory.

(3) Trade cost. The trade cost includes:

① The cost of reaching both parties satisfied agreement.

② The cost of dealing with unexpected emergences.

③ The cost of implementing agreement condition.

④ The cost of terminating the agreement. The final purpose of the supply chain management is to lower the customer cost. How to share trade cost in reason between the cooperation colleagues (cooperation management sharing mode) and lower consumer needs solving in the cooperation of the supply chain.

In the entrusting processing supply chain, the enterprise concentrates its own efforts on market research, product design, sale and service and production management of the enterprise by entrusting the chosen enterprise to complete parts of business. Because enterprises are all an independent benefit entity, they lack the trust mutually, causing the run-time cost of the supply chain higher. In principle-agent relation, these two problems are needed to be solved: adverse selection caused by asymmetrical information (for clients) and moral hazard (for agents). These problems are resolved by creating the agent inspiring mechanism and the trust mechanism between enterprises, to reduce the effect on the whole benefit of the supply chain.

7.3 Logistics Management of Network Enterprise

7.3.1 Logistics Management Overview

In the last few years, especially after the 21st century, logistics became focus among researchers and Industries, and continuously ascended. Then what is

logistics? The status of logistics in the economy shall be dealt with before answering this question.

It's well known that the mankind society is composed of politics, economy, culture, and the economic activities which include production, circulation and consumption. As for circulation, it can be divided into business flow and logistics with assistant activities such as finance, insurance, specification, standardization.

Table 7.3 Circulation structure

Circulation	
Business Flow	Logistics
Wholesale (Distribution)	Transport (Deliver), Keeping, Packing, Loading and unloading (Transit), Circulation matching, Information
Circulation auxiliary actives: Finance, Insurance, Specification, Standardization etc.	

Briefly speaking, business flow, the transfer of ownership of material resources, creates the ownership value, which is the non-physical movement. The business flow includes trade activities such as wholesale, retails, online shopping, representing the buy-sell relationship (as shown in Table 7.3). An example of bicycles will be taken to illustrate the concept of business flow in the following. The ownership of bicycles belongs to the production factory before sold out, to the vendor after the wholesale, to the store after the vendor sells wholesale bicycles to the store, and lastly to the consumer after the store sells a bicycle to a consumer. The ownership of the bicycles transfers several times in the trade process, and this transfer process is called business flow. With the occurrence of the business flow, the logistics activities come out naturally, namely packing, loading and unloading, transportation, storage and information transmission process which is necessary in the series of processes after the bicycles have left factory. Transportation, storage, packing, loading and unloading, circulation machining, delivering and information are considered as a whole or a system, and called logistics. Logistics can also be considered as the activities that overcome the interval of time and space and create location benefits and time benefits as shown in Table 7.4. For example, supplying urban inhabitants rice produced in villages resolves the interval of location and time. Similarly, heating equipment that is produced in the factory in summer needs to be kept for a period of time, and is sold to the consumer in winter also overcomes the location and time interval and creates the location benefits and the time benefits.

Along with the social economic development and technological advance, the theory, concept and range of the logistics change and develop constantly. For example, in circulation activity, information flow and capital flow are added in; the scope of the logistics has also been extended from the original transportation, storing, loading and unloading and packing after products left product line, to the overall transportation, keeping, loading and unloading, carrying, packing,

Table 7.4 Four Types of classification of Logistics

Logistics	First classification	Macro-logistics	National logistics development plan, law, statute and policy establishment, Logistics layout, Logistics theory study, Knowledge popularization, Talent cultivation, Logistics infrastructure and information platform build, Economic method support and instruction
		Micro-logistics	Supply Logistics, Production Logistics, Sale Logistics, Recycle Logistics, castoff Logistics
	Second classification	Society Logistics	Third-party Logistics, Specialty Logistics such as transport, storage and Enterprise Logistics, and logistics activities such as railway, highway, port, dock, logistics park, storage, and deliver center
		Enterprise Logistics	Supply Logistics, Production Logistics, Sale Logistics, Recycle Logistics, castoff Logistics
	Third classification	International Logistics	Foreign-trade Logistics, International Through-transport, Ocean Transport, International Aviation, International Post, Port Logistics, Continent-bridge Logistics
		National Logistics	Economic Biosphere, Economic Band Logistics, City and periphery Logistics, Complementary Natural Zone Logistics, Regional Logistics
	Fourth classification	General Logistics	General, universal and common logistics activities, or logistics activities that do not have particular requirements
		Special Logistics	Logistics of dangerous, flammable, explosive, corruptible, virulent, corruptible goods, Logistics that have particular requirements for speed and condition, such as transport for files, valuables and propagation

circulation, manufacturing, distribution and information activities of raw materials purchase, production process and wastematerial recycle; the seven main links, or the seven main functions, of the logistics include circulation, manufacturing, at the same time it develops in the direction of the supply chain.

Before introducing the definition of the logistics, it shall be made clear that the definition of the logistics is still changing and evolving up to now. The definition varies, evolves, adjusts and perfects in different economic stages to adapt itself to different economic activities. Even if in the same economic development stage of the same history period, it will differ from each other because different schools of thought, academic groups, organizations and nations treat it from different angles and standpoints, which is still an issue up to now. However, the evolving process of the definition of the logistics just reflects the development progress of logistics theories, management and technologies in different periods. As for its name, there are two words in English to describe it: Physical Distribution (PD), and Logistics, words appearing almost in the same period but with different perspectives, scopes and emphasizes.

In *Marketing Vocabulary* compiled by The American Marketing Association (AMA) in 1935, the logistics is defined as that "Logistics is the various corresponding enterprise activities during material resources transfer from the production location to the consumption area, including the service process". In 1948, AMA made a modification to this definition as "Logistics refers to the enterprise activity expense determined by the flow process of material resources from the producer to the consumer or the consumption location". Afterwards, AMA modified the definition of the logistics again that, "So-called logistics refers to the material resources moving from production stage to consumers or users and the management of the process."

In terms of the three changes of the logistics definition by AMA, it is clearly seen that their logistics concept is defined from the perspective of the sale. Although there are no differences in the ranges of the definitions before World War Ⅱ, 1935 and that of post-war in 1948, the focus of the definition has transferred from the movement of material resources to the management of the transportation.

The most authoritative definition of logistics in the United States given by CPDM (National Council of Physical Distribution Management) in 1960 goes like this "So-called logistics is the wide range of activities during the finished products which effectively move from the end-point of the production line to the consumers, sometimes also including the transportation from the supply source of the raw material to starting point of the production". Apart from the above definition, CPDM also listed out various logistic components, including commodity conveyance, warehouse keeping, loading and unloading, industrial packing, stock management, choosing location of the factory and warehouses, order processing, market forecasting and customer service.

The range of the definition of the logistics by CPDM is wider than that by AMA, referring to not only the process of products from the production line, to wholesaler, retailers, and consumers, but also the transportation of raw materials from producing factory to the processing factory. In 1985, CPDM changed its name into Council of Logistics Management (CLM). At the same time, it modified the definition of the logistics: "So-called logistics is the process of plan, implementation and administration for the efficient and beneficial movement and safekeeping of raw materials, semi-products and related information from production location to consumption location to satisfy customers' requirements. These activities include, but are not limited to customer service, portage and transportation, warehouses keeping, choosing the factory and warehouses location, stock management, accepting orders, circulation information, purchasing, loading and unloading, accessory supplying and service providing, castoff recycle, packing, return of goods, and requirement forecasting, etc.".

In 1998, CLM defined logistics again as follows, "The logistics, a part of the supply chain, refers to the plan, implementation and control process of efficient and beneficial normal and reverse flow of goods, service and related information

from original product location to consumption location to satisfy customer's needs".

In 1965, the Japanese Ministry of Economy, Trade and Industry once entrusted Japanese Incorporated Foundation Machinery Promotion Association to investigate the Japanese logistics actuality. The association made such description to the definition of the logistics in the report: "The so-called circulation of material is the various indispensable activities to physically transfer goods from the manufacturers to the final requesters. To be specific, it includes various activities such as packing, loading and unloading, transportation and telecommunication".

Japanese Industry Composition Council defined logistics as, "The so-called circulation of material, is the physical flow of tangible and intangible material resources from the suppliers to the requesters. It refers to the various activities such as packing, loading and unloading, transportation, safekeeping and telecommunication. Compared with business flow, this kind of circulation of material contributes to creating time and space value of the material resources".

Logistics Manual, written by Japanese Comprehensive Research Institute in February 1981, defined the logistics as, "Logistics is the physical transfer of the material resources from the suppliers to the requesters, and the economic activities that create the time and location value. According to the range of the logistics, it includes the various activities such as packing, loading and unloading, safekeeping, stock management, circulation, manufacturing, transportation and distribution. Without the above processes, the materials cannot be transferred."

In the logistics technical term announced by the ELA (European Logistics Association) in 1994, logistics was defined as, "The logistics is the plan, implementation and control of transportation and arrangement of personnel and goods and the corresponding support activities in a system, to attain the particular purpose".

In the Chinese national standard *Logistics Glossary*, it is defined as, "The entity flow process of goods from the supply location to the reception location. According to the actual demand, it organically integrates the basic functions such as transportation, storage, loading and uploading, conveyance, packing, circulation, manufacturing, and distribution and information disposal".

According to the data published by the Japanese logistics authoritative professor, the word Logistics derived originally from French, a troops terminology meaning soldier station, and is regarded as logistics management in Japanese enterprises. Before 1985, Japanese basically used PD to represent the logistics. But both the United States and Europe turned to use the Logistics, because both the range and meaning of logistics were expanded continuously, and much importance was attached to customers from the perspective of the enterprise management strategy. In the second half of 1980's, Occident almost adopted the word Logistics instead of Physical Distribution.

In spite of these, it should be pointed that the Logistics originally should be translated into soldier station or logistics. Otherwise it will result in confusion. In

fact, the Logistics, originally the military technical term used by the American troops in the World War Ⅱ, mainly emphasized that arms, ammunition and all basic necessities of living in the wartime should be transported according to the requirements to the battlefront safely, exactly, at the fastest speed and at the most efficiency, which is of vital significance for the troops to win. If the soldier station does not work well on the logistics, the troops cannot win the war. It needs a set of scientific logistic supply management systems to accurately supply in time, including the order of munitions, establishment of the production plan, purchase, stock management, supply, conveyance and telecommunication. Afterwards the logistics of soldier station, such a scientific and effective management system in World War Ⅱ, was introduced to the enterprise operation in the hope that the enterprise logistics can also be managed scientifically and operated efficiently just like the logistics of soldier station.

7.3.2 Environmental Logistics

The Environmental Logistics means restraining the harm to the environment in the logistics process, and purifying the environment of the logistics to make the full use of the logistics resources. Along with the environmental deterioration, human existence and development are threatened, so people have attached much more importance to the use and protection of environment. Accordingly, environment must be primarily taken into consideration when developing and perfecting modern logistics. Logistics system needs to be improved from the perspective of the environment, and an environment-symbiosis-type logistic management system shall be formed. This kind of logistic management system is created on the base of maintaining the global environment and sustainable development, changing the former single-acting relation between development and logistics, consumption and logistics. While restraining the harm to the environment, a logistics system that can promote the health development of the economy and consumption shall be built up, that is, turning to the environmental logistics. Therefore, the modern environmental logistics emphasizes the overall and long-term benefit and all-wave concern about the environments, and represents the environmental image of enterprises, which is the new trend of the logistics management. The theoretical principles of the environmental logistics are shown as follows:

(1) Sustainable development theory: The sustainable development means to satisfy both the contemporary demand and that of offspring's. The research report *Our Common Future*, published by The international environment and the development committee in 1987, pointed out that, the contemporary development and use of resources must be advantageous to the maintenance of future environmental maintenance and sustainable resources utilization, therefore, for the sake of the realization of long-term, sustainable development, various measures must be taken to support our natural environment. The economically sustainable

development can also be applied to logistics management. Because it is unavoidable to consume energy and resources in the logistics process, and to cause pollution, various measures should be taken to support the natural environment and to realize the long-term and sustainable development. Modern environmental logistics, which is just based on the sustainable development theory, forms the mutual-supporting promotion and condition relationship between the logistics and environment, and further promotes the development of modern logistics to attain the symbiosis of the environment and logistics.

(2) Ecologic economics theory: Ecologic economics is the science to study the circulation of materials between the economic system and the ecosystem, and the energy conversion and value increment rule and its application in the reproduction process. The logistics, an important link of the social reproduction process, includes cyclic utilization of matters, energy conversion, and value conversion and realization. Therefore, the logistics relates to two systems: the economic system and the ecosystem, naturally bridging between the economic benefit and the ecological benefit. However, the relation is not appropriately dealt with in the traditional logistics with excessively emphasizing the economic benefit, while neglecting the environmental benefit, which causes the whole social benefit descending. The economic benefit mainly involves the immediate and partial benefit, while the environment benefit concerns the macro and long-term benefit. The presence of the modern environmental logistics preferably resolves this problem. Guided by the general principles of economics and based on the ecology, the environmental logistics studies the relation among the economic behavior, economic relation, and rules of logistics and ecosystem in order to optimally integrate the ecosystem with the environment and develop in phase under the condition of ecosystem balance, economy rationality and advanced technology.

(3) Ecological ethics theory: The ecological ethics forces people to deeply introspect the environmental problem caused in the logistics process, thus generating a strong social sense of responsibility and obligation. For the sake of human own healthier life, existence and safely development and offspring's benefits, the mankind should self-consciously maintain the ecosystem balance. This is the undeniable responsibility that our age endows to us, and it is also the right and the duty that mankind should fulfill for the nature. The environmental logistics just gets the moral support from the ecological ethics.

As an important component of present economic sustainable development, the environmental logistics management plays a significant role in the economic development and the improvement of people's living quality. Both the governmental departments and the enterprises involved should enhance the logistics management and construct the framework of the environment logistics development jointly.

Measures of enterprise environmental management are as follows:

(1) The environmental transportation management

① Developing joint distribution: Joint distribution refers to distribute by syndication. Several medium or small distribution centers join up and separately

distribute for a certain area. It is mainly used when vehicles are not fully loaded and the utility rate is low, because goods needed by customers are small in quantity in individual areas. The joint distribution can be divided into two types, one of which gives priority to the goods, and the other gives priority to the logistics enterprise. From the perspective of the consignors, joint distribution can improve the logistics efficiency. For the medium or small wholesalers, it is hard to satisfy the many times and small batches distribution requirements of the retailers. While adopting joint distribution, deliveryman can reduce distribution times, and consignees can entirely check the goods, thus achieving the goal of improving the logistics service level; from the perspective of the logistic enterprises, especially some medium or small logistics enterprises, because of the limitations of fund, talents and management etc., using more vehicles and carrying on business all by itself is restricted by the logistics rationalization and efficiency. The problems such as raising money, predominant goods and the increasing the vehicle usage rate through information network can be well resolved by the application of cooperation and joint distribution. Therefore, joint distribution could furthest increase the utilization efficiency of resources such as personnel, materials, capital and time, achieving the most economic benefits. Meanwhile, it could wipe off redundant interleaving distribution and achieve social benefits such as relieving traffic and protecting environment.

② Adopting Combined transportation: Combined transportation extracts the advantages of the basic types of conveyance, such as railways, trucks, ships, and planes and integrates them organically, and links up multi-links, multi-section, and multi-conveyance. Containers are used as the general medium in this mode of shipping through various conveyances, which are used to promote the compound nonstop transport. Therefore, it is required to standardize loading tools and the size of the packaging. On account of adopting the packaging form such as containers in a whole, it can reduce the payout for the packaging, and the damage and mistake of goods in the transport process. The advantages of combined transportation are also embodied in the following aspects: it overcomes the inherent limitation of the individual transport mode, thereby guaranteeing the optimization and efficiency of transport process on the whole; on the other hand, from the perspective of logistics channel, it effectively resolves the problem of the separation of goods in the space and time between production and sale caused by the differences of various market environment, such as geography, climate, and infrastructure, and promotes the tight coupling between production and sale and the efficient operation of enterprise production and management.

③ Enforcing third party logistics: In the business mode of the third party logistics, a dedicated logistics enterprise instead of suppliers or requesters provides the logistics service. If the third party logistics is developed and those enterprises specialized in the logistics business provide the logistics for the supplier or the requester, the problem of logistics rationalization can be considered at a higher

level and more widely, and conveyance link be simplified, and transportation be rationalized. The third party logistics can use and configure the logistics resources reasonably in a broader area, and overcome the problems caused by logistics, such as fund using, low efficiency of transportation, fussy conveyance link, aggravated burden by enterprise and city polluting aggravating. When the vehicle conveyance becomes saturated in some large cities, the emergence of the dedicated logistics enterprise reduces the number of vehicles for transportation in large cities, thus relieving the pressure brought about by the logistics to city environmental pollution. Besides, enterprises should adopt materials good for energy conservation, environmental protection as power of conveyance for example, using LGP, solar power or respond to the call of the government to expedite updating the conveyance.

(2) Environmental Packing Management

Environmental packing refers to the packing which is propitious to energy conservation and environmental protection. The approaches of environmental packing mainly include: Promoting production departments to adopt simplified packing with degradable materials, taking steps to rationalize and modernize packing in the circulation process.

① Packaging standardization: Packaging standardization is to fix on the standard of the basic size of packaging. When the modulus standard of packaging is fixed on, various products entering the circulation field are needed to be packed according to the size set by the modulus. Package standardization is fit for the aggregate of small packaging and the use of containers, pallet encasement. If packaging standardization could be unified with the size modulus of depository and conveyance, it is helpful for transport and storage, thus rationalizing the logistics system.

② Upsizing and containerization of packaging: It is advantageous to the mechanization of loading, unloading, moving, storage and transport in logistic system and to speeding up all these links, to reducing unit packaging, packaging materials and expenses, and to protecting goods, such as adopting containers, flexible containers, and experience.

③ Multiple, repeated and processing of disused package: It is unnecessary to make echo use by adopting universal packaging; it can be repeatedly used several times by adopting turnover packaging, such as beverage bottle and beer bottle; wrappage used once can be repeatedly used by adopting multistep packing, if it is transformed to other usage directly or through simple disposal; it can be used for other purposes or as new material by retexturing scrap wrappage.

④ Developing new packaging materials and packaging containers: The development trend is that the packaging becomes multifunctional, that is, using less material to realize multi-functional packaging.

(3) Environmental Circulation Processing

Circulation processing is the generic name of simple jobs according to needs

in the process of merchandise transfer from manufacturing location to territory of use, such as packing, dividing, measuring, classifying, assembly, price labelling, and commodity inspection. Circulation processing, strong in productability, will go far for the circulation department to protect environment. The following measures can be taken to carry out environmental circulation procesing: first, transforming consumer processing into professional centralized processing to make more proficient use of resources by scale job and to reduce environmental pollution. For example, cater service industries processing foodstuff intensively in order to reduce energy and air pollution caused by dispersive family cooking. Second, disposing flotsam produced in consumable processing intensively to reduce wastematerial pollution caused by consumers' dispersive processing. For example, the circulation departments processing vegetable intensively to reduce garbage litter caused by dispersive residents processing and to promote environmental pollution improvement.

(4) Waste material Logistics Management

From the perspective of environment, mass-production and mass-consumption will surely result in mass castoff in the future. Although many steps have been taken to speed up the disposal of castoff and control the castoff logistics, but as a whole, the appearance of mass castoff still causes seriously negative effects on society and brings about difficulties in disposing castoff. Moreover, it will lead to exhaustion of social resources and deterioration of natural resources. Therefore, the logistics in the 21st century must be propitious to use resources efficiently and maintain the earth environment.

Wastematerial Logistics refers to goods flow formed by collecting, sorting, processing, packing, conveyance, storage, and delivering the goods which lose their primal value in the economic activities, to the special disposal location according to the actual needs. The function of castoff logistics is to cremate or chemically dispose it or transport it to a particular place for stacking or burying from the perspective of environmental protection, without taking into account its value or there is no recycling value of it. It is necessary to set up a castoff recycle system for production, circulation and consumption so as to realize the reuse (reuse after reclaiming and disposing) and recycle (transforming to new raw materials after disposing for use) of the resources and reduce wastematerial logistics. Therefore, to achieve the above goals, an enterprise should not only consider its own efficiency of logistics, but organize the logistics in the view of the whole supply chain for manufacture, supply and sales. Moreover, along with the further development of the supply chain management, it should take cycling logistics of the wastematerial into consideration. The management-type logistics pursues to gain mutual benefit with its trade partner jointly; the supply-type logistics pursues the overall benefits from production to consumption and circulation; the circulation-type logistics pursues the efficiency in the whole process from production to castoff. This is a burning problem to be resolved in the environmental logistics management of the 21st century.

7.3.3 The Third Party Logistics

The third party logistics (3PLs) is a relatively new term of logistics. While the traditional enterprise transforming to the modern enterprise, and the logistics service evolves from the primary form to the advanced, the concept of 3PLs will play an important role. Therefore, it is important to accurately master the intrinsic meaning of the term of 3PLs, especially the actual operation.

According to the actual operation of 3PLs in the developed countries, there are various forms of motivation and cooperation of enterprises; moreover the operation of 3PLs is nearly involved in all links of enterprise management activities.

(1) American auto industry. In about 1996, General Motors Corporation found that its cost of stock-in-trade and distribution was continuously rising, and automobile carriers entering and leaving all over assembly plants are of less than full load shipment. It was found after analysis that there were more than 400 suppliers in 14 states providing materials to 30 assembly plants in GM through phone instruction at that time. Then GM appeal to a third party logistics service company Penske to design a solution to solve the following three problems: Reducing cost, improving materiel backhaul management and corresponding methods of information processing, and reducing the number of carriers. The 3PLs service company first diagnosed the process of materiel backhaul and distribution of GM, then proposed to set up a strategic distribution center in Cleveland in which changing and loading jobs could be done, which was in charge of organizational management of backhaul materiel and parts distribution. The strategic distribution center was completely operated and managed by the 3PLs company. The 3PLs company also configured round-the-clock full-time transport motor-lorry unit for GM, set up EDI special railway line system to arrange time to deliver goods of suppliers, designed the way of backhaul of materiel, and implemented JIT distribution for the assembly plants.

Ford, which is also a magnate in motor industry, decided to outsource its complete car distribution business in North American to UPS global logistics Service Company, one of a branch of UPS Company, in March of 1999. The 3PLs service company itself did not transport cars but managed the distribution work of complete cars in place of Ford. The company should rebuild the distribution network of Ford, introduce new management method, remove distribution bottleneck, and reduce the waiting time on the one hand, and provide a distribution information management system to effectively monitor the whole process of distribution every car. The goal of Ford was to shorten the distribution time of a car from 14 – 15 days to 9 – 10 days, to make customers more satisfied. In addition, Ford intended to reduce the stock-in-trade and cost, improve use rate of infrastructure and market competitive ability. It was prescribed in contract that the transition period of cooperation between the two parties was 18 months. It was mainly implemented in west and southwest of America in the first phase, and then gradually expanded to the whole America, Canada and Mexico.

(2) Other industries. The operations of 3PLs of different industries have their own characteristics.

Some refer to the professional logistics service company to operate and manage existing logistics asset. For example, when it found the surplus of its capability for distribution and at the same time intended to build up activity-based cost keeping system, it referred to Burnham Logistics Company, the logistics expert of electronic products and office equipments, to manage and operate the biggest global distribution center, while reserving the personnel and establishment of former distribution center. The operation cost of enterprise reduced by 20% in less a year with the aid of the above mentioned measures.

Some retain the 3PLs service company to improve after-service level. For example, when Sun Microsystems Inc. encountered the need of customers shortening distribution time of fittings from two days to one hour, even requesting instant on-site jobs, it established strategic union relationship with USCO Logistics Service Company, a logistics expert on pharmacy, and handed over transport, storage, fittings schedule and maintaining jobs to USCO to manage. Therefore, it not only achieved 96.3% of distribution service rate in one hour, but also cancelled some local depositories.

Some retain the 3PLs service company to advance the level of management of goods. For example, when Zenith Electronic Company intended to change the traditional management mode of handwork goods yard, it referred to GATX Logistics Company, so-called *expert on storage logistics*, to provide a set of yard management software (YMS). It electronically monitored the process of receiving and sending goods, and electronically scheduled idle and actual load of tow trucks, and displayed computer images of location of the layout of yards and tow trucks, and reported to Zenith in real time.

Some retain the 3PLs service company to organize the backhaul of materials. For example, when Derre Agricultural Machinery Company in Canada found its product assembly was greatly impacted by the more and more accumulating materials and parts in assembly plants, it realized that its core business was assembling parts rather than taking over parts. In order not to increase the investment on infrastructure and human resources, it decided to retain the Caliber logistics company to organize and manage the backhaul of its materiel. Therefore, the 3PLs service company set up a new depository as distribution center five kilometers away from the assembly plant, to control stock-in-trade, manage carriers, arrange time of deliver goods by suppliers, optimize path of delivering goods, and to manage freight containers and customs clearance.

Some retain several professional logistics service companies at the same time to help organize and operate global market distribution together. For example, in order to expand the increase in the global market, the Case Inc., an American manufacturer of farm and architecture equipment firstly retained a consulting company to analyze and diagnose current operation conditions of the enterprise, and then found that it must greatly shorten order cycle of customers and try to

eliminate storage of finished products and spare parts worthy of nearly two billion dollar in that the key market competitive capability consisted in logistics. Then it decided to outsource all the logistics operation to the 3PLs service company. The famous international freight forward Fritz Inc. took charge of development of information system and freight forward business, and played as the leader of supply chain integration. The Schneider logistics company, the famous truck transport carrier, took charge of transport on land. The GATX logistics company, the third party storage expert, had charge of management of depository and schedule of stock.

Some retain the special logistic service company to manage logistics bill of document and balance expense. For example, LOF, a glass manufacture company, retained a 3PL service company to organize and manage backhaul quota of deliver trucks of suppliers. At the same time it also retained Cass Logistics Inc. which was famous for its logistics information management to take charge of management of all freight bill of document and expense payment.

Therefore, it can be seen that although the actual goals and methods of cooperation between different enterprises and special 3PLs service companies are different, there is invariable masterstroke inside—enterprises are highly interactive cooperating with each other. The reason for adopting the term "highly interactive cooperation" rather than "cooperation" is that 3PLs service cooperation could have different levels from the perspective of essence of outsourcing operation of enterprise logistics, but the term of "3PLs" actually refers to the advanced form of logistics service outsourced by enterprises particularly. On the other hand, the 3PLs cooperation is not just co-operation based on division of labor in general, but a process of working out logistics solution together and dynamic execution according to the market needs for the common strategic goal under the condition of sharing information between the two collaborative parties. The operation of logistics enterprises is actually integrated with management activities of customers.

Sharing information and establishing logistics solution jointly are important signs of highly interactive collaboration of enterprises, and also the remarkable characteristics of advanced form of 3PLs operation. In the logistics operation, the enterprise exports its internal function, and establishes highly cooperative operation system, which is the inevitable result along with the maturation of the market economic system.

For an enterprise, whether to choose self-support logistics or to outsource logistics mainly depends on two factors: The effect of key logistics activity on the success of the enterprise and the enterprise's ability to manage logistics operation.

If an enterprise requires high level of customer service, is capable of managing logistics, and its logistics cost takes a high proportion in the whole cost of the enterprise operation, it is likely to choose self-support logistics. In other words, if the enterprise takes development of supply chain management as its core competitive ability, it should not outsource the logistics service, such as Wal-Mart.

If an enterprise is not good at logistic management and its core business is not

logistics, it is likely to outsource logistics. In other words, if the enterprise is green-handed in storage and transport, and its storage and transport activities are not the key factor for the market competitive status of the whole enterprise, it will outsource logistics service, such as Dell.

Apparently, if an enterprise is not good at logistic management and its key factor of market competition is not logistics operation, the best way is to outsource logistics service. For example, American General Food Inc., famous manufacturer of oatmeal and sweetmeat, has an annual turnover of six billion dollar with three billion dollar on packaging and transport of product every year. The freight cost of food is 0.4 billion dollar, 60% of on-shelf cost of oatmeal product. After analysis, it turned out that the main reason for the high cost of logistics was that trucks were not full when delivering and empty in backhaul. In order to reduce the cost of transportation, the company retained NC Online Logistics Marketing Inc., a 3PLs company focused on packaging food logistics, to help online assemble truck capacity. The two parties jointly developed special freight management software. In the background, NC Inc. connected to the ERP system of General Food Inc. through special-purpose communications link. In the foreground, the freight information of General Food Inc. is divided and loaded with the freight plan of 200 carriers which are operating on four million lines. It saved 0.7 million dollar of carriage just through sharing truck capacity with one partner in online trade market. And the partner was a paper product company manufacturing packing case of oatmeal for General Food Inc.

Generally speaking, the enterprise could gain much economic benefits through outsourcing special logistics service and make itself competitive, such as reducing investment in capital assets, the operation cost and requirements of flow capitals, acquiring the special technology and management technology of logistics operation, gathering resources for core business, improving the operation and customer service of enterprise and market penetration. But the enterprise will bear some risks, that is, losing control of key logistics activity. For example, Wal-Mart will not outsource its logistics operation to the 3PLs service company, because that is its core competitive capability.

Actually, the decision-making of outsourcing logistics for enterprise itself is a process to trade off interactive cooperation economically and technically. For example, SCM Logistics Inc., founded by GM and CNF Managing Group Corporation with joint contribution in the beginning of 2000, was in charge of providing all the materiel and visibility service of complete truck in the integration operation management of global supply chain and the whole logistics operation for GM. The goal of GM was clear: The newly founded logistics company must shorten the order cycle time from current 60 days to 15 – 20 days, the dispatching time of complete truck from current 11 days to 6 – 7 days in the future 2 or 3 years, and reduce storage at least by 50% with no influence on improving customer service. The newly founded logistics company was controlled by CNF, but GM had one ticket veto in the important strategic issue. Both

companies used a management information system based on network which was developed by CNF. At the beginning, SCM Inc. was just in charge of backhaul of product materiel, complete truck conveyance, transportation and Import and Export practice in North America. According to the agreement, SCM Inc. gradually took over the global logistics management of GM. Concerning freight work load, everyday freight weight was up to 0.9 million kilogram. It organized 12,000 suppliers of GM to produce and supply materiel for 70 assembly plants, and sent 35,000 deliveries every day. The global logistic management department of GM would reserve the responsibility of strategic management, monitoring and evaluation. Therefore, the logistics management teams, 300-person in North America team and 800-person in global team, were unchanged. This was actually an organizational step to keep away risk after outsourcing logistics service. For the highly competitive auto industry, the operation of auto logistics is the key competitive capability of enterprise.

It must be pointed out that the credit relation between the enterprise and the 3PLs company is very important. The common market credit system with entrusting agent as the basic frame is an important environmental condition for the operation of 3PLs. It is the problem that seriously limits the normal development of 3PLs operation and even logistics industry in our country.

The famous American MERCER Management and Consulting Company defines 3PLs as "To provide consigners or consignees services from functional service of logistics node to broader integration service of logistics channel; to integrate transport management, stock-in-trade schedule and information technology, to provide customers increment service through the whole low cost of channel", which is obviously too broad.

In fact, there are many names of the operation of 3PLs in the related literatures, among which most common ones are Third-party logistics, and also Third-party providers, third-party Logistics Company, Third-party contract logistics, integrated logistics companies, contract logistics specialists, and so forth. Sometimes it is also called the logistics partner of enterprise because the advanced form of 3PLs is usually closely related to the strategic partner relationship between enterprises, namely strategic alliance.

Actually because the operation of 3PLs is always an especial and individualized one-to-one cooperation relation, Thomas Craig, CEO of American LTD Management and Consulting Company, put forward "it is not enough to outsource assets or business. The real 3PLs is to meet both customer's requirements and enterprise's business development to customize special logistics solution for customers" to differentiate 3PLs from the ordinary logistics cooperation which only provides standard service. In other words, the 3PLs is the process of working out the special logistics solution together by the two parts of cooperation, and achieving win-win. It is obviously different from the ordinary simple contract process of "agreements" and "promise".

In fact, there is disagreement about the term "the third party". Although a

centure has registered intellectual property right of so-called the "the fourth party", and some scholars have also defined the "the fourth party" as the consulting company which specially establishes logistics solution for customers, some experts have pointed out that, it is best to less use such terms as the "third party", even the fourth party, because it is easy to bring about confusion. It is best to use "Logistics Outsourcing" exactly, to reflect such a relation about outsourcing of logistics operation to the third party enterprise which could provide the needed logistics service.

According to the author, the so-called 3PLs is the process of enterprise or other economic organizations outsourcing part or all of logistics management, logistics jobs or logistics establishment of non-core business to strengthen its core competitive capability, and to establish the win-win interactive cooperation with dedicated logistics company until further to establish the market competitive strategic alliance. The operation of 3PLs is the operation of interactive cooperation, and the management of 3PLs is the management of interactive relation by the two parties. For example, Georgia-Pacific Forest Products Group Corporation, the first rank in the field, outsourced the logistics service to different 3PLs service companies in different local markets, and regarded the operation of 3PLs as the extension of its management activity. SUN Microsystems Inc. claimed that, the 3PLs service company had become an organic part of the whole operation of the enterprise, and the management of 3PLs cooperative partners had become its core competitive capabilities.

The development of logistics industry depends on the maturity of market economy on one hand, and benefits from the continuous enrichment and innovation of logistics service ideas. On the other hand, the enterprise, which is going to participate in or has participated in the operation of 3PLs, needs to correctly master the kernel of the operation of 3PLs operation, and to roundly understand the 3PLs operation from the following six aspects:

(1) 3PLs is the result of enterprise outsourcing logistics or logistics management.
(2) 3PLs is the process of interactive cooperation between enterprises.
(3) 3PLs is the customized service of customers.
(4) 3PLs is the strategic alliance of enterprises.
(5) 3PLs is the market competitive advantage that is hard to copy for competitors.
(6) 3PLs is the advanced form of enterprise outsourcing logistics service.

7.4 Human Resources Management of Network Enterprise

7.4.1 Overview of Human Resources Management

Human resources refer to those manual workers or brainworkers who have normal intelligence and could be engaged in produce activities. The "human resources"

regards human as a kind of resource, which constitutes the three resources of enterprise together with material resources and information resources. The human resources have the following characteristics:

(1) The human resources are "live" resources. It has movable, periodicity and abrasion, while the material resources could produce value only through process and creation of the human resource.

(2) The human resources are the main source of profits. The innovation ability of the human resources is the best wealth of the enterprise especially in the new economics.

(3) The human resources are strategic resources.

(4) The human resources are a resource that could be infinitely exploited, and the current exploiture of human potential is not consistent with the actual potential of human resources.

The human resources management is to improve productivity through a series of measures such as job analysis, human resource program, staff recruitment and selection, performance estimation, salary management, staff inspiriting, and human resources training and development. The final goal of human resource management is to promote the realization of the enterprise goal. From the perspective of "human" and "thing", it is to achieve the harmony of "human" and "thing", and "human" and "human", which could increase productive efficiency, thus achieving the final goal.

(1) The goal of the enterprise is finally realized by the staff of the enterprise.

(2) To gain the development of both the staff and the enterprise, the staff should regard promoting the success of the enterprise as his work goal.

(3) An enterprise can effectively use resources and realize its business goal if consistent guideline and system of human resources which is joined to the achievement of the enterprise is established.

(4) The policy of human resources management should be consistent with the business goal.

(5) When the enterprise culture is reasonable, the policy of human resource management is supportive; when the enterprise culture is reasonless, the policy of human resource management should promote its improvement.

(6) Create perfect enterprise environment, encourage staff to create, and cultivate positive style; the policy of human resource should provide appropriate environment for the improvement of collaboration, innovation and full quality control.

(7) Create sensitive and adaptable organization system to help the enterprise realize the material aims in the competitive environment.

(8) Strengthen the flexibility of staff's on-duty time and the work content.

(9) Provide necessary working environment to make the staff fully exert his potential.

(10) Maintain and consummate staff rank, products and service.

Humanistic management is a people-oriented human resources management ideology. It regards human as the most important resources for the enterprise, and

scientifically arranges the most appropriate work according to the integrated facts such as human ability, merits, interest and mentality, and fully considers the development and value of the staff in the work, and uses scientific management method. Through the full-scale exploitation plan of human resources and buildup of enterprise culture, it makes the staff able to fully invoke and exert the enthusiasm, go-aheadism and innovation in the work to promote work efficiency, increase work performance and make the most contribution to achieving the development goal of the enterprise.

At present, the human management is generally divided into five levels:

(1) Management of Emotion Communication

It is the lowest level of humanistic management, and also the foundation for other levels. In this level, the manager and the staff are no longer the simplex commander and the one who takes the order. There is other communication between the manager and the staff besides the work order, which is mainly the emotional communication. For example, the manager would know some real thought of the staff about the work, or some other requirements on life and personal development. In this stage, the staff does not communicate decision-making with the manager on the work issue, but it lays the foundation for the decision-making communication.

(2) Participative Management

Participative management is also called "decision-making communication management". The communication between the manager and the staff is not limited to show a kind concern for the staff's comfort, and the staff has begun to participate in the decision-making of the work goal. In this stage, the manager would discuss the work plan and work goal with the staff, carefully listen to the staff's opinion on the work, and actively adopt the reasonable advice proposed by the staff. Participative management makes the work plan and goal become more reasonable, and increases the work enthusiasm of the staff and the work efficiency.

(3) Staff Self Management

Along with more and more staff involved in management, the company could carry out staff self management on the business-skilled staff or the knowledgeable staff. The manager could point out the work goal of the whole company or the department, and ask for work plan and work goal from every staff, which could be put in practice after discussed by everybody. In this stage, it will exercise the working capability of each staff, and the staff with overall and creative ability will pale others by showing his talents and ability, become enormous asset to the enterprise and assume sole responsibility for a certain sector or task.

(4) Human Exploitation Management

To further increase the work ability of the staff, the company needs to do some human resource exploitation work particularly. The increase of the staff work ability is mainly through three approaches: study in work, study in communication, and special training. The human exploitation management should first set up a work and communication environment for the staff, and let everyone study and

discuss mutually. In addition, the human resources department could invite some experts to make specific training.

(5) Enterprise Culture Management

In fact, the enterprise culture is just the working habit and style of the company. The form of the enterprise culture needs long-term accumulation of the company's management. The working habit of employee will develop either to be good or to be bad. If the company does not instruct the working habit of the staff to the good direction, it will just develop to the bad direction. The effect of the enterprise culture is to set up such an orientation, which must be agreed on by majority. Along with the development of the company, the enterprise culture will also continuously develop. However, the key of the enterprise culture management is to induct the work habit of the staff, not just only for the propaganda of the company's image.

7.4.2 Realization of Human Resources Management

The combined application of information technology and management technology in the human resource management could effectively help the HR manager rise to the occasion in complicated environment. At present, the main goal of introducing human resources management information system into enterprise is:

The first level: to increase the work efficiency of the HR department. Affairs such as checking on work attendance of staff, computation and management of laborage, duty transfer management and information management will take a great deal of time of the HR manager, and handwork operation is not only low in efficiency, but also fallible. Therefore, HRMS software will chiefly solve the issue of how to increase the work efficiency.

The second level: to standardize the business flow of the HR department. The design of flow such as recruitment, achievement estimation, training, staff career plan and dimission, is in the range of consideration of the HR manager. HRMS software completely covers the related work functions, divides them clearly, and could present the optimized flow in the software.

The third level: to provide value added service for the enterprise and staff. From the perspective of the development trend, the HR manager will evolve from civil service handler to enterprise strategic partner. As to the HR department, the enterprise manager and the staff are just its customers, and how to realize their increase in value for these customers is an important problem faced by the HR department. For example, how to program the human resources according to the enterprise strategy, how to select the appropriate talents for enterprise through rational recruitment technology and testing technology, and how to advance the performance of the organization and individual through work analysis technology and corresponding performance checking system, are all needed to do by the HR department.

The first step: preparation before using the HRMS. The special consulting organization analyzes and diagnoses the fact of the human capital structure and expected effect (which can be done by enterprise itself if possible) beforehand, and installs it in the system platform of the software supplier after find apt and specific ways to solve problems. Meanwhile, adjustment and corresponding training shall be carried out.

The second step: choosing the HRMS solution. When the enterprise chooses the HRMS, it is easy to draw conclusion experientially about technology service, product price and product popularity degree; while as to the feature of performance of products and second-developed function etc., it is hard to master without a propriety standard as instruction. A good HRMS should be an effective, multifunctional and easy-to-learn, easy-to-use solution. Users could judge its functions through the following characteristics when choosing a system:

1. Integrality and integration

(1) User information management platform of routine shall cover all the business functions of the human resource management with every business function designed based on a complete and standard business flow and a great lot of corresponding tables.

(2) The input work of user data is needed only once, and other modules could share it, thus greatly reducing a great deal of repeated input work.

(3) It could be used as a whole system, or individually, and could be extended to integrate if necessary.

2. Easy to use

(1) Adoption of navigation interface represents the main work contents of the HR manager friendly, compactly and directly, guides users to operate according to the optimized HR management flow.

(2) It is high in information integration based on no pop up dialog box and one interface displaying all of the related information and operating all the functions.

3. Network function and self-service

(1) Support group-type enterprise users, and provide non-local, multilevel and layered data management function.

(2) Daily management is not limited by physical location, and can be carried out in any online computer after authentication.

(3) Provide staff in non-HR department intranet application based on Web.

(4) The staff could check out information of the enterprise and individual online, register internal training lesson, submit application of leave/furlough, update personal data and communicate with the HR department through electric methods within allowed privilege.

(5) Allow the line manager to online check the personnel information of

underling staff, examine and approve the staff application such as training, leave, and furlough, and evaluate performance of the staff within the authorization.

(6) Allow general manager to online check all important human resources information of the company such as allocation of human resources, cost fluctuation, compensation balance sheet, organizational performance/staff performance.

4. Open

(1) Provide powerful-function data interface to easily realize the import and export of various data and seamless access with external system.

(2) Could expediently import various Office documents, and store in the database with standardized format safely.

(3) Support all principle RDBMS and all document processing systems.

5. Flexibility

(1) Could change customized function and alter display of interface data items according to user requirement.

(2) Powerful inquiry function, which could carry out inquire with any combined condition flexibly.

(3) Support real-time dynamic switch between Chinese and English (or other languages).

6. Intelligentization

(1) The auto-mail function of the system could directly send information in batch to the related personnel through e-mail, which greatly reduces the intension of the civil service of management personnel.

(2) The system set up reminder function for fixed cycle operation, which makes the HR manager active from passive, and effectively promotes the contentment of staff for the work of HR department.

7. Powerful report forms/graph output function

(1) Provide powerful facture and management tools of diagram, by which users could directly design various required diagrams.

(2) Provide flexible report form generator, which could quickly design various conditional diagram and update at any moment.

(3) The diagram could be out to printer, Excel, and ASCII text file (for example, files submitted to banks).

(4) Provide perfect graphic statistic and analysis function, and the output statistic graph could be directly exported to a MS Office document and quickly form the work report of HR.

8. System security

(1) The key data is encrypted to store, and even the system manager cannot

directly read these data.

(2) Set up operation privilege of different levels in different system modules of users.

(3) Set up log files to track and record the details of every operation to the system by users.

(4) Set up periodic data backup mechanism and provide data recover function.

The third step: how to implement HRMS. The impersonal and full evaluation of oneself shall be carried out before company implementing HRMS, and then the range and boundary of the HRMS to be implemented will be determined. On the other hand, enterprises shall be with a factual and realistic work style and not devote to perfection excessively but try to act according to actual circumstances. Only if it realizes its situation correctly, will the enterprise find an appropriate solution.

After realizing its requirements, it is time to select an appropriate solution supplier. What should be pointed out is that the implementation process of HRMS solution is not just a simple trade process, but a complete project. The implementation process of the project is divided into three phases:

① Requirement analysis and process design phase cooperating with the supplier before implementation: The phase usually takes more than half time of the whole implementation cycle of the project. As to the HR manager, it is a god-given process to settle and consummate the HR management operation system, in favor of standardization and systematization of former discrete work. As to the supplier, clarifying the customer requirement is crucial to successfully implement the whole project. Therefore, both users and suppliers should treat the work in this phase seriously rather than be eager to seeing the effect of the system operation.

② System implementation and customized alteration phrase: After completing requirement analysis and design phase, the supplier would customize alteration of the system according to the specific requirements of the user. In this period, the supplier should keep intimate communication with the user to avoid going out of form of the requirements of the user in the customized process. When the development of all the functions is completed, the supplier just submits a system frame which could not operate right now. The user needs to initialize the system and switch the data with the help of the supplier to transfer the basic data of the enterprise and the staff to the system as soon as possible. Moreover, the enterprise should take up the related technology training about using the system from the supplier in the formal operation of the system.

③ System application training phase: In the implementation process, the enterprise requires the software supplier to improve and add corresponding modules according to the specific characteristics of its business, and the software supplier should actively do the second development work to meet the continuously changing management requirement of the enterprise.

7.5 Summary

Network enterprise management, crucial to the network enterprise, mainly includes strategic management, supply chain management of, logistics management and human resource management. The chapter discusses network enterprise management, its corresponding management system, the establishment of management system, management principles related and some brief introduction of network enterprise culture.

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Part 4 Practice

8 E-commerce Architecture and System Design

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Abstract E-commerce can only be conducted through an e-commerce system. Together with the embedded computer applications, e-commerce system plays an important role in the implementation of e-commerce. E-commerce system used to be a complicated piece of integration system, constructed under strict principles in order to make sure every parts work well. This chapter examines the data flow and the architecture of e-commerce system, and presents some basic principles, basic design methods that should be followed in designing an e-commerce system.

Key Words e-commerce, architecture, system design, Petri net, data flow, optimizing, secure system, online payment, design.

E-commerce is to make various business activities electronicalized, computerized, digitalized, non-paper and internationalized through various technologies such as modern computer technology, network communication technology, multimedia technology, Internet, Intranet, Extranet and so on. From the perspective of system, e-commerce system is an integrated information system composed of various electronic technical methods that support business activities. From the perspective of application, it is a complex application system facing customers, provides various business management and administrative services to directly realize multi-functions of e-commerce. The key points of this chapter are: construction modes of e-commerce architecture, construction modes of e-commerce system architecture and design of e-commerce system.

8.1 E-commerce Architecture

8.1.1 Infrastructure

The infrastructure of e-commerce is shown as Fig. 8.1.

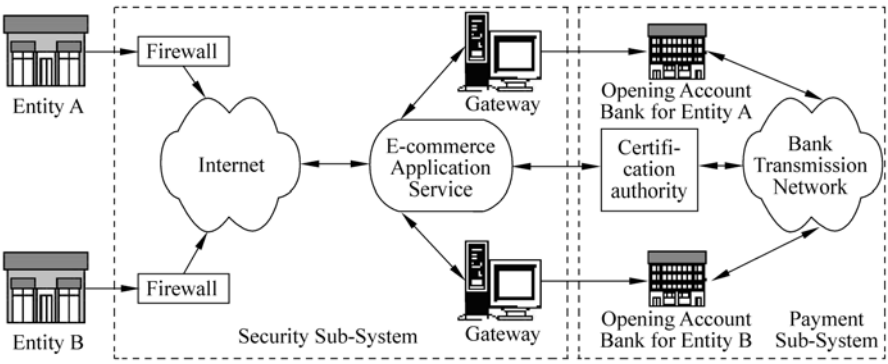

Figure 8.1 Infrastructure of e-commerce

In the infrastructure of e-commerce, e-commerce entity A submits a business request, and sends request information and bank account information to the e-commerce application service center provided by the e-commerce ASP through the Internet; the intelligent search engine searches the appropriate trade entity B on the Internet, and sends the request information to entity B through the Internet; after entity B receives the request from entity A, entity B responds to the trading request after analyzing and handling, and then sends the response information and its bank account information to the e-commerce application service center after analyzing and handling with the request; after receiving entity B's trading request, the e-commerce application service center authenticates identities of both sides, and sends the authenticated bank account information to the banks, which they open their accounts through payment gateway, and then completes bank account transformation through bank private network; the transferred information is sent to the trading entities through the e-commerce application service center; the delivery is completed with the help of some cooperated organizations, such as industry and commerce, revenue, CIQ, law and transportation.

The e-commerce infrastructure can be divided into two relatively independent sub-systems. They are e-commerce security sub-system and e-commerce payment sub-system. The e-commerce security sub-system is in charge of handling security issues of information interaction in the e-commerce trade process, including the security issues between the internal Internet subnet of the e-commerce entity and the Internet, between the Internet and the e-commerce application service center, and between the e-commerce application service center and the payment sub-system,

etc.; the e-commerce payment sub-system is in charge of handling the electronic payment issues in the e-commerce trade process, which integrates the payment part in the trade process with the Internet, realizing a digital, electronic and automatic payment process, clearing away obstacles and paving road for completely implementing of e-commerce in every aspect of everyday life.

The figure above briefly illustrates the Infrastructure of e-commerce system, and the functions of each part and relations between sub-systems of the e-commerce infrastructure. It simplifies the security sub-system and the payment sub-system. There are details about the security and payment sub-systems in the following chapters. Next, we will specify the infrastructure of e-commerce on the view of data structure and Petri net modeling, then make out the data flow and process control method of the structure.

8.1.2 Data Flow of Infrastructure

The whole framework of the e-commerce infrastructure includes the realization of the functions of every part, communication relations of the parts and sub-system division. This section gives a clear representation of communication relation of different parts from the perspective of the data flow diagram, and describes the information flow; data flow and control method in the data flow diagram using PASCAL-like language. And deals with the content of security sub-system and payment sub-system with the absolutely similar method of structural description.

The data flow diagram of e-commerce infrastructure is shown as Fig. 8.2, in which A and B are e-commerce entities, and C is the e-commerce application service center.

The PASCAL-like description of the whole data flow of the e-commerce infrastructure is shown as follows:

```
Program Basic_Architecture //statement of sub-process and function;
Procedure Send_To(Message_Sender,Message_Receiver,Message); //authenticated
  entity sends information;
Procedure Show_Message(Message: String); //display system prompts information;
Procedure Process_Terminated(); //authentication error, system exits
  abnormally;
Procedure Process_Finished(); //authentication completes, and system exits
  normally;
Function Find_Entity(Request): Entity; //search for the e-commerce entity
  meeting the requirement;
Function Is_Transaction(Requst_Sender,Request_Receiver,Request): Boolean;
  // judge whether to process the e-commerce trade;
Function Start_Payment(): Boolean; //start payment subsystem, and return
  a Boolean variable;
//The main body of e-commerce infrastructure flow
Begin
  Send_To(A,C,Request); //A sends business request to C;
//C startsup search engine to find an appropriate e-commerce entity B;
start:B:=Find_Entity(Request);
```

```
Send_To(C,B,Request); //C transmits the request to B;
If (Is_Transaction(A,B,Request))Then
  Begin
Send_To(B,A,Response); //B sends the response information;
        If (Start_Payment()) Then
           Begin
Show_Message("The e-commerce process completes");
           Process_Finished();
        End
        Else
           Begin
              Show_Message("Payment subsystem Error");
           Goto start;
        End;
    End
  Else
Goto start;
End
```

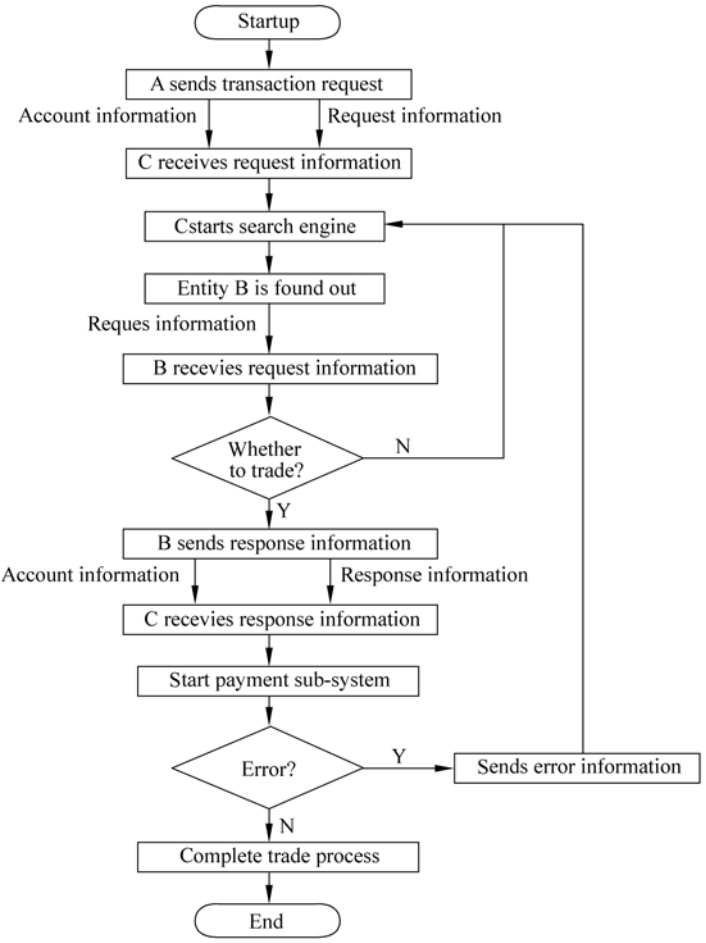

Figure 8.2 Data flow of e-commerce infrastructure

The security and payment subsystem in the e-commerce infrastructure of data flow and PASCAL-like description are both simplified. The security sub-system is included in the whole infrastructure, rather than a very independent module, so it is not explicitly represented here; as a more complete sub-module, the payment subsystem is not detailed, and we just describe its location in the system and interfaces to the internal and external applications of the system, and its internal structure will be detailed in the following part.

8.1.3 Process Control of Infrastructure

The process control of e-commerce infrastructure can be divided into the following parts:

1. A sends a business request to C

There is an Intranet built in the internal structure of e-commerce entity A, the Intranet is connected with the Internet through firewall. If e-commerce entity A has a trade request, the request information is encapsulated according to the specified protocol format (here is M1), and sent to the e-commerce application system through firewall system, then the e-commerce application handling module does the following work, whose Petri net model is shown as Fig. 8.3.

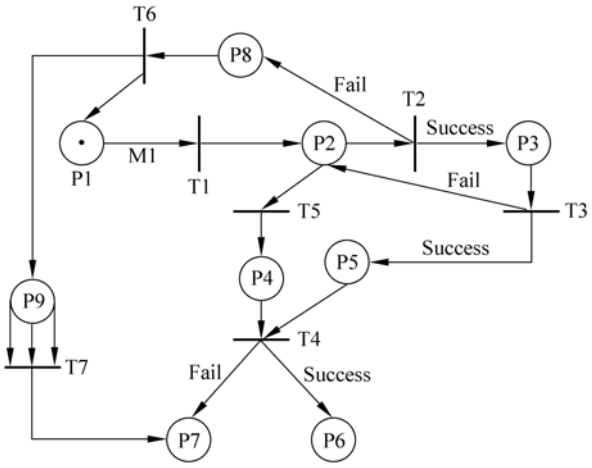

Figure 8.3 Process of A sending a business request to C

Position P1 has a token in the Petri net model in the above figure, which represents A has an e-commerce request, making transition T1 in the enabled state; there is no token at other positions, so the corresponding transitions do not meet the conditions of Enable and are in the waiting state. Information M1 whose

format could be represented as (A, C, T1, Request) is an encapsulated information package generated according to the information interaction protocol between the e-commerce application system and the e-commerce entities, and it can be represented as; T1 represents that the e-commerce entity A sends business request to the e-commerce entity C.

It is clear that only one element P1 is in the preceding set {·T1}of T1 from the Petri net principium, and m (P1)≥W (P1, T1), that is the transition t1 meets the triggering condition, and could be triggered at any time and can cause the change of the system state of the Petri net.

2. C accepts A's Request, and prepares to start agent to search the appropriate entity B

The result of the triggering of T1 is that A sends information package M1 to C, and the e-commerce application system C accepts M1, sends response information to A, and at the same time prepares to start several intelligent agents to search the e-commerce entity B that meets the request, that is position P2. When T1 is triggered, the Petri net model is shown as Fig. 8.4.

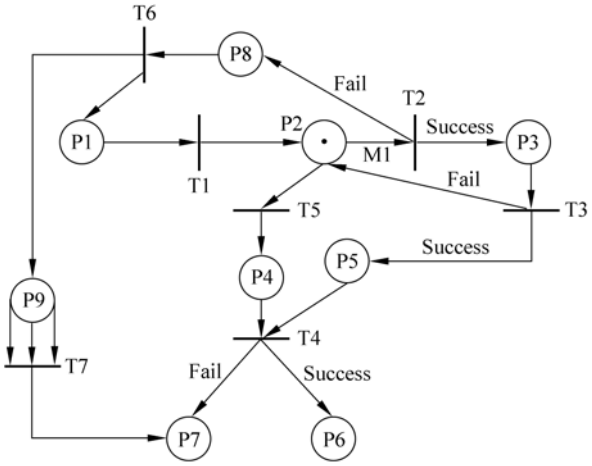

Figure 8.4 Entity C accepts A's request

Based on the rules of Petri net model transition trigger, the triggering of T1 in the Fig. 8.3 turns the Petri net of e-commerce infrastructure into Fig. 8.4, in which position P2 owns one token, P1 loses the token, and T1 completes the triggering. The token of P2 means that transitions T2 and T5 could be triggered, that is C sends the response signal to A, and prepares to start intelligent agent to search the appropriate entity B at the same time. When the only forward element of transitions T2 and T5 owns a token, the triggers of these two transitions could complete in parallel, without the conflict problem.

3. C sends a response to A, and starts an agent to search the appropriate entity B at the same time

The trigger of transition T5 is natural, and position P4 obtains the token, which represents entity A receives the response information from e-commerce application system C, and waits patiently for the appropriate trading e-commerce entity B; see Fig. 8.5.

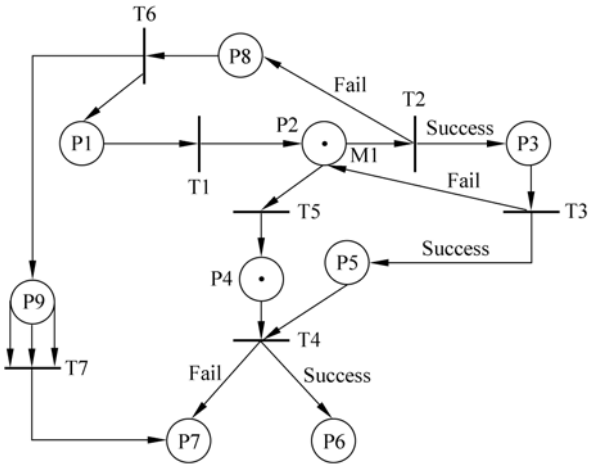

Figure 8.5 Find no appropriate entity B

The trigger of transition T2 is little complicated, because transition T2 is a condition judgment transition, which may lead to two different possible results.

(1) Find an appropriate entity B

The several intelligent agents started by the application system C find B that meets A's Request, and the Petri net model of e-commerce infrastructure is omitted here. The position P2 loses the token, and the position P3 obtains the token at the same time. A token in P3 means that entity B will decide whether to trade with A based on the specific information of A's Request.

(2) Not find an appropriate entity B

The transition T2 is triggered, but the appropriate entity B is not found (namely failed), then position P2 loses the token, and position P8 obtains the token. P8 with token means one's attempting to find an appropriate entity B failed, and transition T6 obtains the triggering condition. T6 is actually a process of handling error, and triggered T6 causes P1 and P9 to gain a token. If P8 receives a token, the system will restore to initial state, and A sends Request to C again. At this time, A can adjust original request according to response information, and encapsulate it into M1 again to send it to C; P9 is a counter, when tokens contained in P9 exceeds pre-established capacity limit, transition T7 is triggered, P7 gains a token, causes an error in the system and exits, then the whole system stops. B makes decision on whether to trade with A.

Entity B will decide whether to trade with A based on the Request sent by A.

(1) E-commerce trading process

If B accept A's Request, T3 will obtain a positive trigger (that is success), and sends a response information package M2 to A. The format of M2 is: (A, C, T1, Response). The Petri net model of the infrastructure is shown as Fig. 8.6.

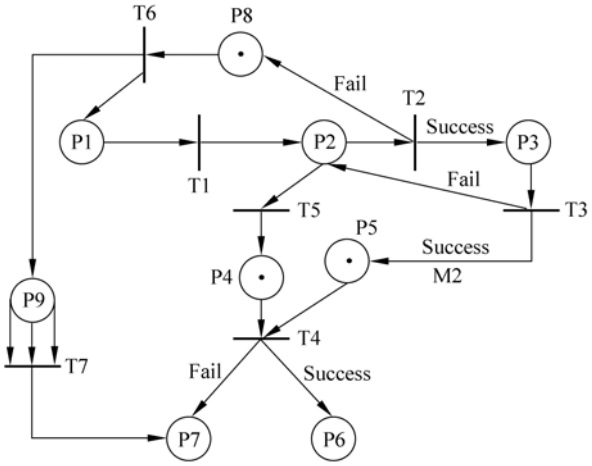

Figure 8.6 Entity B accepts request

Then P4 and P5 both have tokens in the preceding set of transition T4, and T4 meets the trigger condition, which could trigger T4 to start the payment process and complete an e-commerce trade.

(2) Do not make e-commerce trade

If B cannot meet the business Request of A, T3 gets negative trigger (that is fail). Position P3 loses the token, and P2 gets the token and the whole Petri net model returns to the similar situation of step 2 (omitted).

After analyzing the business Request of A, and if B cannot meet A's request, the system will give up trying to trade further. Then P2 gets a token, and can search again for the e-commerce entity meeting request, or can generate an information package to A based on the response information from B, promoting A to adjust its business request appropriately to better realize e-commerce interaction.

4. Start payment process

Both P4 and P5 own tokens, that means e-commerce entity A has a business request and entity B can meet A's business request, transition T4 is triggered, and then the e-commerce payment process starts. However, because of the complexity of the payment protocol, the payment process is actually possible to fail, so it's necessary to consider the following two points:

(1) The payment process succeeds, and the e-commerce interaction completes

If the payment subsystem runs well, the Petri net model of the infrastructure evolves to Fig. 8.7.

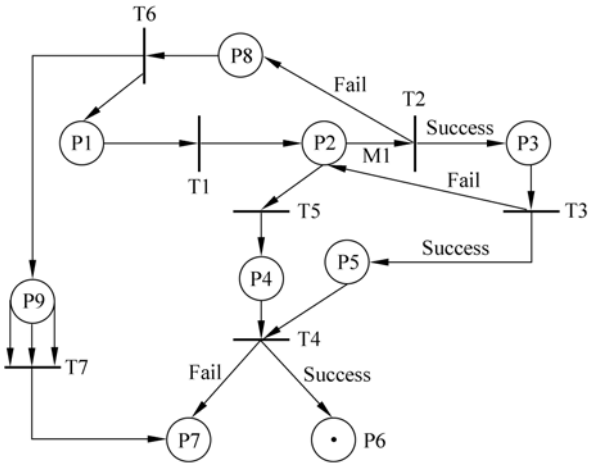

Figure 8.7 The completion of payment process

The transition T4 is positively triggered, and P6 obtains a token, which indicated the e-commerce interaction completes normally.

(2) The payment process fails, and the e-commerce interaction could not be completed

If errors appear in the running process of the payment subsystem, the evolvement of the Petri net model could also be presented with the corresponding Petri net (omitted). Then the transition T4 is negatively triggered (namely fail), and P7 obtains a token, indicating the e-commerce interaction is abnormally stopped.

The above figure is just a sketch Petri net model of the e-commerce infrastructure. Conceptually and in detail analyzed the data flow of the e-commerce infrastructure, displayed the hidden control flow and information flow in the data flow on the view of the process control. However, it is emphasized that the model is just a concept model, not an exact model of modern e-commerce architecture; meanwhile, the security subsystem and payment subsystem are not detailed in the model analyzing process, and are left in the following chapters, which simplifies the complexity of the e-commerce infrastructure from the layered point of view.

8.1.4 Optimizing Method of Infrastructure

The optimizing process of e-commerce infrastructure needs to be constructed in terms of the following optimizing rules:

1. Reachability

When designing a distributed system, there is a very important problem: Whether the system could reach a certain specified state, or complete a certain specified functional behavior. To prove that whether a model system could reach the

specified state through a certain functional behavior, designers need to find a chain generated by transition trigger. The system can reach the specified state m_i along the transitional activating chain from the initial state m_0, and the chain represents a series of functional behavior.

It's necessary to point out that, in a system model based on Petri net, the reachability of a specified state m_i is defined by a transitional activating chain which can be followed from the initial state m_0 to the specified state m_i. If there is only one transition in the transitional activating chain from m_0 to m_i, m_i is called instant reachable state.

2. Boundedness

The position is usually used for representing an information storage unit in communication and computer system, so designers must identify whether a particular control strategy could lead to overflow of the information storage units. The concept of bounded is introduced into the system model based on Petri net to handle the overflow problem of information storage unit. A k-bounded position p means the total of tokens must be less or equal to k in the changing process of the system states $(m_0 - m_i)$. If all of the positions in a Petri net model are k-bounded, the Petri net model is called k-bounded.

3. Conservativeness

In a real system, the quantity of available resource is usually limited because of various factors, such as the economic ones. If a token is used to represent resource, the quantity of tokens in a system is usually conservative, that is however the state of the system changes, the quantity of the tokens in the Petri net model of the system is always unchangeable. If a single host computer in the network fails, the number of tokens representing the host resource should decrease one.

The conservativeness of a Petri net is defined as: a vector $w = (w_1, w_2, \cdots, w_n)$ is existed, n is the position number, the weight of each position in the model is greater than zero ($\forall p \in P, W(p) > 0$), and the sum of weights of tokens keeps unchanged in the changing process of the system state. Figure 8.8 represents a conservative system model:

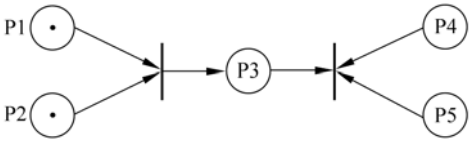

Figure 8.8 Conservative petri net model

Here $w = (1, 1, 2, 1, 1)$, thus the sum of weights of tokens is always 2. A Petri net model whose sum of tokens is always equal to 1 is a restricted conservative model.

4. Activity

The concept of activity is tightly connected with deadlock, and deadlock is thoroughly discussed in the computer OS principle. To avoid deadlock, a Petri net model must exclude the following four cases:

① Resource monopolized
② Keep waiting
③ Non- deprivation
④ Form waiting circle

5. Resumption

An important problem in the model analysis based on Petri net is whether a system has error-resuming function; that is to say the system can self-resume from an error state to a correct state. As to Petri net model, Resumption means that, if the initial state s_0 can reach a certain state s_i along the transitional activating chain, there must be a transitional activating chain from s_i to s_0.

6. Common optimizing models

We can use the following common optimizing models in the optimizing process of e-commerce infrastructure (Figs. 8.9 – 8.14):

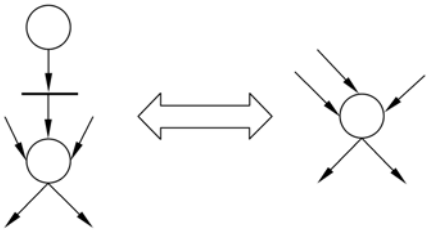

Figure 8.9 Optimizing models 1

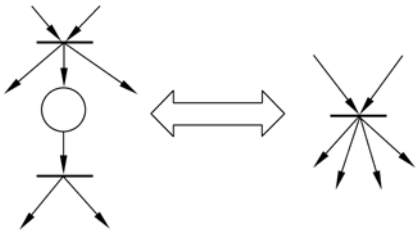

Figure 8.10 Optimizing models 2

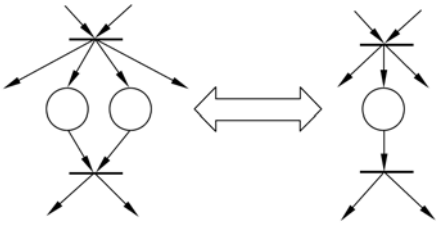

Figure 8.11 Optimizing models 3

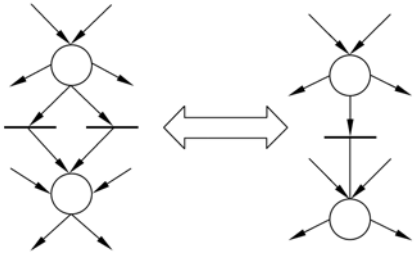

Figure 8.12 Optimizing models 4

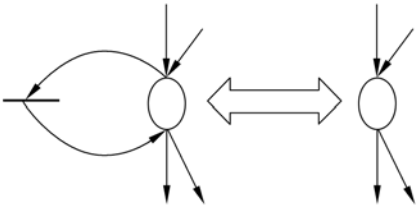

Figure 8.13 Optimizing models 5

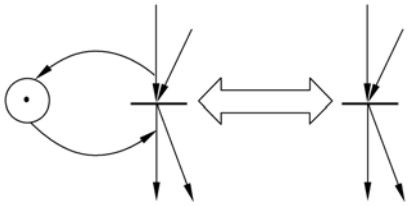

Figure 8.14 Optimizing models 6

The optimizing work of e-commerce infrastructure would be greatly simplified with the above six common optimizing models.

8.1.5 Event Process Control of Infrastructure

In the e-commerce infrastructure, most events are represented as various transitional activating conditions that are event drivers. Generally, several forms mainly for the process control of e-commerce system events are as follows:

1. Sequential relation

If the occurrence of E1 is the condition of E2's occurrence, E1 has sequential relation with E2, this situation is shown in Fig. 8.15.

2. Conflict relation

If E1 and E2 cannot occur concurrently, E1 and E2 are conflict mutually. This situation is shown in Fig. 8.16.

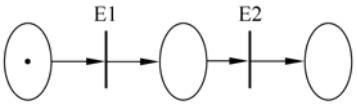

Figure 8.15 Sequentially occurrence of E1 and E2

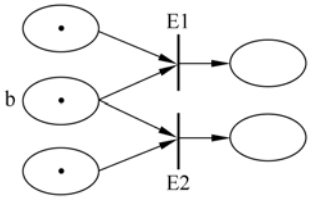

Figure 8.16 E1 and E2 are mutual exclusive

3. Collision relation

If occurrence of E1 or E2 can result in the change of certain position state, we define that the position has collision with E1 and E2, as shown in Fig. 8.17.

Collision refers to the relation that both parts have occurrence right, but only one could occur. As to the system itself, it's uncertain that who has the priority. It needs the system environment to give some hints by inputting one bit of information

to decide which of two conflict parts occurs first. Therefore, collision is also called choice or non-determinism, or we can say it needs decision.

The characters of the competing resources between conflict and collision are different: one competes for information, and the other competes for space to store information; the competitive result is also different: whichever occurs in conflict, the other will lose occurrence right; however whichever occurs in collision, the existence of the other will always cause collision with b. Collision reflects the potential danger.

4. Concurrent relation

If E1 occurs before E2, the system could reach a certain state. If E1 and E2 occur concurrently, it also could reach the same state, and there is no conflict, which means E1 and E2 have concurrent relation. Concurrency defined here is just involved with two events in the assumption without collision, as shown as Fig. 8.18.

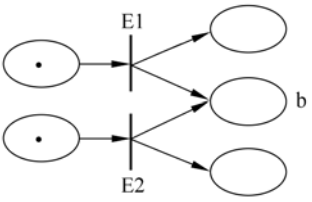

Figure 8.17 E1 and E2 are in collision mutually

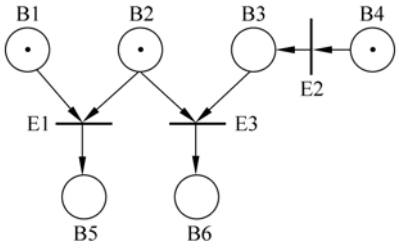

Figure 8.18 E1 and E2 are mutually concurrent

It is not necessary that E1 and E2 must occur concurrently, namely one-step occur, and it is not even guaranteed that the event having occurrence right must occur. If E2 occurs before E1 as in Fig. 8.18, E3 gets occur right, and E1 and E3 are in the conflict state of competing resource. If E3 occurs in further to resolve the conflict, E1 will lose one-step occurrence right.

If E1 occurs in conflict of E1 and E3, B5 gets the token, and the system reach the final state {B3, B5}. Another possibility from the initial state {B1, B2} to {B3, B5} is that E1 occur first, and then E2 occurs. The concurrence of E1 and E2 can also reach the same state. The two cases will not cause conflict.

Where the system conflict occurs is the system control occurs. If confusion occurs in the application system, the system environment cannot determine whether conflict occurs, or the conflict has disappeared without control. In a word, the occurrence of confusion will bring trouble to system analysis and control, and the system model with confusion is not a good model. The reason for the occurrence of the confusion is that the system and system environment are divided incorrectly. In other words, some transitional extension in the system is

uncompleted, and their extension should be supplemented from the environment to obtain more integrated and more exact description of these transitions.

8.2 E-commerce Security System

In the above e-commerce infrastructure, the security issue in e-commerce is not discussed in detail. But it does not mean that the consideration of security in e-commerce system could be neglected or is in the minor position. Oppositely, the e-commerce system built on the basis of Internet not only needs to handle various security issues, but also must meet some specific security control requirements in e-commerce interaction. Therefore, in the transition process from traditional trade mode based on the paper to the electronic trade mode, how to keep the electronic trade mode secure as the traditional mode is the focus, and also is one of key problems in the widely application of e-commerce.

This section will discuss the security issue in the e-commerce infrastructure, and detail the solution of security issue in e-commerce through analyzing noumenal security architecture of network and the specific security factors and control methods of e-commerce.

1. OSI security architecture

OSI security architecture instituted by ISO is an academic basis for study and design computer network system and for estimating and improving existing systems. OSI security architecture defines functions of security services, security mechanism and security management, and presents the logical relations among OSI network layers, security service and security mechanism. OSI prescribes five standard security services:

Object authentication security service: both sides of communication authenticate the validity and authenticity of each other, to prevent cheat.

Access control service: used to prevent unauthorized users to use the system resources illegally.

Data secrecy service: used to prevent information to be intercepted or betrayed by illegal entities.

Data integrity service: used to prevent the change, insert, delete exchanged data form illegal entities and lost of data.

Preventing denying security service: used to prove occurred operations, and prevent the denying of the happened behaviors.

Security service is implemented by security mechanism. OSI defines eight types of security mechanisms: encryption mechanism, signature mechanism, access control mechanism, data integrality mechanism, authentication exchange mechanism, business flow filling mechanism, route control mechanism and notarization mechanism. The relation of security mechanism and security service is shown in Table 8.1.

Table 8.1 The relation of security mechanism and security service

Security Mechanism	Object Authentication	Access Control	Data of Secreting	Data Integrality	Deny Preventing
Encryption	√		√	√	
Signature	√	√		√	√
Access Control		√			
Data Integrality				√	√
Authentication Exchange	√				
Business Flow Fill			√		
Route Control			√		
Notarization					√

2. E-commerce security factor

(1) Validity: Controlling and preventing the hidden threat caused by network failure, operation error, application error, hardware failure, system software error and computer virus, to guarantee trade data valid at certain time and in certain place.

(2) Confidentiality: E-commerce is built on the open Internet environment, and maintaining business confidentiality is an important safeguard for widely spreading e-commerce application. Therefore, it's necessary to prevent illegal access of information and to prevent information from to be wiretaped in the transmission.

(3) Integrality: E-commerce system should prevent to generate, update and delete information arbitrarily, avoid losing and repetition of information and guarantee the order of information transmission.

(4) Reliability: It's impossible to distinguish handwriting signature and seal in the non-paper e-commerce mode, so reliable identifiers are needed for individuals, enterprises or countries involved in information transmission in an e-commerce transaction.

The security factors and security service of various e-commerce and network are all implemented by security technologies. The e-commerce security technologies based on Internet mainly include: data encryption, authentication and digital signature and firewall.

PKI is used as core technology of information security in the security subsystem of e-commerce infrastructure. The detailed process and data flow are briefly explained below, taking example mutual authentication between e-commerce entities as example.

Assuming that e-commerce entity A and B adopt RSA public key to authenticate each other, the protocol is shown as follows:

A sends its identity to B.

B chooses a random number R_D, and encrypts it with A's public key to get y1, then sends y1 and y2 which is generated by encrypted y1 with its private key to A.

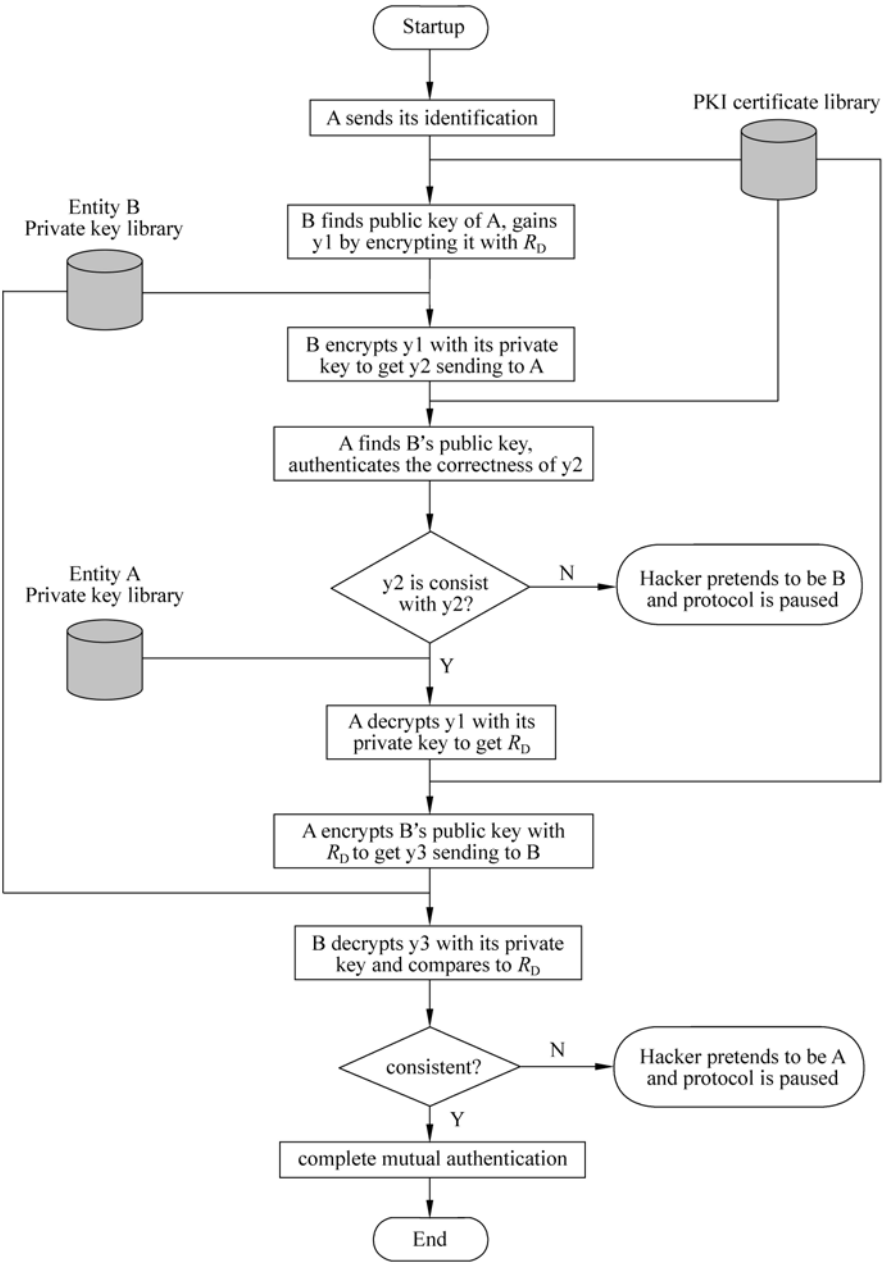

Figure 8.19 Mutual Authentication Process of e-commerce Entities Based on PKI

After A receives y1 and y2, it validates y2 with B's public key. If the result is the same as y1, then B is confirmed.

A decrypts y1 with its private key to obtain R_D; at last, A encrypts R_D with B's public key to obtain y3, and sends y3 to B.

After B receives y3, it decrypts it with its private key. If obtain R_D, it assures that the other party is A, otherwise a hacker. After that a cycle of authentication process is finished.

We can see that, the above simple protocol model has four behavior bodies: Entity A, Entity B, hacker and management organization adopted PKI framework. The hacker could cheat A or B, entities such as CA and certificate database in PKI take charge of work such as distributing and protecting public key. The flow chart of the protocol is shown as Fig. 8.19.

The whole mutual authentication process could be described with PASCAL-like language as the following:

```
Program Authentication_Process //Description of sub-process and function;
Procedure Send_To(Message_Sender,Message_Receiver,Message); //Function of
  authentication entity sending information;
Procedure Show_Message(Message: String); //Display system prompt information;
Procedure Authentication_Terminated(); //Authentication error, system exits
  abnormally;
Procedure Authentication_Finished(); //Authentication is finished, exit
  normally;
Function Encrpt(Key,Message): Message; //Encrypt Message with Key;
Function Decrpt(Key,Message): Message; //Decrypt Message with Key;
Function Get_Public_Key(Entity): Key; //Get public key of Entity;
Function Get_Private_Key(Entity): Key; //Get private key of Entity;
  Begin //Body of authentication process;
     Send_To(A,B,IdentifierOfA); //A sends its identifier to B
     Y1:=Encrpt(Get_Public_Key(A),Random()); //B encrypt random number with
  A's public key;
     Y2:=Encrpt(Get_Private_Key(A),Y1); //B encrypts Y1 with its private
  key;
     Send_To(B,A,Y2);
     If (Y1<>Decrpt(Get_Publc_Key(B),Y2))Then
        Begin
Show_Message("Cracker Imitates B");
Authentication_Terminated(); //Authentication error, abort protocol
        End
     Else
        Begin
             RD:=Decrpt(Get_Private_Key(A),Y1);
             Y3:=Encrpt(Get_Public_Key(B),RD);
             Send_To(A,B,Y3);
             If (RD <>Decrpt(Get_Private_Key(B),Y3))Then
                  Begin
Show_Message("Cracker Imitates A");
```

```
Authentication_Terminated();
                End
            Else
                Begin
Show_Message("Authentication is Finished");
Authentication_Finished();
                End
        End
  End
```

In terms of Petri net theory, the specific data flow and information flow in the mutual authentication protocol could be analyzed in detail. The more detailed analysis is omitted here, we refer the interested readers to related resources.

8.3 E-commerce Payment System

8.3.1 E-commerce and Online Payment

Electronic payment is an important component of e-commerce, and a complete e-commerce operation process typically includes three links that are market information communication, fund payment and goods distribution. It could be figured out from the operation process of e-commerce that online capital payment plays connecting part in the whole process. How consumers do electronic payment for all kinds of products and services is the key link of e-commerce. If this link were not resolved well, the trade flow would be delayed or even aborted.

E-commerce makes the electronic payment more and more important, and the urgency for resolving the electronic payment well is extremely great. For example, foreign trade corporations need to promote products online, and expect to sell product online and that requires banks to supply electronic payment. Civil aviation and railway also expect to sell tickets on the Internet. Government also expects to take various revenue on the Internet. However, all of these online economic activities need the support of the electronic payment. The commercial bank is the main agency organization in realizing e-payment.

Thus we can conclude that, e-payment is closely integrated with online trade, and they are needed each other. If the online trade is uncertain, e-payment will not happen; while if the e-payment is not carried on, the online trade will not finish finally. Therefore, e-payment naturally and closely related to e-commerce. The e-payment is the core and most crucial link, which is an important step of two trade parties to realize their trade goals, and also is the premise of carrying on e-commerce.

The core and crucial problem of e-commerce is the security problem of trade. In the e-commerce activities, online trade faces various risks and is sensitive to

security and secrecy. For example, the issue which users concern about e-payment is that the security of account and password information. Therefore, it is not hard to figure out that, with the increasing of risks and uncertainty of online trade, higher requirements are brought forward on security and secrecy of data in the network transmission process, especially on the sensitive data involved in e-payment which requires safer environment. E-commerce payment subsystem is a very important link in the whole e-commerce architecture. If it breaks away with e-payment, the e-commerce will never become to a real economic revolution; if the e-payment problem is not resolved appropriately, the popularisation and application of e-commerce will be bosh.

The e-commerce security subsystem should serve the e-commerce payment subsystem to solve the most important security and secrecy problem in the payment process. The payment subsystem needs encryption technology and authentication technology etc. to meet the basic e-commerce security demand; at the same time, it also needs to apply various electronic payment protocol and different e-payment methods on the basis of security technology, to satisfy the security control requirements of e-payment.

8.3.2 Data Flow and Process Control of Payment System

As described above, many big corporations and academic organizations develop and apply many different or incompatible payment protocols at present. When considering the length and practicability, it is impossible to analyze in detail the data flow and process control of all the protocols in the book. Next, payment subsystem will be detailedly analyzed with current popular SET payment protocol guaranteeing the generality of payment subsystem.

A complete handling process of e-payment could be divided into the following steps:

1. Cardholder register and apply

A cardholder firstly needs to apply certificate from CA before taking part in online electronic trade, and the certificate contains credit card information such as account and period of validity. To ensure the private information not leaking, generally we need to encrypt private information by a one-way hash function to make outside unable to capture the information when the certificate of the cardholder is used and transmitted online. The process of cardholder applying certificate with secure payment protocol is shown in Fig. 8.20.

The process in the flow chart is described as follows:

Starts payment system, and sends an initial request to CA.

CA sends a response: when CA receives the request, it sends its certificate to the cardholder.

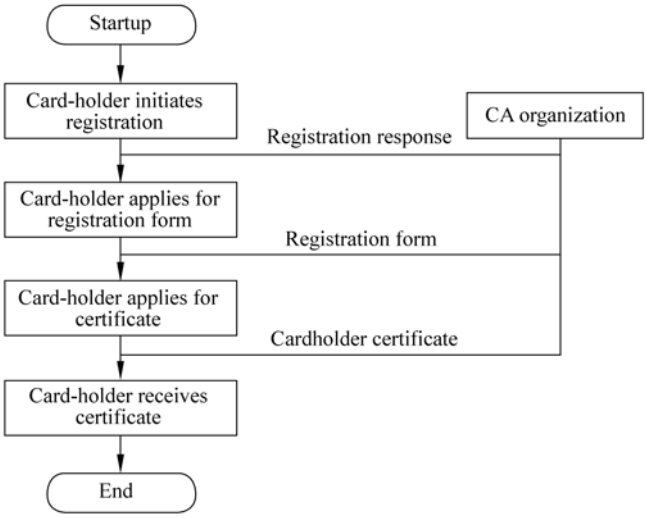

Figure 8.20 The cardholder registers and applies a certificate

The payment system receives the response, and applies to register the registration form.

CA deals with the request and sends the registration form.

The cardholder receives the registration form and requests a certificate.

CA deals with the request and issues a certificate.

The cardholder receives the certificate.

The seller registers and applies the certificate.

When receiving the SET instruction from the cardholder or dealing with SET trade through a gateway, the seller also needs to start seller software to request a certificate. The process is similar to the applying process of the cardholder, so it is not detailed here. What is needed to point out is that, there are typically two models of applying certificate for a seller, online and offline. Because of the number of sellers is far less than the number of cardholders, it is censored more strictly. The offline mode is usually adopted.

2. Purchase request

Online shopping is more convenient and quicker than going to supermarket in person. Connecting to the Internet, you can enter online shops by opening a browser. After browsing and shopping all needed goods, the seller will provide you with a detailed order for the goods, which includes quantity and price. You can modify the goods and quantity in the order, and then press the purchase key. The whole trade processes of payment system begin here, which is indicated in Fig. 8.21.

The cardholder sends an initial request.

The cardholder sends an initial purchase request to the seller after making choice of goods.

The seller responds to the request and sends a certificate.

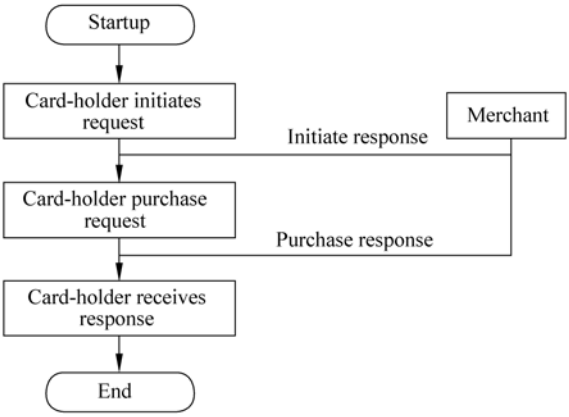

Figure 8.21 The purchase quest flow chart of cardholder

The seller sends a response after receiving the request; the response message of the seller generates digital watermark by a hash function; then digital signature is formed by using the private key of the seller; at last, the response message, the seller's certificate and gateway certificate together are sent to the cardholder, as shown in Fig. 8.22.

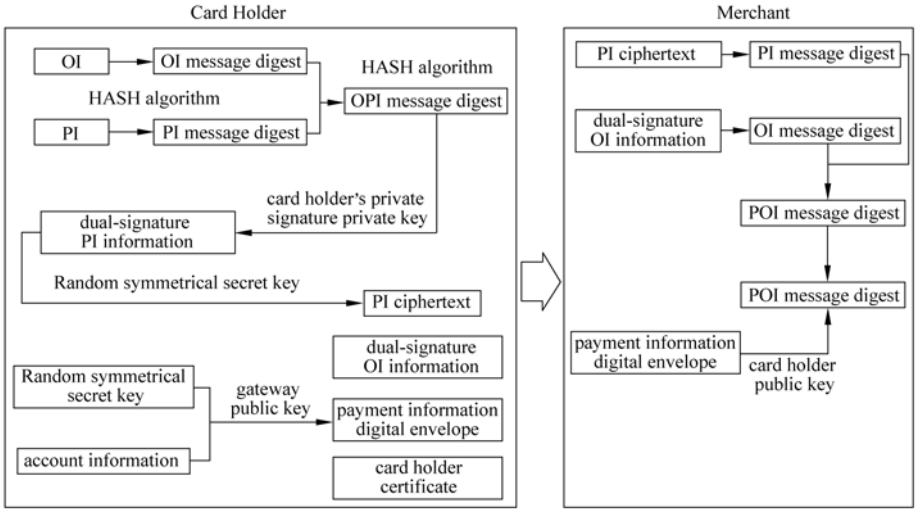

Figure 8.22 Signatures flow chart

The cardholder receives the response and sends the request.

Double signature technology is used in SET, that means the cardholder sends the purchase instruction which contains order and payment instructions, and the seller could only read the order instruction and the gateway could only read payment instruction, thus the account of the cardholder is invisible to the seller.

The order information of the cardholder is called OI, which is handled by the seller; the payment information is called PI, which is handled by the gateway. These two parts form an information package, which is sent by the cardholder together. When the seller requests authorization, the gateway connects OI with PI through object process identifier.

The payment system verifies the seller's certificate and the gateway certificate through certificate chain after receiving the response, and saves these certificates for the order processes later. The payment system also generates digital watermark separately for OI and PI; then it is encrypted to generate digital signature with the private key of the cardholder; the payment system randomly generates symmetry key to encrypt the double signatured PI information; the payment system encrypts the account of the cardholder and the symmetric key with the public key of the gateway, and puts it in a digital envelope; at last, the payment system sends the information including the OI and PI together to the seller.

3. Handling of the request information by the seller

The seller first verifies the certificate of the cardholder by the certificate chain after receiving the order information; then it uses the public key of the cardholder to verify the digital signature, to ensure that the order information is not tampered in the transmission process; and then the seller begins to handle the order request and transmits the PI to the gateway to request authorization. After OI is handled, the seller generates a purchase response (including the signature certificate of the seller). It produces digital watermark of the response information and encrypts it with the private key of the seller; at last, the seller sends the response information to the cardholder. Once the trade is authorized, the seller delivers goods to the cardholder.

4. Receiving the purchase response by the cardholder

The cardholder verifies the signature certificate after receiving the purchase response, and checks the signature with the public key of the seller. The cardholder stores the purchase response and state information that can be queried. And the handling process proceeds as following:

① Authorizing the Account Deduction for the Purchase

Before sending the goods to the cardholder, the seller first sends an instruction of deducting payment to the gateway to check whether the cardholder has the ability to pay. Only if it is confirmed, will the seller sends goods to the cardholder.

This process is shown in Fig. 8.23.

② Authorizing Seller's Request

During handling the order of the cardholder, the seller's software produces an authorization request, which includes the number of goods that need to be authorized, identifier number of transaction and other information. Then the seller software produces digital watermark of the authorization request and sign

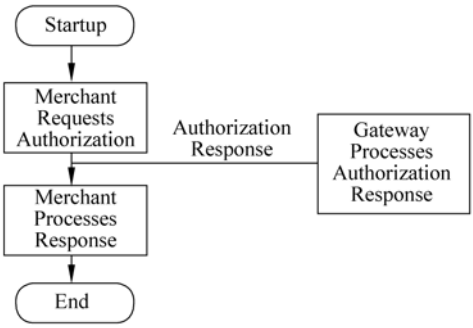

Figure 8.23 Authorizing the Account Deduction

it with its private key; it encrypts the digital signature with the symmetric key generated randomly, and encrypts the symmetric key with the public key of the gateway to form a digital envelope; then the seller's software sends the encrypted authorization request and encrypted PI information in the purchase request of the cardholder together to the gateway.

③ Handling Authorization Request by Gateway

After receiving the authorization request, the gateway handles it as following:

After receiving the authorization request, the gateway first acquires the symmetric key and decrypts the request information; then verifies the validity of the signature certificate of the seller and the signature request information with the public key of the seller.

The gateway receives the symmetric key of the payment instruction and account information, verifies the validity of the signature certificate of the cardholder, checks the digital signature to ensure that the PI information is not tampered in the transmission process.

The gateway compares the transaction identifier number in the seller's information with the one in the payment instruction of the cardholder to ensure the information is from the same trade, and if it is the case, then sends the request to the bank. After receiving the authorization information from the bank, the gateway produces response containing the gateway signature certificate. And the response is encrypted with the new generated symmetric key and then encrypted with the public key of the seller, and sends to the seller.

④ Handling Response by Seller

After receiving the authorization response from the gateway, the seller acquires and saves the authorization response information through a similar decryption process, and sends goods to the cardholder according to the order. So far, the order process is completed.

5. Getting Payment

When the purchase process is accomplished, the seller sends the payment-deducting request to the gateway to gain the payment for the goods. The gateway

transfers the payment to the account of the seller through the finance network. Then a process of deducting payment follows, as shown in the Fig. 8.24.

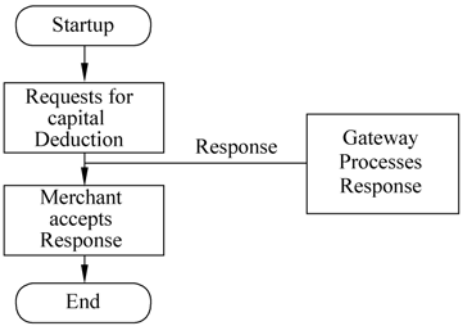

Figure 8.24 Payment-deducting Sketch

The above five steps describe the online shopping process based on SET protocol. In fact, an online shopping only includes three steps that are purchase request submitting, payment authorizing and payment acquiring. The cardholder and the seller only need one process of applying certificate in the whole valid period. Although SET has a strict encryption mechanism and a complicated information transmission process, all of these have already been included in software products, and users could acquire expected goods just through a simple shopping process. The appearance of the SET standard gets rid of people's worry about the security of online shopping. Many manufacturers have developed software products based on SET one after another, in order to get the promising Internet e-commerce market. With the perfection and developing of the new technology of SET, it will become the leading solution in the e-commerce area.

8.4 Architecture and Design Method of E-commerce Application System Software

8.4.1 Architecture of E-commerce Application System Software

E-commerce application system is a foundation of transiting the traditional business process. It integrates multifold computer information disposals and related technologies, and mainly has the following characteristics:

(1) Standard-based.
(2) Server-centered.
(3) Retractable.
(4) Using the existed core system.

(5) Quickly deployable and applicable.
(6) Manageable.

E-commerce application system adopts reusable component design structure, representing a set of abstract components and cooperative interfaces between components. The e-commerce application system structure introduced in this section is based on the industrial standard; it provides a set of complete services for developing and deploying e-commerce application system; the Web application programming model provided by it defines Web application topology and services using component structure to design a model of Web application. The component structure is based on the technical standard independent from platforms and vendors, including standards on client, application server, network, data and the infrastructure. These standards permit clients to access related data and service in any place at any time, and make the development of application software to be write-once-and-run-anywhere, and permit plugging in and playing all kinds of components. The basic system model and software architecture of e-commerce application system is introduced in the following.

1. Basic system model

E-commerce application system software architecture provides a model for designing e-commerce solution, which is based on multi-layer distributed environment. In the environment, application logics and business services in each layer are divided into different kinds of components, and these components are communicated through network. Its basic form could be described as a "logic" three layers computation model, which means that the delamination is logical, not physical. The basic 3-layer system model includes client, Web application server and connector connected to external service. The application elements in the three logical layers are connected with each other through a set of standard protocols, servers and software connectors in industry, as shown in Fig. 8.25.

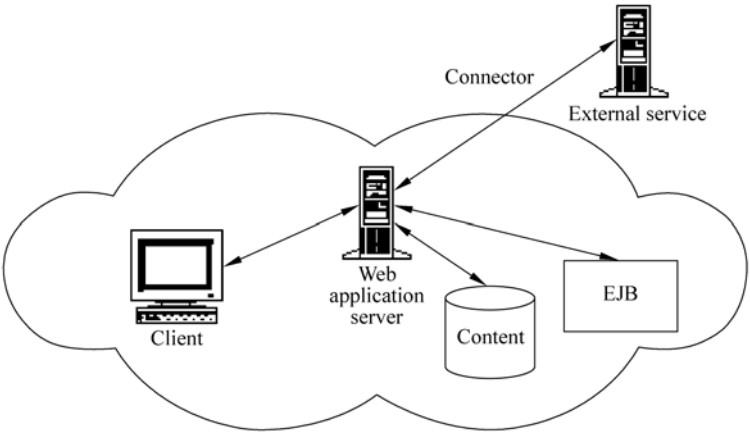

Figure 8.25 Basic system model

(1) Client

The basic system model, which is connected to the web application server by Internet, supports broad client devices from widely used devices such as PDA, smart-card and mobile phone to network computer and personal computer.

(2) Web Application Server

The Web application server provides a run environment for application business logic. Application software runs in Web application server and its embedded-in JVM. These server components communicate with clients and other components through HTTP or IIOP, and use the directories and secure services provided by the network infrastructure.

(3) Connector connected to external services

The connector connects new business logic in the middle layer to existent applications and data of the enterprise; thereby the Internet is connected to the enterprise seamlessly.

The e-commerce basic system model typically exemplifies the Web-oriented network computation style, and integrates three layers application elements that are display logic, business logic and data storage. The characteristics of the basic system model are as follows:

① Java Supporting Web explorer Client.

② Clients are easy to manage, hardly need to install local software and backup data, and easy to configure.

③ Enable to quickly develop and real-time deploy the Write- Once-and-Run-Anywhere application software.

④ Advocating software reusability, to minimize programs, maximize productivity, and improve software quality.

⑤ Fully using the existed business application and data stored in external service system, and making good use of these systems to service customers and business partners, staff.

2. Software architecture

E-commerce application system software architecture provides a set of integrated services for developing and deploying e-commerce application systems. The architecture is composed of the following key elements, which are shown in Fig. 8.26.

Web explorer-based, makes access of application system common and application components could be sent instantly;

Network infrastructure provides service such as TCP/IP, directory security and so on, and the capability of these services could be accessed through open and standard interfaces and protocols.

Application server software provides a platform formed by HTTP servers, database and transaction processing services, e-mails, and groupware service and message service to e-commerce application system.

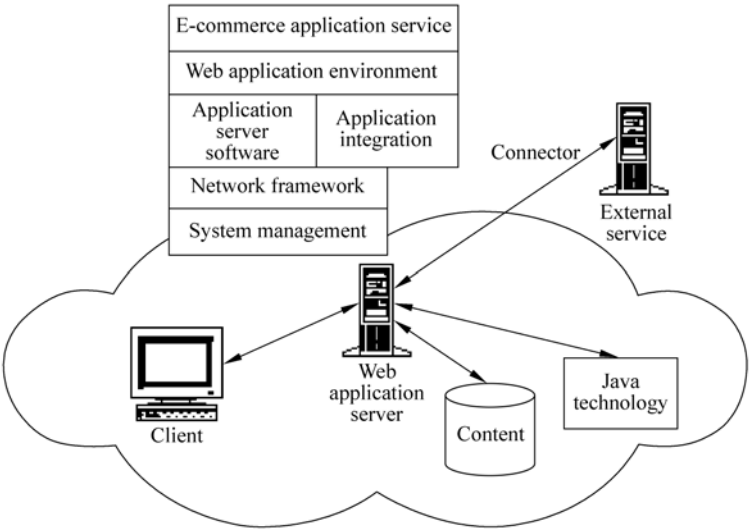

Figure 8.26 E-commerce application system software architecture

Application integration makes heterogeneous application systems able to communicate with each other, and access to existing data and application systems with Web.

Web application programming environment provides server-side Java programming environment for creating dynamic and robust e-commerce application system;

E-commerce application service provides special functions for high-level application in order to make it convenient to create e-commerce solutions;

System management is used to satisfy the management requirements of network computation. The elements in the system are user, application, service, infrastructure and hardware;

Development tools are used to create, assemble, deploy and manage application system.

The main elements in e-commerce application system software architecture are as following.

(1) Client

Client usually refers to “thin client terminal”, which means that there is little or no application logic running on client, therefore client just needs to install a few programs. The new generation client of application should be implemented with HTML, DHTML, XML or Java Applet. The new generation of application supports broad client-side devices from popularly used PDA and Smart Card to network computer and personal computer.

(2) Network infrastructure

It provides a secure, retractable and distributed network platform for the whole architecture including service based on open standard: TCP/IP and network service，secure service, directory service file and print service, etc.

(3) Application server software

Application server software layer provides core function for developing and supporting the business logic of e-commerce application system which is running on the Web application server. It includes the following services: HTTP server, e-mail and community service, database service, transaction processing service and message sending service, etc.

(4) Application integration

Application integration makes heterogeneous application systems communicate with each other inside enterprises or across enterprises. The heterogeneous application system maybe implemented with different programming languages, and maybe built on different architectures. At present, a large number of key data and application programs of enterprise are hosted in the existing system. Methods adopted by application integration include connector, application message sending service, business process integration and workflow service and components integration service.

(5) Web application programming environment

Web application programming environment is based on components model and provides programming environment for creating dynamic and robust business application in Web application server. It provides related services to encourage the separation of business logic and display logic, to make application able to tailor dynamically according to users' interest and client-side device.

(6) E-commerce application Service

This part includes components oriented to the high level application, and is built on the basis of application server software and network infrastructure to meet functional requirements of a specified application type. It is implemented according to programming model of application framework. Such as, payment service and order management service.

(7) System management

System management service provides core function for supporting end-to-end management within each enterprise, and also provides related tools and services to support the whole management lifecycle of application system, from installation, deploying to monitoring of operation characteristics. Also system management provides an approach of collaboration management between different enterprises, including strategy management and data warehouse management.

(8) Development tool

Development tool is used to create, assemble, deploy and manage application system.

8.4.2 Design Method of Application E-commerce System

E-commerce application system mainly adopts B/S mode, which is called Web application programming pattern. The design method mainly involves Web client,

Web server and standard Internet protocols. Generally, Web application can also use external non-Web application and data. Web application programming model defines Web application topology structure and methods of using services provided by framework to design Web application model, as shown in Fig. 8.27.

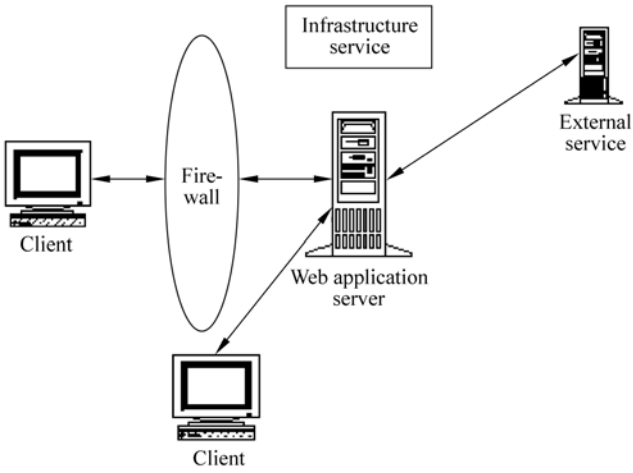

Figure 8.27 Topology structure of Web application

The topology of Web application is shown in the above figure (including main elements). What is worth to note is that, Web application server and external service are in different logical layers, but they may run on the same machine. In addition, functions of Web application server may be distributed in many machines. Generally, the front end and business logical part of a Web application operate on different machines. The topology of Web application includes client, Web application server, infrastructure service and external service.

1. Client

Client uses Internet technical standards (for example, TCP/IP, HTTP, HTML and XML) and Web application server to access business logic and data. The basic functions of client are to accept and validate user's input, and display the result returned from Web application server. The client could be client on Internet, Intranet and Extranet. One of the important rules of Web application programming model is that business logic of Web application is always running on the server, rather than client. The advantages are shown as follows:

① Supporting broader client devices.

② Web application server can integrate access to resources (for example, database), thereby to simplify the design of application, promote scalability, and provide better protection for resources.

③ Business logic running on the server side is easy to protect, update and maintain.

④ Business logic running on the server can centrally manage the application environment of users and rebuild it on different clients.

2. Web application server

Web application server is the core of Web application topology, which provides Web application with broad services such as programming design, data access and application integration. Web application can be regarded as a series of interactions between client and Web sites. The whole interaction process begins with a page displayed on the Web browser. The user clicks a button or a hyperlink in the page to generate a request, and the request is sent to the Web application server. The Web application server disposes the request, and generates a new page, which is sent back to the client. The new page displayed on the Web browser is just the result of the request, and maybe also the beginning of the next request. So, Web application includes a set of interactions or processing steps, each of which must generate a page-formed response, which is used as the entry of the next interaction (shown as in Fig. 8.28).

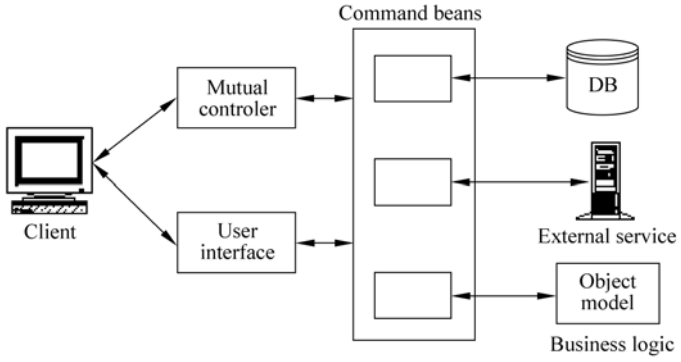

Figure 8.28 Interaction model of Web application

Looking deeply at the details of each interaction, it is easy to find out that there are three sharing process requests, including business logic layer, user interface layer and interaction control layer. They are illustrated in detail as the following.

① Business Logic Layer. It records and processes the input of users, such as the corresponding updating to add an item of commodity data, or transferring from an account to another.

② User Interface Layer. It constructs HTML pages. The constructed page, then will be sent back to the user. And this layer determines the display form and style of the result presentation.

③ Interaction Control Layer. It controls the elements else except the ones mentioned above. It handles HTTP request, selects components to run in the business logic layer, and selects the corresponding components from the user

interface layer according to the running results of business logic to construct the response page.

These three layers just correspond to the classic MVC (Model/View/Controller) paradigm. This is very important, because different layers typically need different developing technology and tools. Application framework provides each layer with support of using various components, among which there is a fixed interface.

3. Infrastructure service

Besides the above programming design mechanism, application developers also need running service to support Web application. Expediently locating application components, guaranteeing their usability and access security and executing them are all the key elements to implement Web application on Internet, Intranet and Extranet environment. The infrastructure service provides the following establishments to support Web application: directory service, authentication and authorization, firewall and proxy server.

8.5 Summary

This chapter introduces description of Petri net of e-commerce, and presents system structure of e-commerce infrastructure, each functional part and the relationship of subsystems. At the same time, it analyzes the infrastructure of e-commerce in detail on the view of data structure and Petri net modeling, and presents the data flow and process control method of the structure. In the part of e-commerce security sub-system, it discusses the security issues in the infrastructure of e-commerce, and thoroughly expounds the solution to security issue in e-commerce. The payment subsystem needs security subsystem such as data encryption and authentication technology to meet the basic secure elements of e-commerce; meanwhile, on the basis of the security technology, it still needs to apply various electronic payment protocols and different electronic methods to solve secure control requirements of electronic payment. It introduces constructing method and designing method of software architecture of e-commerce application system from the perspectives of architecture, operating system, Web server and database.

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[42] http://www.omg.org
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9 Portal Site Design of Virtual Enterprise

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Abstract Portal site is the gateway of e-commerce, served like the shopping window of commodities, and it also provides an interactive platform for customers to communicate with online seller. The quality of a portal site determines how well an enterprise is working on. Meanwhile, a good portal site can promote products, attracting customer to log-on constantly, checkout the latest development, receive comment from customers, and most importantly, deliver a positive image of the enterprise. The design of portal site is an important link of virtual enterprise construction. The layout design of the portal site plays a crucial element into the overall success of the e-enterprise. This chapter studies the design principles that should be followed when develop a portal site. This chapter employs an online shopping cart as a sample to show the design principles and how to optimize database inquiry.

Key Words e-commerce, portal site, online shopping cart, database, inquiry, order.

E-commerce is by using existing computer hardware, software and network infrastructure to carry out various business behavior in the electronic environment where is connected with certain protocols. As the window of e-commerce system, portal site displays resource information of e-commerce system in the form of explorer, and seamlessly integrates various application systems of the whole e-commerce. It realizes real-time update and communication of data between systems. At the same time it provides customized information service and supply users with simple and easily usable Web interface. Thus it provides the website which includes customized information, synthesis service and access to internal/ external resources for various crowds related to e-commerce system, such as sellers, users, managers and related institutions of government. A portal site is the

exhibition of the core of the whole e-commerce system.

This chapter mainly introduces the knowledge of e-commerce portal site, including design and implementation of virtual shops, product catalog and carter, disposal method of electronic order and data inquiry method.

9.1 E-commerce and Portal Site

9.1.1 Concept of Portal Site

Portal expands the enterprises business to all over the world by using information expressway through Internet and Intranet. But there may be no real enterprises, or many parts of an enterprise can be spreaded out all over the world but it is integrated as a whole by network dynamically and efficiently.

9.1.2 Meaning of Portal Site

Generally speaking, a portal site has the following effects on enterprise:

1. Upgrade enterprises' image

Generally speaking, the effect of portal site is beyond the corporation propagandizing and advertisement in newspaper and on television. Because portal site is bulky in information, real-time, interactive and global, enterprises can put almost everything that they want to let their customers and the public know into its website without the limit of time and space, to make users all over the world can find out products information of enterprise at any time, to boost up the confidence of enterprises and upgrade enterprises' image.

2. Make enterprises acquire network-communicating capability

The real meaning of Internet lies in the abundance of its content. For an enterprise, the sign of owning network communication capability is that the enterprise has interactive and individual website of its own not only has an e-mail.

3. Can introduce corporation and its products in detail

One basic function of portal site is to introduce the corporation and its products fully and in detail, represent the specification, performance and shape of all products to users.

4. Can tie up with customers

The foreign corporations have been used to publish all of the new products and

new services on website, and periodically publish companies' information on the website, to make customers know about its information and tie up with customers.

5. Can build business relation with potential customers

This is one of the most important functions of portal site, and is also the fundamental reason why so many foreign enterprises pay great attention to build their own website. Buyers can find new products and new suppliers using Internet, with low cost and high efficiency. If corporations registered their address of website to famous global search engines (for example, Yahoo, Google, BaiDu), the potential customers can easily find the enterprise and their products by selecting key words related to enterprise's products and services.

6. Can reduce communication cost

For many enterprises, annual communication cost, especially involved with imports and exports, is huge. It can efficiently reduce communication cost by using many kinds of e-mails provided by portal sites. This is one of practical advantages of portal site.

7. Can receive customers feedback in time

Customers usually would not actively give feedback to corporation. If adds e-mail and electronic forms for customers to communicate with the corporation when the corporation designs portal site, customers may generally be willing to communicate with the corporation by using this method owing to the convenience. Therefore, the corporation will receive a large number of ideas and advice from customers.

8. Can make corporation serve customers better

The corporation can realize many things which are impossible to realize before through building up website. For example, GM and Haier implement user design and customized manufacture of enterprise manufacture through website. This can exploit new market; expand new customers, meet many requirements that are unable to be satisfied before, thereby to serve customers better.

9.2 Online Virtual Shop

9.2.1 Virtual Shop Mode

Virtual shop mode refers to that enterprise opens a virtual shop to advertise and display its products and service and provide function of online trade further. This mode is similar to online retail market, but more professional than the online retail market.

Let's take an example of an enterprise that has a successfully developed online

shop mode to illustrate online shop mode.

AMP Inc. is a company of accessory related to computer, motor and communication. It specializes in producing circuit connector, and it holds thousands upon thousands various accessories. Their products catalog is about 400 pages. Thereby, customers found it hard to search for a certain product in the immense catalog ever since. But after the company publishes online product catalog, customers can conveniently find target products only by inputting the description of the product characteristics. Obviously, online inquiry is much easier than entity catalog inquiry. The company's online inquiry catalog is published in eight languages (Spanish, Italian, French, Japanese, Chinese, Korean and English), serving for customers from 114 countries and areas.

How much ROI does the online investment of AMP bring to it? Considering the saving on printing, communication and phone supporting, the corporation primarily estimates the yield to be 1.5 – 2 million dollars. Moreover, because database in AMP is rather huge and ordinary searcher is not applicable, it specially engages SAQQARA Systems Inc. to develop appropriative software, which is called Step Search.

This software makes AMP e-commerce website so successful that the website has attracted large quantities of companies to contact with it to consult the approach of successfully developing e-commerce website. Therefore, the company specially found a department to provide Internet e-commerce solution and sell software to clients currently. AMP becomes the largest connector manufacturer in the world owing to it "connecting" thousands of customers with myriad of products on the Internet.

9.2.2 Virtual Shop Design

Modern e-commerce technologies have concentrated on foundation and operation of Internet virtual shop. There is no difference between network virtual shop and real shop on department structure and function, and the differences lie in the implementation methods of these functions and structure and the approach of business operation.

Internet virtual shop is viewed as an especial Web server from the foreground. Multimedia support and good interaction function of modern website become the foundation of this kind of virtual shop, which makes customers to select commodity as in the real super market, pushing cart and pay at payment desk at last. According to above, we can derivate the three pillars of constructing Internet virtual shop: commodity catalog, shopping cart and payment desk. Good commodity catalog can make customers quickly find the wanted commodity by the easiest method, and make them know information of products fully through various channels; shopping cart links up shop and individual, customers can put his favorite commodity in the cart, also can remove it from the cart, until to pay at last; payment desk is the final link, and also the most pivotal link. It must be secure to use some electronic currency to trade with a shop for both customers and shop.

At the back of the Internet virtual shop, the enterprise firstly should have commodity storage and management organization; secondly, it needs to deliver products sold online to the customers through logistic channel; thirdly, the enterprise also needs to take charge of after-sale service, which may be through network or not. Online trade is generally a "cash before delivery" shopping mode. For the customers, the convenience is that the purchased commodity will be directly delivered to their home, but what worrying them is that they do not know what the commodity exactly is. Virtual shop is not a real shop. Although the customers know the introduction and packaging of the commodity, after all it may be greatly different from the real commodity. Therefore, the credit standing and service quality of the network virtual shop is actually the key of the success for e-commerce.

9.2.3 Implementation of Virtual Shop

A business Web site is founded on the Internet, where customers can select commodities and pay for them as in a real shop. Multimedia support and good interaction function of modern website become the foundation of this kind of virtual shop. Therefore, the virtual shop needs:

Shop name: on the Internet it is called domain name, which is unique in the whole Internet world.

Shop site: it is the Internet address of your shop. High-speed network connection is just like that you open a shop in a golden place in downtown area.

Shop decoration: it is termed as Web page design in computer science. Ornate web page is like a well-decorated marketplace, naturally more attracting.

Commodity update: Pages should be continuously maintained. Removing commodities sold out and placing new ones is the daily routine.

Settling account: It is the prerequisite to build up Internet virtual shop. Moreover, the security of settling account directly affects the security of the business operation.

Storage management: Whether for virtual shop or real shop, commodity and currency are both real, as is management of storage.

Commodity being delivered to customers finally: Online trade is similar to mail order. The last step is to deliver goods to customers by post system, logistic system or people.

Typical department structure of a virtual shop is shown as Fig. 9.1.

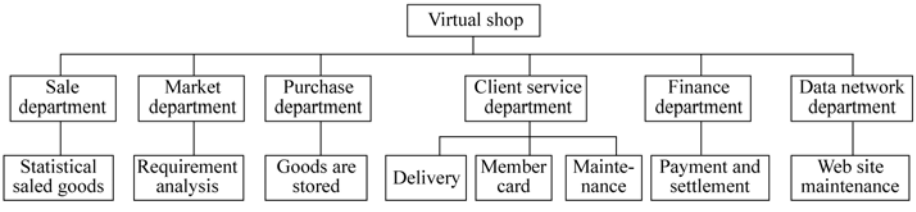

Figure 9.1 Structure chart of virtual shop

9.3 Design Method of Product Catalog

E-Catalog is an electronic catalog to provide products information and service for the convenience of the customers to search online. Through e-catalog, users can acquire the latest product and price data, the cost of e-catalog is much lower than printing or mailing annual product list. In terms of requirements, information can be easily updated each month, each week, or each day, and customers will not obtain old list number, products which have been removed from the product line, inaccurate introduction or outdated price data. We consider the compatibility of software and hardware of the website, then arrange pictures with words aside, or video snippet to introduce company's products and service, and list some technical information related to the products and service in proper place. If including some product opinion from the individual third party, or the opinion of current customers, the page will be more persuasive. Moreover, a searcher should be placed in this part for customers to conveniently search information related to the company on the website. Products have been published recently or are going to be published should be introduced in an attractive method in the product catalog.

9.3.1 Product Information Storage

Product information storage is to store enterprises' products in the form of data. Its goal is to make production information queried quickly through the database, such as inquiring the total kinds of products produced by the factory and annual output of various products. Another goal is to provide reference for the development of new products by using the database, and provide basis of decision-making for investing new product projects. Therefore, the design of database is first to set up a system for collecting product information.

1. Organization of information

Information includes two main parts: Enterprise's products information and information about the enterprise. Information related to product includes category, specification and introduction of current product. Image information should be added in product information, to directly and vividly display various products. Image information is corresponding to the trend of current commodity database multimedia. It not only can avoid uncertainty of literal description, but also can convey what literal cannot describe. It is also involved with information of product manufacturer, including corresponding address and contact method (phone and fax number, etc.), contact person or manager and also the introduction of the enterprise.

2. Information grouping

The mission of information grouping is to classify and handle collected information

to determine how to create one or more special tables to record information. One important principle in database design is that one data can be recorded only once. If the same information is found in many places, the information should be placed in an individual table. According to this principle, when designing electronic product catalog, product information should be collected in the form of several special tables, namely, information is logically grouped according to the characteristics of the product information, then the information is cut into several tables to reduce repetition of information.

3. Structure of product information database

Just take industrial products table as an example to explain the structure of product information table and field list in product information system. Industrial products have many kinds, such as traffic, architecture, textile, packaging, energy resource, papermaking and so on. Considering these factors, industrial products table is designed to be consisted of five basic fields (Table 9.1). Thus, industrial products table in product information category is subdivided into a table consisted of five fields. The four tables of agro-goods, civil goods, cultural artwork and semi-finished goods are also divided into corresponding tables which are composed of five basic fields in the same manner.

Table 9.1 Industrial goods table structure

Product Code	Type	Product Name	Product No.	Product Image	Product Introduction
10001	Packaging	Packaging Board	000	Omit	Omit
10002	Packaging	Packaging Board	001	Omit	Omit

4. Relation among tables

After subdividing product information table and enterprise information table, we need to consider creating the relation among these tables. The goal of creating the information storage to collect information is to make the enquiry of the information more effectively. There are many inquiring requirements, one of which is to inquire all products of a certain enterprise. Firstly, the enterprise should be found from the enterprise information table, and then all products of the enterprise should be found from every product information table. Information in one table is required to have certain relation with information of many other tables. In database, this relation is called as 1-N relation. Moreover, information system can also find the same product from different enterprises, and many tables (product information table) have N-1 relation with one table (production enterprise table). Therefore, product information table has N-N data relation with enterprise information table. It is necessary to develop a special table to maintain such relation (short for relation table).

9.3.2 Product Information Inquiry Function

1. Design principle

The goal of DBMS is to create useful output information, or information for users to summarize and analyze which provide basis for customers to make decision. Since ANSI took SQL as the standard of relational database language in 1986, more and more DBMS have adopted SQL. Programming with it can achieve better performance than with ordinary command, so this technology is also used to design multiple inquiry functions.

2. Inquiry Example

(1) Inquiry of a certain commodity

If we want to know the category and specification of hectograph, using the SQL technology, we just need to input one command "select* from 001 where t_name = 'hectograph'".

The "*" represents all fields in the database, namely all information about hectograph; "from 001" means the information comes from product industrial storage (001); "where t_name = 'hectograph'" is a restricted condition, which requires all output information is about "hectograph", rather than other information.

(2) Inquire all products of some enterprise

For convenient description, it is given to inquire all products of company A. The idea of inquiring is: first to find company A from production enterprise table (006) to get the enterprise code of the company; using the code, to find all product codes matching with the code in relation table (007); the last step is to divide all product codes into each product information table, to get the required product information. The result will be the products of the enterprise.

The command programmed with SQL is shown as follows:

```
select distinct  007.t_name, 007.t_number, 006.org_name FROM  006, 007, 001,
  002,003, 004,005 where  007.customerid=006.customerid and 001.produc_n=
  007.produc_n  and 006.org_name like "Company A";
```

It can be seen that inquiry program can conveniently be designed by using SQL. Therefore, the current inquiry program of product database designed with SQL also lays foundation for implementing high-speed searches when the information quantity enlarges in the future. In the process of designing electronic product catalogue, two common all-around inquiry methods are designed with SQL for common inquiry with specific goal, including to inquire the production enterprise of some product and to inquire the products of a certain enterprise; and multiple monomial inquiry including the existed type of inquiring some product. Monomial inquiry can list all the congeneric products, to serve product design and development of new product.

9.4 Design of Online Shopping Cart

9.4.1 Online Shopping Cart and Implementation Technology

1. Definitions and analysis of online shopping cart

Online shopping cart is the necessary shopping tool for customers doing online shopping. It is used to temporarily store the selected commodity of users, to assist customers to choose commodity, take commodity, and check out in the virtual cash table.

The implementation of online shopping cart is not as simple as explained above. In fact, online shopping cart script is hard to create. Because, first, the design of Web is stateless, namely all Web servers process URL request in the same way, independent from any foregoing request; second, explorer is also works in a stateless way, and deals with the new URL, independent from foregoing request. Server cannot remember user, and cannot identify whether it is the first access or the thousandth access. The stateless mode makes Web server faster and more efficient, and needs not to maintain information of explorers which request URL. However it still leads to many disgusting problems—online shopping cart is one of the main examples of those problems. When a customer selects some commodity and puts it in his virtual online shopping cart, he needs to remember which commodity he has selected so that he will know how much to pay when arriving at virtual cash counter. Servers cannot remember the information and also cannot make users re-input the selected commodity information each time when users see a new page, so script is needed to record all information of selected commodity by users.

2. Implementation technology of online shopping cart

To implement design of online shopping cart system, solve stateless connection of Web application and keep Web page state information of explorer side (information of commodity in the online shopping cart), implicit form field manner and Cookie manner used in HTTP protocol are adopted currently.

(1) Implicit Form Field Manner: Script of online shopping cart type can solve stateless connection problem with implicit field. Then the implicit information after last call can be got when user invokes explorer again. All commodities in online shopping cart have three properties: quantity, price and commodity description. When one selects one kilogram oranges which are 3 yuan per kilogram, online shopping cart will write string “1/3/Orange” into implicit field, in the string, semicolon indicates the end of the record, and fields in the record are separated by slash, and a long string composed of any number records is allowed. When it needs to separate information, online shopping cart can separate selected commodity simply by searching for the semicolon and slash. The implicit field is

not displayed and unchangeable for users. The implicit field form of online shopping cart is dynamically created when CGI program processes data submitted by other forms. When the server sends message to the explorer, CGI program write all commodity information to the script in the implicit field manner. When the user submits forms including implicit fields, the commodity information formerly stored in the field is returned to the server, and the server separates the commodity information in implicit fields, thereby the commodity information is preserved in the online shopping cart.

(2) Cookie Manner: Cookie is one way to continuously preserve state information and other information, and the information is preserved in the different explorer session periods. Cookie is composed of information sent by server which responses to the explorer URL request. According to the URL of the CGI program, Cookie preserves the information in the local Cookies.txt file of the explorer, and the URL can be unified according to the other information in the Cookie. When the explorer requests a URL from the Web server, the explorer searches for the Cookies.txt file to examine whether some URL request of Cookie accords with the requested URL, and then the explorer sends the information in the Cookie which accords with the request in the URL request to the Web server. In the process of implementing the online shopping cart, when the user chooses the commodity and puts it in the online shopping cart, the system processes in Cookie manner, which writes the information of the selected commodity in the form of text string in the local Cookies.txt of the explorer. When the online shopping cart is activated next time, Cookie manner will read the corresponding text string information in the local Cookies.txt of the explorer, to get the information of the selected commodity in the online shopping cart.

9.4.2 Database of Online Shopping Cart and Actual Implementation Policy

1. Design ideology of online shopping cart based on database technology

Through the analysis above, it is not hard to figure out that the online shopping cart program is a script difficult to program, which is hard to be implemented by both implicit script and Cookie. Therefore, this section introduces a new method using database technology to implement online shopping cart.

To steer clear of the stateless connection characteristic of Web, and save or get information of online shopping cart at any moment, more mature Web database technology should be used to design online shopping cart, making use of the characteristics of DBMS, such as convenient access, security, easy operation and powerful computation. The information of commodity in the online shopping cart is stored in database, and is picked up from the database when needed. Because every Internet user corresponds to one IP address and the IP address can

be gained through CGI, what a user accesses is actually the Web server of the virtual shop when the user accesses the virtual shop through an explorer. When the user puts forward the purchase request or wants to update information of a selected commodity, the online shopping cart is activated, and Web server interoperates with the database server, operating tables of online shopping cart data on the database server, completing the operations of updating the data record of user selected commodity and updating commodity information in the online shopping cart. At the same time, the commodity in the online shopping cart can be stored securely and gathered statistically.

2. Implementation of online shopping cart based on database technology

The data table structure of online shopping carts in accordance with the above analysis is shown in Table 9.2.

Table 9.2 Data structure of data table of online shopping cart

Field Name	Data Type	Length	Null
Code	*Varchar*	15	*Not null*
Name	*Varchar*	50	*Not null*
Price	*Decimal*	8, 2	*Null*
Number	*Int*		*Null*
IP	*Char*	16	*Not null*

The online shopping cart mainly implements the following functions: users put selected commodity into the online shopping cart; delete commodity in the shopping cart; update the amount information of commodity in the shopping cart; sum up the total price information of commodity in the shopping cart. These four functions are all implemented with CGI program. When user's explorer put forward a URL request, which triggers CGI program in Web server, CGI script reads environment variables and STDIN, and builds up connection with the database through database interface, applying SQL statements to operate database, sending the correct MIME head information and its HTML output part to STDOUT. Customers can freely look around in the marketplace, if customers want to purchase something, the CGI script of shopping cart in the server will be activated, and the CGI script reads environment variables to acquire IP address information of the customer's explorer, request information of purchasing commodity, and writes these information to the data table of shopping cart in the database. Similarly, CGI script can provide the commodity selected into shopping cart in the form of list for users to check, and also provide commodity price statistics and payment result.

Part of function modules implementation of online shopping cart is given in the following section.

(1) Commodity selected by customer is put into the shopping cart: In the data

table, each commodity owns a commodity number, which hides in HTML script in the form of implicit field. When a user clicks "put into shopping cart", the shopping cart CGI script is triggered to do the following work: getting the explorer IP address information (strcpy (IP, getenv("REMOTE-ADDR"))); Acquiring and decomposing the commodity number which is purchased from the environment variables (GetData(), ProcessData()); Connecting to database, and finding the name and price of corresponding commodity from the commodity table according to the commodity number, and setting the default amount of purchasing to 1, and assigning these information separately to the corresponding variables; Writing these commodity information and IP address information to shopping cart data table (if the commodity information already exists in the online shopping cart, the amount of the commodity pluses 1); selecting and listing all commodity and price information in the online shopping cart data table in the form of list for customers; disconnecting to database. Page output is transformed to the corresponding HTML script output with C program when the page is displayed.

(2) Deletion operation on commodity in user's online shopping cart

Triggered by a user, the deletion script first gets the number information of commodity to be deleted from environment variables in the way of GET from the HTML implicit script, then connect to the database, delete the commodity from the shopping cart data table according to the acquired commodity number and IP address information, then list output of information of commodity in the online shopping cart, at last disconnect to the database.

(3) Updating amount information of commodity in the online shopping cart

Every time the online shopping cart is activated, the amount of commodity in the cart is different. However, what to be decomposed of the saved commodity information from pages in the environment variables is required to be the fixed data, thus it's hard to determine the corresponding relation between the code and amount, and also hard to update data in the shopping cart data table. The update of system amount adopts POST manner. The state information from online shopping cart script (code and amount for all commodity in the shopping cart) is saved in the form of string, whose format is as (code1 = 000001 & number1 = 3 & code2 = 000006 & number2 = 4…), where code is written in the script in the implicit manner when the commodity content list in the online shopping cart is displayed, and number information is written in the script in the form of input textbox, the name of which is automatically defined through a cyclic manner. Because of the unfixed amount, the length of saved string is also undetermined, in program implementation, the commodity information with fixed amount can freely be changed adopting queue technology and written back into database. First we define two queues, then decompose the string, compute amount information of all commodities, and decompose them one by one; put the decomposed information of code in the first queue, and put the corresponding amount information in the second queue, then complete the decomposition of all

the strings in a loop manner, and then connect to the database and get the code and amount of the commodity information from the two queues separately, and update amount information of data table according to the code and IP address information until the queue information is null, the loop finishes; output the list of commodity information updated in the shopping cart, at last disconnect to database, and complete the update operation on the amount information of commodity.

(4) Summing up the price information of commodities in user's shopping cart

This function implements price subtotal of single commodity information in the shopping cart and the total price of all commodities and provides them to users. The price information of commodity in the shopping cart can be computed with the sum function of standard SQL statement, and by this we can realize the function of summing up all price information of commodity in the online shopping cart.

9.5 Processing of Electronic Order

9.5.1 Processing Flow of Order

After receives order data, the main processing operations are to input the data into the system and record, to set up file, and to distribute storage, and to output the processing result at last, such as the printing of picking out order and shipment order, carrying out shipment logistics operation according to the output order form. Each operation is discussed in the following. The processing steps of order data are shown in the Fig. 9.2.

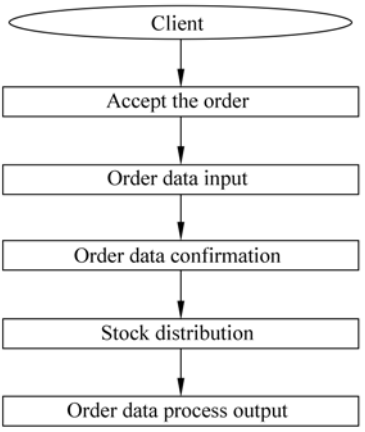

Figure 9.2 Steps of order data processing

1. Order data input

The electronic order data of customer is directly transferred into computer system via network. The electronic order takes the method of online input, but if the format of transmitted data is not the conventional standard of both sides, it is necessary to transform the format before entering the order processing system.

2. Checking out and confirmation of order data

Before input the order data, every data in the order form should be checked carefully to find whether it is complete and meets the requirement. If there is any problem, contact customer immediately and input the right data after confirmation. The order data accepted through electronic order system also needs to be checked out and confirmed. The checking out and confirmation of order data can be divided into two parts. They are input checking and trade condition confirmation:

(1) Input Checking

Basic check-up of the order data item; For example, to check out whether commodity name, quantity and deliver date are missed, or do not meet the requirement of the company.

(2) Trade condition Confirmation

① Confirmation of customer credit status: Check out whether the purchase sum of customer exceeds his credit limitation.

② Order form confirmation: It is needed to confirm the trade type of order item data in the order form (ordinary order form, cash sale order form, indirect trade order, etc.), in order to process them separately, that means system provides different processing functions for different order forms, such as providing different input menu or different checkout, inquiry functions and different storage documents.

③ Storage confirmation: When input commodity code name, system needs to check the storage state of this commodity, to permit the staff that execute the order to assort with customer to decide whether to reorder substituted commodity or postponed shipment date, to improve staff's executing order rate and processing order efficiency.

④ Sale quota confirmation: For the commodity that has sale quota limitation, when input the order quantity, system has to examine whether it exceeds the limitation, in order to maintain the rights and interests of other customers.

⑤ Price confirmation: There may be different price for different customers and different order quantities, so system should examine the price when input price. If the input price is not correct, the system should lock it to be looked through by director.

⑥ Packaging confirmation: For the ordered commodities, it should be verified in detail about whether customers demand to have special packaging, divided packaging or packaging with label.

3. Storage distribution

After input the order form data into the system and be verified, the main processing

operation is how to efficiently classify the large numbers of order data as an efficient collection and distribute the storage, to make the following logistics operation to continue efficiently.

① Distribution mode: Distribution of storage can be divided into single order form distribution and batch distribution.

② Single order form distribution: This mode is mostly online real-time distribution, which means that storage is distributed to the order form when input order forms data.

③ Batch distribution: After accumulating and summing up some orders, the storage is distributed once for all. Owing to large numbers of order forms and many kinds of customers, the logistics centers mostly distribute fixed times per day, thus they usually adopt batch distribution to make the storage distribution optimal.

④ The range of the involved distributed order form

When and what commodity in shipment will be confined to a certain process if order form is processed in normal steps. However in the real system there is often exception that leads to the result that some order forms cannot be processed in normal sequence, so it also should be take into consideration whether these exceptional order forms are involved in the distribution when current order forms are distributed.

⑤ Multi-storage or multi freight space or multi lot number storage distribution selection

If the place where the commodities stored have many storage, many freight space or many lot numbers, it is considered how to choose appropriate shipment storage, shipment lot number and shipment freight space, to distribute the appropriate commodity (first in first out based on selection of lot number or storage bit) at the appropriate time (selecting the nearest storage from the client for shipment).

⑥ Distribution order

After order forms involved in distribution are selected, if the total shipment amount of some commodity in the order forms is beyond the available distributed storage quantity, some exceptional order forms such as the above OOS order forms, delayed order forms or long term order forms, which should be in shipment last time, or some order forms booked in advance should in the priority of getting the merchandise. Therefore, when merchandise is supplemented or shipment date is reached, these order forms should be in the priority shipment.

⑦ Exceptional processing after distribution

If OOS occurs when storage has been distributed, these OOS order forms should be appropriately processed:

- Re-allot: Commodities can be re-allotted between order forms, which should be informed to clients and asked for their permissions.

- Reissue: If the client allows distribution with OOS and permits reissue when the OOS commodity are supplied or reissue in the next order form, the OOS commodity data should be recorded as file.
- Deferred shipment (postpone): If the client does not allow distribution with OOS, but permits the whole order form to be carried-forward, and then the postponed order form should be recorded as file.
- Transfer to the next order form: If the client does not allow distribution with OOS, but permits the whole order to merge with the next order form, the order form data should be recorded as file.

4. Order form data processing output

After order form data is processed as described above, shipment order can be printed, and the following logistics operations can be carried on. It includes:

(1) Delivery order: Delivery order provides the indication data on commodities delivery, as shipment gist. The form of delivery order data should be designed in cooperation with shipment policy and shipment operation form of the logistics center, to provide detailed and efficient shipment information, this is convenient for shipment.

(2) Delivering note: When goods are delivered and distributed, they are always attached with delivery note for customers to check the amount and sign for. To ensure data on the delivering note matches the actual delivering data, besides checking the amount before shipment, the print time and update of delivery note should also needed be paid attention to.

(3) OOS Data: After storage is allotted, the system should provide inquiry or report forms printing function for the OOS commodity and the OOS order form data for the related staff to deal with.

9.5.2 Gathering the Payment Online

1. Payment gateway technology

(1) Definition of payment gateway

As shown in Fig. 9.3, participants include customer (cardholder), seller and bank in e-commerce. The trade flow typically includes the following steps: the customer sends purchase request to the seller; the seller sends the payment instruction of customer to his bank to receive the payment through payment gateway. After the seller's bank receives authorization from cards issuing bank (the bank where customer opens his account) through bankcard network, and sends the authorization information back to the seller through payment gateway. Gaining the authorization, the seller sends the response information of purchase to the customer. If the payment acquirement and payment authorization cannot be completed at the same time, the seller still needs to send the payment acquirement

request to the sheet-received bank through the payment gateway to transfer the money of this trade to the account of the seller. Banks complete the final balance between them through the payment system. From the view of the above trade flow, online shopping process can be divided into two basic steps: trade and payment balance. The payment balance link is completed by the financial appropriative network consist of gateway, the sheet-receiving bank and the card-issuing bank.

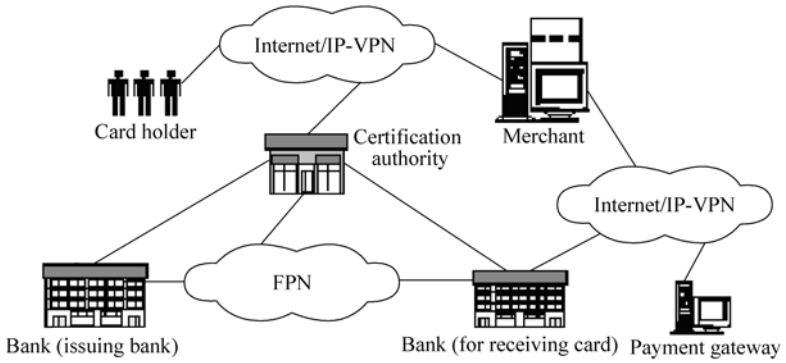

Figure 9.3 Basic structure of e-commerce system

Payment gateway is a set of servers connecting bank's private network with Internet. It is the interface between financial private network and public network and is also the secure barrier and pass of financial network. It is an important tool of electronic payment, and is also an electronic payment service tool oriented to sheet-receiving bank. Meanwhile, payment gateway is also the gateway between bank's internal network and enterprise internal network.

SET protocol formulate that, the payment gateway must be undertook by seller's sheet-receiving bank or the organization made up of the sheet-receiving banks (for example, bank card organization). It related to the arrangement of online payment balance, risk protection of financial system and bank security.

Double signature technology is used in SET. Payment information and order information are signed respectively, which guarantees that the seller can only check order information instead of payment information. The payment instruction includes secret data related to bank transaction such as ID, trade sum and credit card data, which are transparent just to the payment gateway. Therefore, the payment gateway must be assumed by sheet-receiving bank or the card organization entrusted by the bank.

(2) Function of payment gateway

The main function of the payment gateway is to complete the communication of both parts, convert protocols, and encrypt and decrypt data, in order to protect the internal network security of bank (as shown in Fig. 9.4). It can guarantee information be transferred securely and seamlessly between Internet and the

seller's mainframe, and support various Internet payment protocols and particular security protocol, trade protocol and protocol conversion and local authorization and balance disposal.

Figure 9.4 Function of the payment gateway

The basic functions of the payment gateway include: intellectualized router for import and export information; secure storeroom to protect private key for decrypting; management and distribution center for authenticating the sellers; the certificate to validate the cardholder and seller.

2. Validation of credit card

The design of payment module is definitely very important in the process of designing e-commerce website. Because there are so many kinds of credit cards all over the world currently, it is necessary to validate the credit card well.

9.6 Search and Inquiry of Website

Browsing your virtual shop, customers always want to find the goods they need easily. So the search and inquiry is very important for customers to make decision of purchasing goods. How to add simple search and inquiry function to the website will be discussed in this section.

9.6.1 Application of Advanced SQL

1. Grouping result function

To get the collective information, these functions aggregate many group data. When the data rows are gathered together, it can be viewed as the operation that incorporates the same kind of information when searching for information from the database. Some common grouping functions are listed in Table 9.3.

After understanding the common grouping functions, let's review their application in the following part. In SQL*Plus, a large amount of queries of users are completed by the grouping functions when searching for data in the database.

Therefore, mastering the functions is the foundation of understanding the function of SQL *PLUS.

Table 9.3 Common grouping functions

Function	Return	Example
Avg(column_name)	The average of all values in the column_name Table	Select avg(sales) from customer
Count(*)	The number of rows in the table	Select count(*) from customer
Max(column_name)	The maximum in the column_name Table	Select max(sales) from customer
Min(column_name)	The minimum in the column_name Table	Select min(sales) from customer

(1) Using group by clause

The functions described in the above table can be followed by "group by" clause or not. When not using the "group by" clause, for example "select max (sales) from customer;" it actually makes the database view all rows in the table as a group. For another example, to find out the average sale or sale amount, inquiry statement "select avg (sales) from customer;" returns the average sale, and statement "select sum (sales) from customer;" returns the sale amount. However sometimes what interested people is that it is needed to ensure the correct number of column of table in each statement using "group by" when inquiring pre-classified or grouped data.

When "group by" is used, and columns not used in the group by part appear in the select part, the grouping function is supposed to be used. Let's reconsider the probable problems when omitting to use the grouping function. When "select last_name, state_cd, sum (sales) from customer group by last_name;" is executed, it will return the following error:

```
ERROR at line 1:
ORA-00979: not a GROUP BY expression
```

This is due to not using "group by" clause in the column state_cd, therefore it is needed to add the grouping function. In other words, max( ), min( ), sum( ), count( ) or avg( ) is needed. If no appropriate grouping functions are found for the specified column, the column is moved to the "group by" clause.

(2) Using "having" clause

Just like setting inquiry condition for single row inquiry (for example, state_cd = "MA"), "having" clause can be used to set inquiry condition for a set of records. For example, provided that we want to find out the states where numbers of customers exceed 300, using "having" clause, the inquiry state is "select state_cd, avg(sales) from customer group by state_cd having count (state_cd)>300;". The "having" clause permits users to specify the search condition for a group of records, whereas the common "where" inquiry condition focuses on single record, instead of record group.

2. Embedded inquiry

Another powerful function of SQL is embedded inquiry, which is also called sub-inquiry. The format of sub-inquiry is shown as follows:

```
{main inquiry text} where {condition}
( {sub inquiry text});
```

For instance, the following main query accesses the customer table, and sub-query accesses the state table:

```
select last_name, sales from customer
where state_cd=(select max(state_cd)from state);
```

Please pay attention to the following points: the sub-query is parenthesized, and the condition of "where" clause depends on the queried result. In other words, the "where" clause includes another SQL select statement. SQL statement running embedded sub-query will affect statement's performance. As the experiences of using sub-query are continuously increasing, users will find out that it is needed to tie up with the database administrator to optimize the query statement including sub-query processing.

3. Defined variables in SQL*Plus

It permits to use defined variables in the same program in SQL*Plus, which can be viewed as a column that owns only one column of data. Just as column, variables own type (number or character) and data. Remember that there can be one or more SQL query statements in a command file, and one variable which can be used in all SQL statements in the command file can be defined with define statement in SQL*Plus. Take the following codes as an example, and let's see how to define a variable:

```
define rpt_cd="MA"
select sales from customer where state_cd='&rpt_cd';
```

Although there is no mandatory provision, it is advisable to parenthesize the text assigned to the variable with double quotation marks, thus blank horizontal space can be embedded in the parenthesized text.

Provided that the variable "rpt_cd" has been assigned to a value "MA", when writing a query statement, we can add prefix "&" in front of the variable, and parenthesize the variable by single quotation marks. Imputing command "define" can find out all defined variables. Suppose that three variables "rpt_cd", "sales_amt" and "cust_start" have been defined; the following output is shown after command "define" executes:

```
DEFINE RPT_CD="MA"(CHAR)
DEFINE SALES_AMT="18000"(CHAR)
DEFINE CUST_START="A"(CHAR)
```

Imputing variable name after “define” can find out the value of the variable. If Imputing “define sales_amt”, it will display that:

```
DEFINE SALES_AMT="18000"(CHAR)
```

We should know that all variables are character type data, no matter what kind of data type has been assigned to.

If it needs to clean the value of the variable for some reason, command “undefined” followed by the variable name can be imputed. If command “undefine sales_amt” is executed and then command “define sales_amt” is imputed, the following message will be displayed to show that the variable has been cleared.

```
SP2-0135: symbol sales_amt is UNDEFINED
```

Note that “define” and “undefined” can be shortened as “def” and “undef”.

9.6.2 Optimizing Database Inquiry

For a complicated inquiry statement, there are generally various expressions for the query of the same query condition, however different expressions make the response speed of the database different. Statistics shows that about 90% performances problem is caused by programmers’ or users’ input of the inappropriate inquiry statement. Therefore, improving the program quality of the SQL statement will definitely improve software performance. Nevertheless, the quality of inquiry statement is always related to database structure, quantity of records and other specific situations of the practical running system, and there is no simple and universal rule to summarize the optimizing of the inquiry statement. Understanding the basic operation rules of DBMS is helpful to optimize the inquiry statement, and then the using of the appropriate inquiry strategy will improve system performance.

The optimization of optimizer is based on the content of query table and other factors related to server, such as cache size, cache strategy, and I/O size. Generally speaking, access to hard disk is the operation that cost most. Therefore, for the users, the key to optimize the inquiry is to make the optimizer operate on the field index.

There are many executing strategies for SQL inquiry statement, and optimizer will estimate the least-time way of all the executing ways, which is also the least-cost way. Generally speaking, the most important selection is that which kind of index to use and which kind of methods to join the tables, and all the optimizations are based on the “where” clause in the inquiry statement used by users.

1. Classification of optimization

The optimizations of the “where” clause made by the optimizer are classified as

follows:

(1) Search parameter

The key of search parameter is whether the database can use the index of field in the table to search for data, instead of directly searching for data in the record. The condition query with the operator such as = , < , > , >= , and <= can directly use the index. The optimizer sometimes can convert the non-search parameter into search parameter. Therefore, some redundant search parameters should be provided in the query to make the optimizer have more choices.

(2) Link condition

The optimizer enumerates all link methods when we use the linked inquiry, and computes the cost of each method to select the least-cost one. The system generally uses the average density as the base to estimate the possible hitting rate when the link data cannot be acquired.

(3) "or" calculation condition

When there are key words such as "in" in the query statement, the optimizer converts the content to "or" juxtaposition condition. For example:

```
"select * from author where au_lname in ('Berry','Densham') " will be
  converted to:
"select * from author where au_lname = 'Berry' or au_lname ='Densham'"
```

DBMS will query each "or" clause, merge all results and delete the repeated items to get the final result.

2. Optimization skill

Based on understanding of database optimizer in the previous part, in order to ensure the exact optimization of the query statement be executed, we should pay attention to the following points:

(1) Avoid the using of the incompatible data type. For example, *float* and *int*, *char* and *varchar*, and *binary* and *varbinary* are incompatible. The incompatibility of data type might make the optimizer unable to perform some optimizing operations that can have been performed.

(2) If the value of an expression cannot be obtained in storage procedure or trigger when it is compiled, the optimizer will estimate the hitting record amount only with its average density.

(3) Avoid using other math operator for the search parameter. For example,

```
select name from employee where SUBSTRING(id, 1, 1) = 'B'
select name from employee where salary * 12 > 30000
```

Written as:

```
select name from employee where id like 'B%'
select name from employee where salary> 3000
```

(4) Avoid using operator such as! = or < >, because they make system only search data in tables directly, and unable to use index.

Above-mentioned points are some basic ideas to improve the query speed. However in most situations, the programmer needs to repeatedly compare different statements to get the optimal solution. In addition, what is more important is that the database administrator should adjust parameters of the DBMS in the server side to get faster response performance.

9.7 Customer Service in E-commerce Time

9.7.1 Component Technology and Build Method of Call Center

1. Key technology of call center

The development of the call center in China have made great progress in a short period, and according to the requirements of customers and market, various new technologies such as IP, WAP, ASR and Data Warehouse are integrated with call center to be creating new call center with new concepts and new functions, and to make it more and more important in the information communication field in the future. These call centers with new mode will become the principal part and new platform of e-commerce.

The call center (CC) is also called Customer Care Center (CCC) or Customer Relationship Management (CRM) abroad. The application and development of the call center goes through several stages. The current call center is an integrated information service system based on CTI and continuously integrates state-of-art technology in communication network, computer network and information field, and it is also integrated with enterprises.

The basic components of call center include: PBX/ACD, CTI, IVR, ICM, and OCM, business charging system, monitor system, management/statistics system, CRM and assistant desk. There are manifold application servers such as Web server and e-mail server. In addition, there are also network technology and database technology.

As shown in Fig. 9.5, its key technology include ACD, IVR, CTI, CT middleware, unified message, assistant desk technology voice synthesis and recognition, record monitor, charge, test, training tools and many application service modules based on software such as Web function, e-mail process system, text conversation system, page synchronization and IM. There is IP gateway or IP-PBX in the call center based on IP technology. Web call center applies VoIP technology and Web callback technology. Video call center applies video technology.

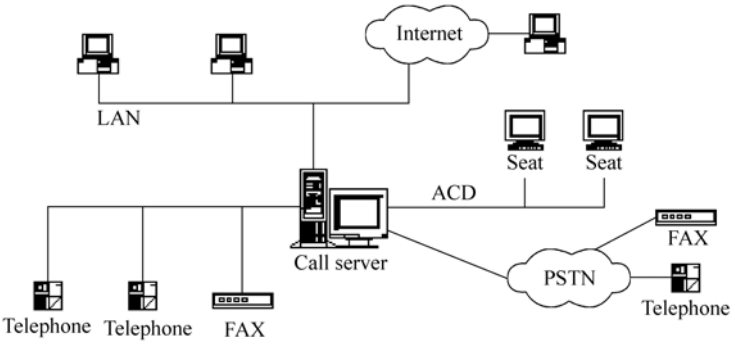

Figure 9.5 The architecture of a call center

2. Construction solution to call center

There are two modes to build a call center system: "outsource" mode and "self-build" mode.

First of all, in the "outsource" mode, there is an independent call center business operator, which owns large call center operation scale and can contracts part of its seats or business to other related enterprises. Therefore, other enterprises can build their related business requirements directly on that of the operator without adding their own separate hardware devices. They only need to provide related particular service information, and the call center provider will provide service to their customers. The advantage of this mode is cost saving, and provide professional service. But enterprises should train staff in charge of their seats according to their particular business information.

The "self-build" mode means that the enterprise purchases hardware devices, and develops software related to its business process and directly serves customers. This method is more flexible in providing services, and can get various responses from users in time.

To build call center system, there are two-implementation technologies for reference: one is based on switch, and the other is based on computer. The difference between these two modes lies mainly in the front process of voice continuity. In the switch mode, the switch completes the front voice continuity, namely user' phone access; in the computer mode, computer completes the control of the users' dialing call through voice processing board. The former mode has more powerful process ability and stable performance, and it is suitable for bigger call center system with more than 100 seats, but its cost is too high to take on for most enterprises; the latter mode has smaller scale, and less stable performance, and it is suitable for smaller-scale system, and its advantages are less-cost and flexible to design.

There are many factors to be considered to build a call center system: budget issue, business management capability, training of the related staff etc. The costly part to build a call center system abroad is usually the salary of the seat staff,

because, like a salesman, a good employee of seat staff can bring more benefit and gain more profit for an enterprise.

The specific steps of building a call center system include:

① Clarify related object: Find out functions needed by users, and document these requirements for reference.

② Building related technical solution: Put forward technical solution to meet user's various needs, fit for user's budget, choose switch mode or computer mode to establish functions of each part.

③ To completing related design in detail: Establish details of the implementation and complete detailed design work after reiterative communication with users.

④ System design and implementation: Complete design and implementation of call center system, and complete coding work.

⑤ System test: The call center system operates on telephone network, and it requires high reliability of the network. Therefore, it should fully be tested before put into use.

⑥ System operation: Put the system into practical operation, and solve related problems in time.

⑦ System maintenance: Maintain the system operation daily, or upgrade the system according to user's requirement.

In a word, to build a concrete system, it is needed to closely combine the design of the system with the specific business requirements. User's requirements can be met only after having a fully business analysis and based on this we can choose the specific integration technology.

9.7.2 Application of Electronic Mail List

1. Effect of electronic mail list on enterprise

(1) Establish a more perfect marketing channel: It will be the developing trend of marketing to publicize directly to the final users and the most potential users of enterprises' products. The mail list system provides such a platform, the enterprise can establish its own mail publishing system to send a series of commercial information such as enterprise's business movement, product information, market research, after-sale service and technical support directly to the target users who will form an efficient response system to furthest guarantee the effect and efficiency of sales promotion.

(2) Furthest improve work efficiency: When there are a lot of subordinate departments, units or league units, it is usually needed to send a lot of faxes and mails. The work is boring, tedious and error-prone. However, when the electronic mail list system is used, these problems can be solved immediately. You only need to create an electronic mail list on the platform, a mass of mails is sent at one time. Therefore, the work efficiency and quality can be greatly improved,

and the traditional laggard work procedures will be replaced by quick-decision and quick-response.

(3) Accelerate development of network economy: The network economy is in essential a direct economy reducing intermediate cost, stock and circulating fund and making production "direct to" consumption, and "straightening" the circuitous business activity. The electronic mail list system just provides such a pattern.

2. Website

But if an electronic mail list of homepage update has been created, the massive sending work would be done once and can get response in time.

3. Stock information

Online stock markets are developing quickly. There are no buildings or trading halls in these organizations, and all trades can be processed through Internet; the electronic mail list system plays an important part there. All the bulletins such as important financial news, announcement and reports of list companies, general trends viewpoint, individual share workshop, market hearsay, issuing of new stock, distribution of bonus, ex rights of bonus shares, payment of the allotment of shares, stockholder conferences and dynamic information of administration status and project development of listed companies can be sent to stockholders at one time only by creating a mailing list.

4. News release

All news such as international news, national news, social news, sports news, financial news, entertainment news, science news and IT news etc. can be sent to ten thousands of users once through electronic mail list system, and users only need to spend several minutes to subscribe, greatly saving Internet exploration time and expense.

5. Organizations and club

Open and multi-role-involved electronic BBS can make subscribers not only subscribe, but also participate in discussing and the discussion content can be sent to all subscribers' mailboxes.

6. Mail order service

In the traditional mail order business, you needs to make great efforts and spend lot of time to mail product catalogues to customers, and use a lot of papers to make ornate product catalogue to persuade customers to purchase your products, and customers should pay for sending a mail order and should take time to mail the order; currently, you only need to use online mail order service, through which product order mail, requirement for product catalogue and contact advertisement can be sent at one time. Customers can purchase more conveniently and consult

and buy favorite goods in time, avoid misunderstanding, and save time and money for mailing order sheets.

9.8 Release Technology of Web Database

The integration of Web technology and database technology introduce database access system of thin client into common application, and users can access various database systems on different platforms by using common Web explorer. The technology avoids work in the client side in developing database system, and makes the whole development work in the server end, which improves system's maintainability and also improves data real-time and dynamic release capability of database at the same time.

The release of database is just to provide database information for users to access. Since database technology emerged in 1970's, there have been three kinds of methods to release database according to architecture. The first one is the early decentralized distributing, whose characteristics is that when share database information, multi-copy of library is needed; the second one is centralized release, whose characteristic is that the database is on the file server and other workstations access the sharing library through share drivers; The third one—distributed release—came up after the appearance of Client/Server computing mode. The client server accesses database information in the server through interaction with back-end database engine with some protocols. The distributed release method is the most interesting one for people in WWW environment. So, this section focuses on this method.

Currently, there are two types of distributed release: One is based on CGI release technology. Its advantage is simple and the communication protocol between client and server is the standard HTTP. However, its efficiency is low and it wastes network bandwidth easily; the other one is based on Java release technology, such as MsqlJava and WebLogic dbKona/T3. In this method, the access of database has high efficiency and quick response.

Comparing to the second release method, the main reason of low efficiency of the first one is the separation of HTTPD (HTTP Daemon) and database engine, which causes more transfer times of datagram. Actually, along with the development of WWW and the rise of Intranet, the release of database has closer and closer relation with Web server—HTTPD. Therefore, HTTPD is needed to be integrated with database function, then, HTTPD is integrated with a light weight database engine—MiniSQLServer. Meanwhile, the release mode also extends request method of HTTP/1.0 protocol to support access to database. Accordingly, Plug-in is provided in the explorer as access front end. Thus, the release mode introduced in this section integrates advantages of structures based on Java and based on CGI.

Some modes supporting release of database are as follows:

(1) Release mode based on CGI

This is the most popular release mode, such as search engines of Yahoo, Infoseek and Excite. In this mode, interface of database access is typically embedded in the HTML page as FORM (as shown in Fig. 9.6). The whole interaction process between explorer and back-end is as follows: the explorer sends database request of client as FORM parameter to HTTPD, and HTTD invokes corresponding CGI program with received parameter, and the CGI program requests to database to get query result, and then returns results to the explorer step by step. There are many transfers of datagram in the communication, thus its efficiency is low.

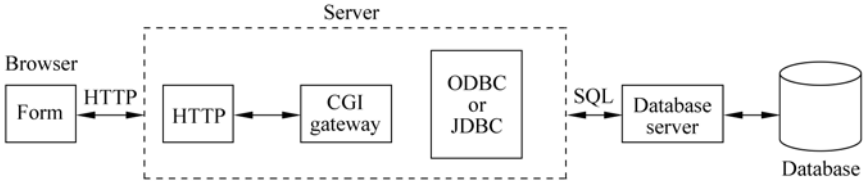

Figure 9.6 Database release model based on CGI

(2) Release mode based on Java

As shown in Fig. 9.7, this mode uses JavaApplet (downloaded from the server) as the access front-end; it directly interacts with database server on server end, or through a middleware on the server and transmits database-accessing request from the front-end (the former is displayed in Fig. 9.7). The transmission times of datagram (especially datagram appended database information) is obviously reduced, and Java Applet can avoid the unnecessary interaction with the server, thus the efficiency is improved. The mode in which HTTPD is integrated with database engine is used to reduce the transmit times of datagram, thus the efficiency is improved.

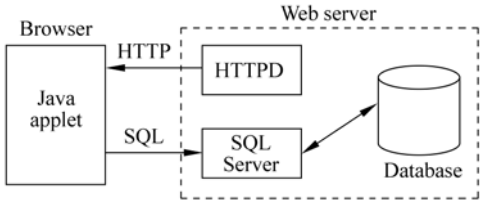

Figure 9.7 Release model based on Java

(3) Plug-in release mode

The concept of Plug-in was first introduced by Netscape to extend explorer's function. Because it is dynamically loaded module coded with Plug-in API provided by explorer manufacturers, it can be seamlessly integrated with explorer. Currently, popular explorer manufacturers such as Netscape and Microsoft all

provide Plug-in API for their products. Multimedia can be played with Plug-in, such as Live 3D, Macromedia Shockwave, Adobe Acrobat and so on; Plug-in also can be used as utility tools such as object embed, compression and decompression; in addition, it can be used to develop applications such as personal information management and games.

Each Plug-in corresponds to one or more kinds of MIME types. If a Plug-in has been registered in the explorer, it will be automatically invoked to process when the explorer comes across files or data of its corresponding MIME type.

(4) MIME (Multi-purpose Internet Mail Extension)

To provide open and extensible data type, Internet Mail (RFC 822) has been expended to MIME. Each type of MIME corresponds to a string of characters, such as "application/x-cgi, text/plain" and so on. On Internet, the sender of data gram sets its MIME type according to the carried information and the receiver will process it according to its MIME type. Some valid MIME types are registered by IANA (Internet Assigned Number Authority). Clients and servers can directly communicate with each other under HTTP, so applications can freely use un-registered types, as long as both sides can identify the type.

(5) Database release model based on extended HTTP

A database plug-in is developed as access front-end of database with Netscape Plug-in API in the explorer side. The un-registered MIME type corresponding to the plug-in is defined as database/x-SQL, and the corresponding suffix is "db". Therefore, whenever the explorer meets data whose MIME type is database/x-SQL, database plug-in is invoked to process it. Extended HTTP is adopted in the communication between the plug-in and HTTPD. A method "DATABASE" is added to method set of HTTP1.0 to permit HTTPD to complete its query, and the corresponding request/response data gram is defined however the statelessness of HTTP is preserved. Several modules can be assorted according to the difference between HTTP request methods on the server side (as shown in Fig. 9.8). After receiving the request data gram, HTTPD invokes the handling module according

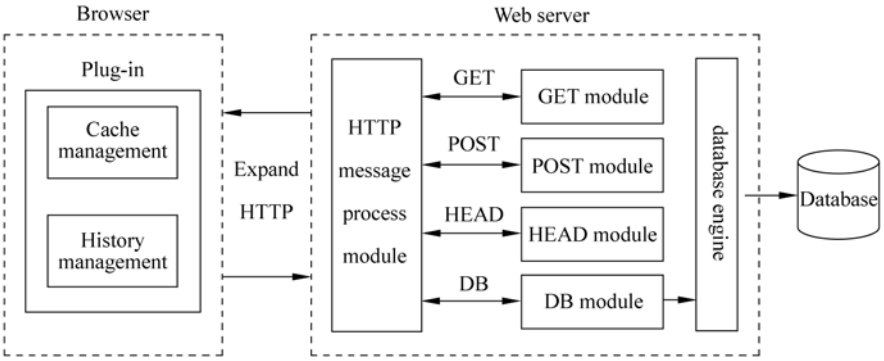

Figure 9.8 Release model based on extended HTTP

to the requested method. For the sake of security, the database engine only provides query function but no adding, deleting and update functions. In addition, if the server sends the queried results to the front-end at one time, the response time will become longer when the data is large. Moreover, because generally the client wants to query a certain subset of the result set, it will cause unnecessary waste. Therefore, it is regulated that only fixed number of records is returned each time. Owing to the stateless protocol, buffer strategy and history management is created on the client end to improve efficiency and performance of the release mode. Every time users explore forward or backward, they do not have to interact with the server end that will cause performance damage.

9.9 Summary

This chapter introduces design method and implementation process of virtual enterprise website in e-commerce environment, and describes various methods and technologies of how to use development tools to build e-commerce website. It introduces solution to virtual enterprise e-commerce application. In addition, it emphasizes principle and implementation methods of key technologies such as network virtual shop, electronic product catalog, online shopping cart, electronic order sheet, query and search, customer service, Web database release and multi-level enterprise computation architecture.

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10 Computer System Integration and E-commerce

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Abstract E-commerce system is a very complex system which integrates related hardware and software to achieve certain functionalities such as information display, exchange and processing. From a macro point of view, e-commerce system integration consists of two main parts: hardware integration and software integration. These integrations are very complicated processes during which some rules must be followed. This chapter discusses e-commerce integration problem, and focus on the discussion of the history of system integration, system integration rules, how to integrate related hardware and software.

Key Words e-commerce, system integration, server, communication net, application protocol.

The future e-commerce system means more integration. From the beginning, IBM believes that network relates to all important events in business organization, rather than just being used in electronic trade. The so-called integration is that business organization integrates all existing business processes with business processes based on Internet, and e-commerce needs to cover all core business processes. Enterprise has to integrate all internal information and applications to acquire real benefits of e-commerce (speed, cycle time, customer response).

This chapter mainly describes the relation between system integration and e-commerce system. Knowledge points include: production, development and actuality of system integration and e-commerce, method and technology of system integration, and how each component of e-commerce system exerts system integration technology to efficiently, safely build e-commerce system.

10.1 Overview of System Integration

10.1.1 Production and Development of System Integration

Simply speaking, system integration is to provide customers with comprehensive solutions according to their business requirements and resource configuration, including business consultation service, software and hardware platform configuration, application software development, network connection and system maintenance. System integration technology came out along with the development of computer technology and network communication technology, and continuously evolved along with changes of customer's application requirements. Its development mainly came out along with changes of network communication speed and appearance of new technology and new products. The development of system integration business approximately went through three phases.

(1) The first phase: Between 1970's and 1980's

The phase just developed accounting computerization functions based on some software, hardware and database products of some mainframe manufacturers according to users' requirements, and then just simply transferred the whole system to users and their task is over. Therefore, system integration at this phase was not real system integration, and then it was called Generation 0. Along with broad prevalence of information technology, requirements of users turned over to how to assemble various existing computing environment into a unified, complete and efficient application system. Under this requirement, it came out the first generation system integrators who have had mature technology and product strength, but they just assemble various products to meet customers' needs with their understanding of information technology. In fact, most work of system integration stayed in "putting trunks together" phase.

(2) The second phase: ERP phase, system integrators mainly provide service based on enterprise business process

The rise of network in 1990's made information industry develop at a very high speed, and the content of system integration service also changed fundamentally. Along with prevalence of information technology, the value of technology and product did not play crucial part any more in integration solution. Whether a system integration solution was successful lied in alteration of enterprise business pattern and business process. Therefore, ERP became the main business direction of system integrators. In enterprise-oriented application, improvement of enterprise administration and management came to the first, and technology fell back to the second. Compared with traditional system integration, integration business of the second generation was mainly based on enterprise business process. It was directed by business and focused on development, and system integration was not limited on selling hardware products on a commission basis any more, and increment service such as software development and rebuilding of business

process took up the main place of solution.

There are two obvious trends in the development of the second generation of system integration: One is that the second generation focused on enterprise business itself. Take telecom as example, charging is one of the functions, but the business mainly focuses on serving customers. The keystone of the second generation of system integration is not simply to provide telecom-charging service any more, but to provide a complete set of business related to customer service according to customers' requirements. The other is that CIO of the second generation of system integrators must have business and technology management abilities owing to business transformation from technology to management.

Based on fundamental change of service manners, the business structure of the Second-generation system integration also fundamentally changed. Along with more traditional system integrators turned into new generation of system integrators, the portion of software and service in business structure increased gradually. System integrators made product value increase through integration to gain reasonable profits, and customers gained ultimate income through increment service, which is the value of the second generation of system integration.

From the view of business pattern, the main business of the second system integration also changed with the change of service manners:

System integrators would spend 80% of the time on providing advice on improving business process to clients before doing system integration to make business process more reasonable. The traditional system integration itself created only a little value owing to mainly depending on hardware products. The second generation of system integration depended on software development from the view of cost control to provide clients with more consulting service while reducing users' total cost to the least, also brings more profit for itself.

(3) The third phase: System integration of Internet age

In Internet age, system integration service has to integrate integrally, not only needing to provide technology increment service, but also needing to guide demands, to become strategy and consultation counselor of enterprise.

The continuous appearance of new computer and communication technology provides system integration with new chances and challenges. There are three development forms of system integration business: one is to deeply mine internal business of industry and extend system integration, to provide users with general, standard and high-quality service that is from requirement evaluation, information product design, instituting solution to implementation. The second is to seek for new business increasing points in newly developing industries and exploit new industry market; the third one is to actively exploit e-commerce field facing Internet, and continuously expend future development space of system integration. Currently, system integration business turns to multi-business integration based on Internet architecture, which requires system integrators to master special technology and service to always stand in the front of network technology, going before users.

10.1.2 Principle of System Integration

Information system based on system integration mainly includes computer network system, voice communication system, and image transmitting process system. These systems interact with each other, and system integration is their link and common transmission approach. System integration should follow certain principles to guarantee normal work and communication of each system, and these principles include:

(1) Advancement of network system: Network system is the foundation of application system, and network system could guarantee to meet the development in 5 to 10 years or more.

Safety and stability of transmission system: Accurate and uninterrupted data transmission and daily management of storage system is very important. The key application system is data transmission and data storage, therefore it is required that the designed system owns high safety and stability.

(2) Manageability of system: Application system as a complex system needs to monitor and adjust the whole operations of system. Regardless where system devices are, they should be able managed and controlled by system.

(3) Expansibility of the whole integrity: System should own good expansibility. Along with continuous development of system and application, hardware devices and software modules could be added anytime according to requirements. Investment of prophase project could be efficiently used in upper expanding and existing devices would not be wasted.

(4) Open: System should be able to support manifold communication protocols, transmission media and host interconnection; support various seamless connection between various isomerous systems and local system.

(5) Security: Application system may use Intranet technology later, and is connected to external system with Internet. The important characteristic of Internet/Intranet is resource sharing and open, which results in many security problem. Therefore, to design and develop mechanism guaranteeing all kinds of information secure is an important issue to implement system operation well.

(6) System flexibility: Aiming at characteristics of dispersal and complexity of information system, system flexibility mainly represents in software configuration, load balance and so on. Assorting the most advanced virtual network technology supported by switch products, the whole application system could quickly and easily transfer user or user group from one network to another network by software, crossing offices and office building, without any changes of hardware, to accommodate continuous changes of organization.

(7) Favorable performance/price: How to implement high-quality-low-price application system with the most mature technology and device is also a principle of system integration to be mastered.

10.2 Hardware System Integration of E-commerce

10.2.1 Integration of Server

1. Method of server integration

(1) Architecture

As for architecture of server, three tiers architecture of application server is advised to use in server integration. Application server uses individual process to handle business and transaction management, and transfers all data operation to the third tier, which is database server of data process tier. In certain instance, it could also be transferred to other systems. The core of application server architecture is between Web server and database server, and uses special application server to complete business process, instead of using customary method, which is directly to access database server from Web server.

(2) Load balance

All the application server systems have load balance capability, namely distributing requests from users appropriately to each application server to make them burden system load respectively. Through load balance, users could add some new servers, and install corresponding software and configure them when expanding system, instead of changing any application, to meet requirements for scalable performance.

There are many ways to implement load balance for server, but each has its advantages and disadvantages. First of all, it depends on load balance algorithm. There are two main load balance algorithms currently. One is accurate load distribution, namely there is a distributor in the system, which distributes system requests to appropriate application sever to handle. The other load distribution is based on statistics, namely received requests are directly distributed to each back application server according to probability based on predefined weights. There are two ways in implementing application server, one is based on process, and the other is based on thread. The way based on process is to pre-generate all processes of application server, and a certain process of application server handles all things when receiving a request. The way based on thread is to create few application server processes in each computer, and a temporarily created thread handles received request. The way based on process is faster because it does not need to create any thread. But a process engrosses more resources than a thread, a computer could run fewer processes at the same time than threads, therefore its parallel handling capability is weaker than the way based on thread.

(3) High reliability

Generally speaking, reliability is referred to fault tolerance and fault recovery. Fault tolerance means system could still operate normally when certain faults occur, including hardware fault, software error and network fault. There are two

grades in fault tolerance. In the primary grade, the processing request cannot be handled when fault occurs. The more consummate grade means these requests are transferred to other servers to continue to be handled without user's awareness. Of course, this grade provides better service, but it generally pays for performance and complexity. Each application chooses some fault tolerance grade according to its characteristics. In the premise of discovering fault and tolerance error, more consummate application server should carry out fault recovery. After the fault occurred, if the fault has been removed automatically or manually, then these application servers should recover to work and continuously serve users. The technology is related to technology that provides high usability.

(4) Connection limitation of database

To solve this problem, database connection pool is generally used in server integration, namely database connections are completed at initial stage or first use, and are not released later. The created connections are repeatedly used when handling the following requests. This method could greatly reduce process time of database, in favor of increasing the whole system performance, and at the same time could make the use of restricted database connections improve efficiently. Therefore, database connection pool technology is widely used in various application server products.

(5) Distributing session management

There are two methods to solve this problem: one is to store its own session information in each server. Thus it needs to be based on session rather than request when distributing load, otherwise it will cause inconsistence of session information. The other one is to specially create a session server to store session information. It is convenient for load distribution algorithm and fault tolerance. But its disadvantage is adding one network communication time and slowing handling speed.

(6) Embedded object

To increase openness of server, embedded objects integrated in servers can be generally placed in application servers or back-end of application server. Embedded objects which are placed in application server could turn object access into local access, without any network communication, so it has better performance. But these objects could exist in application server at the same time, so it could not implement long-term internal state of objects. There are two kinds of implementations when embedded objects are placed in application server. One is symmetrical, namely each application server installs all objects; the other is asymmetrical, namely, cooperating with load distribution program, some objects are only installed in certain servers. If embedded objects are placed in back-end of application server, one level is actually added, namely embedded object level, to make the whole system become four levels. It would increase network communication and reduce performance, however, design of objects is more flexible, and various existing object connection interface can be used. Currently, standard object access interfaces are mainly CORBA and DCOM. CORBA is

standard interface defined by OMG (Object Management Group), which is widely applied abroad including EJB. DCOM is the standard defined by Microsoft, which could directly connect to ActiveX. Currently there are some application servers having their own object access interfaces.

(7) High-speed cache mechanism

To realize optimal performance, many servers use high-speed caching mechanism when integrated. There are two places using cache in application, namely page cache and database cache. Page cache is to record pages corresponding to particular URLs in cache, in order to directly use them when the same URL is accessed in future. Database cache is to record access results of database, thus it only needs to access the cache when the same SQL accesses database again, instead of operating the database. The premise of getting well effect of this kind of cache is that the main cost of system is database access. Because system needs to carry out work of creating page, the effect of cache is not as good as that of page cache, but it is more applicable.

Several technology issues mentioned above need to be resolved in server integration currently. There are many other problems; such as how to implement cross platform even mixed platform and how to implement management of application. The above solutions cannot be judged simply, rather applicable to different types of system. For example, common commercial systems oriented to the public need high performance. If it is referred to e-bank system, the requirement of security would exceed requirement of high performance, which needs more consummate security policy. Therefore, users first need to fully understand their requirements when integrating application server, then determine every main technical problem, choosing appropriate solution, and find products which use these solutions to complete their systems at last.

2. Integration of server

(1) Development phase of application server

In the first phase, server expanding interfaces provided by Web server are used, and they are developed with C or Perl, such as CGI and API. The manner could make developer freely handle various Web requests, dynamically generate response page, and implement various complicated Web system requirement. The main problem of the development manner is the need of high skilled developer, who needs to understand low level of programming method and HTTP. In addition, debugging for the system is rather difficult.

In the second phase, some scripts mainly including ASP, PHP and Livewire in server end are used in the development. The chief advantage of the method is that it can simplify development process. The main problem of this method is bad expansibility of the system. When system is busy, there is no efficient method to expand. Moreover, from the perspective of a nit-picker, the method goes against the implementation of various high-performance algorithms, and could not provide high usability, and has bad integration effect.

In the third phase, a new Web application development method comes out, namely application server method. The core structure and the main problems to be resolved are similar, and the difference is just the different algorithms of various solutions.

(2) Problems of server integration

① Architecture: The chief characteristic of server is server end architecture which owns at least three layers. If application requests are all transferred to application server in application process layer through request receiving layer (generally Web server), application logic, business logic and data logic would be mixed up and interface, application and data would not be distinguished.

② Load balance: When users build their initial systems, they could not accurately forecast the future system scale. If the scale of system is designed to be small, it would not accommodate large scale development in future. If the scale of system is designed to be large, it might cause waste of investment. Application server architecture could be used to add a layer, which makes system more complicated, but will bring many advantages. The basic advantage is to bring system scalable performance.

③ High reliability: The architecture of application server is a special form of distributed system, and one most important characteristic of distributed system is to build high reliable system. Therefore, one solution to increase reliability is to use application server architecture.

④ Connection restriction of database: As well known, database process is the most time-consuming step in the whole business process. Connection and release of database is particularly time-consuming. So database connection is needed to be restricted.

⑤ Distributing session management: Because standard HTTP request is one connection of each request, technologies such as Cookie and IP address identification are generally used in system integration to implement session management in order to make it easy to use application. In single server, session management is relatively easy to implement, but storage place of session information is a problem in multi-servers.

⑥ Embedded object: Embedded objects are provided in server integration to complete various low layer functions, and implement connection with other systems. But differences which mainly represent in the positions of objects and object interfaces in embedded objects among various application servers are quite large. It causes problems when different servers are connected. It needs to design position and interface of object according to different system requirements.

⑦ High-speed cache mechanism: The efficiency of server not only depends on the response to requests of server, but also response amount at unit time, which is called peak value. Cache issue is very important in this situation. High-speed cache mechanism is needed to be considered carefully in system integration.

3. Integration of high performance server

(1) Consideration for purchasing server

As the heart of network architecture and operation, server is very important, and PC servers which have high performance and low price increasingly take up most quotient of server market. Owing to its business's particularity, ISP/ICP not only gains unprecedented development chance from its increasingly networking requirements, and its business development also plays an important part in promoting information construct of the whole society; PC server as the source of power of network is key to ISP/ICP, and operation of ISP/ICP greatly depends on PC server. Therefore, how to choose the appropriate PC server is very important to ISP/ICP. We will introduce the general principle of purchasing PC server and particularity of purchasing of ISP/ICP industry.

After the level of PC server is determined, it needs indicators to measure its performance. There are usually six performance indicators, namely manageability, usability, expandability, security, high performance and modularization.

① Manageability is standard performance of PC server, and is also the important difference from Unix server, because it is better than that of Unix server. Windows NT is not only consistent with other operation systems in working interface, but also is compatible with all kinds of application software based on Windows system. These ease management of PC server. At the same time, PC server provides system with abundant management tool software and especially the installation software makes installing of the server or expending (adding hard disk, memory etc.) as easy as installing PC.

② Usability is referred to normal use time percent of server during a period of time. There are two methods to improve usability of server: reducing average fault time of hardware and using special mechanism. The mechanism could automatically execute system or component switch to eliminate or reduce accidental power down when fault occurs. However, regardless using which method, system or component has to be redundant, and system cost is increased too.

③ Security is the life of network, and security of PC server is just the security of network. To improve security of server, component redundancy of server is very important. Some servers realize complete device redundancy in power supply, network card, SCSI card, hard disk and PCI channel, and support PCI network card automatically switch, which greatly optimize security performance of server. Of course, redundancy of device component needs two sets of totally same components, which greatly increases system cost.

④ High performance is referred to high integrating performance of server, including running speed, disk space, fault tolerance, expandable capability, stability, durative, monitoring function and power supply. In addition, it is needed to note hot-plug performance of disk and power supply, adaptability of network card and redundancy design and correcting function of related components.

⑤ Expandability is one of the important performances of PC server. Because the number of workstations or clients is randomly added, expandability performance of server is needed to be fully considered to keep server working stable and secure.

⑥ Modularization design refers to components such as power supply, network card, SCSI card, hard disk and fan are modularized structure and have hot-plug function, and it would be online maintained to greatly reduce system halt. The particular one is distributed power supply technology, each important component has its own supply system, and one component whose power supply is damaged would not affect security and continual working of the whole system.

These six aspects are usually considered by all kinds of users when they are purchasing PC server. They affect each other and are still individual, and they have different important extent as to different applications and industries, thus users have to do tradeoff. Moreover, factors such as brand, price, service, strength of manufacturer also should be put into consideration.

(2) Particularity of application and purchase in ISP/ICP industry

It is easy to figure out that ISP/ICP mainly belongs to department application and a few enterprise applications according to the above division of application domain. One or more aspects emphasized are determined according to business characteristics of ISP/ICP in performance.

Business characteristics of ISP/ICP: many enterprises and individuals join Internet and build homepage to extend affection, which mainly brings new developing chance for ISP/ICP who provides Internet service. Particularly along with telecommunication infrastructures become more mature, bandwidth problem which harasses exploring speed is gradually resolved, and the main business pattern turns from foregone “virtual host” business to “hosting trusteeship” business gradually. Currently, ISP mainly engages in connecting service IAP.

According to forecast of experts and authority organizations, current ISP/ICP is developing in four directions: the first one is backbone network administration, which mainly engages in long loop access service and scalable management through seizing large number of customers; the second one is to provide increment business service, including dialing connection and cache to make customers quickly access, and to provide VPN business consultation and design; the third one is to provide Internet solution, namely to provide SAP and Oracle application solution and various special information consultation, in order to help customer implement e-commerce, and to provide B2B and B2C solution; the fourth one is data center, including hosting trusteeship, application hosting and enterprise e-commerce creation, management and maintenance.

Data center service business is the most necessary business of PC server among four directions, and is also the main motivation of each ISP/ICP massive purchase. The main customers of host trusteeship are ISP/ICP themselves, and the main customers of application trusteeship are websites of press media, and the main customers of creation, management and maintenance of enterprise e-commerce respectively are virtual host servers, system integrators and enterprises.

Consideration when purchasing PC server:

① Usability. It is very important to ISP/ICP. Otherwise, business will be interrupted by neglect, causing large or destructive damage.

② Space. Because host trusteeship has become one of main businesses of ISP/ICP, how to provide server devices as many as possible in limited space becomes the most important foundation of expanding business scale by ISP/ICP.

③ Manageability. This is key performance which referred to maintenance of system, resource exploitation and user resource management and support.

④ High performance. It directly affects execution in other aspects.

These four aspects together determine whether PC server fully meets requirements of key business and whether ISP/ICP standing in front edge of Internet could play key role, in order to instruct the whole world into "information expressway".

10.2.2 Integration of Communication Network

1. Integration of LAN

Integration of LAN is to implement secure and fast access among computer networks through enterprise network construction to provide good hardware platform for enterprise implementation OA and application information management system running on computer network, thus achieving the goal of making full use of various computer information technology to make enterprise office work and management gradually realize networking, information and modernization.

(1) Principle of LAN integration

LAN is the infrastructure of all information network applications, and whether its design is reasonable is very important to application and development of network. The whole design of network not only needs to consider recent goal, but also needs to make space for expanding, so it needs unified plan and design. Constructing a modern network system, we should use advanced and mature technology and guarantee its advance in a relatively long time. The principles of LAN integration are as follows:

① Practicability principle: Network system should use mature and reliable technology and device to achieve practical, economic and efficient goal.

② Openness principle: Network system should use open standard and technology.

③ Reliability principle: Network system should ensure high reliability and high average of no fault time and low fault rate.

④ Security principle: Network system should have good security to ensure network system and data run safely.

⑤ Advance principle: Network system should use advanced technology and device to capture future development trend of network.

⑥ High efficiency principle: Network system should have high use rate of resource.

⑦ Expandability principle: Network system should have well expandability in scale and performance.

Network system should have high performance/low price, technology first, price second.

(2) Three work modes of LAN integration

Server-Based: also called "workstation/file server" structure, which is composed of several workstations connected with one or more file servers by LOC. Workstations store server file, and share storage devices.

① Client/Server: one or more larger computers which are called servers share management and access of database, and other application process work is distributed to other computers in the network, which composes a distributed process system.

② Peer-to-Peer: It is the same as server-based and C/S in topology. In peer-to-peer, there are no particular servers. Each workstation plays part as client or server.

(3) Network structure of LAN integration

According to construct goal of network system and integrating with current development state of network technology, LAN integration structure typically adopts star network structure with 100Mbps Fast Ethernet as backbone and 100Mbps switch to desktop.

Backbone connection takes on data switch of the whole computer network, so it must have good performance and high security and reliability. Backbone connection uses high performance backbone switch, which has 100M port and is used as fast connection with function servers and office buildings.

The second level of connection takes on data switch of each office building, each floor or office, and switches data through backbone switches and other second level switches. It uses 100M Ethernet switches with up band fiber and switches to desktop with 100M port by connecting backbone switches with fiber.

(4) Device choice of LAN integration

Switch is an important LAN interconnection device, which works in the second layer of ISO/OSI reference model, namely data link layer. The switch function of LAN switch and identification of MAC address tables are totally processed by their internal processor. There are currently two kinds of processors ASIC and RISC used in switch products of each network factory. The switch based on ASIC chip has less frames lost, shorter network delay, and is more stable than switch based on RISC chip.

There are basically two methods for switch to process the data package: cut-through and store-and-forward. The cut-through switch just reads destination address before data package is sent to network, thus making the shortest delay; the store-and-forward switch needs to verify input data package, which makes long delay but could remove error data package. Current first-class switch products could support both methods at the same time and automatically switch. If transmitted data packages have less errors, cut-through is used, otherwise

store-and-forward is used; if network is busy, cut-through is used, otherwise store-and-forward being used.

(5) Selection of LAN switch should follow the following principles

Supporting pure link switch and spanning tree algorithm, having fast backboard switch bus, large throughput of data package and stable structure.

Supporting many kinds of standard LAN protocols, standard network management and cut-through and store-and-forward data package processing methods.

Low drop rate of frame and small network delay.

Maintaining large numbers of MAC addresses in the bridge table.

Supporting virtual network, supporting module function, having enough Uplink insertion slots, appropriate cache size and performance/price for each port.

(6) Other devices and selection

Information jack: super five-class double-hole information jack supports fast transmission of voice and data, which is used for connection between device and horizontal subsystem.

Cable: upper five-class UTP is used in horizontal subsystem, which could support 622Mbps or even faster data transmission.

2. WAN integration

If prevalence of micro computers leads to the interaction among several computers and the LAN, prevalence of network leads to the development of WAN, realizing interaction communication and resource sharing in a wider range. The main difference between LAN and WAN is that the scale of WAN is lager, and the structure of WAN is more complicated, and WAN protocol is more diverse.

(1) Problems that WAN integration faces

How to connect two heterogeneous networks physically?

How to implement interaction and communication between two networks?

How to get rid of the differences between them on protocols?

How to handle the differences between speed and bandwidth?

(2) Methods of WAN integration

The main work is to solve the above problems in the process of WAN integration. Common components to coordinate and transmit are repeaters, bridge, router, gateway, and so on.

Repeaters: Repeaters are used to extend the network's distance when the transmission medium exceeds the net segment's length. They work in the physical layer without providing isolation function of net segments.

Special repeaters:

① Hub (multi-port repeaters): Hub is a device which accumulates communication lines with the star topology, which works in the physical layer just like a bus, and is the most popular device in the network. It can be divided into independent hub, modular hub, iterative hub and intellectual hub in terms of configuration.

Intellectual hub corrects the faults of general hub, adds the ability of bridge connection, gets rid of frames that do not belong to it, enlarges the frequency width of net segment, and has the abilities of network management and monitoring the speed of PC net card connected with port automatically.

② Switch: The destination address of switch Ethernet data package sends the ether-package from the source port to the destination port, theses ether-packages can be sent to different destination ports at the same time, to improve the actual throughput of network. Switch can create several transmission paths at the same time, so there will be obvious effect on the net segment connecting by many servers. It is mainly used to connect hub, server or distributed backbone network. It can be divided into straight switch and storage transportation in terms of technologies adopted.

③ Bridge: Filtration and transportation, study function, connection with different transmission media, without the capacity of route selection.

④ Router: It is a device to implement network interaction among many LAN and mediums, and is more complicated than bridge. Its major functions are grouping transportation, providing isolation, supporting spare network router and so on.

⑤ Gateway: Its major function is to change one protocol to another, or change one data format to another format, or change one speed to another speed, in order to match with each other and join two totally different networks. In Internet, gateway is a computer device which can decide whether to send out information user requested from the local network according to IP address of computer used by user, meanwhile, it can also receive information which outside sends to the local network computer.

The above devices should be used to solve the problem of integration flexibly when WAN is integrating. The appropriate WAN connection devices should be selected in terms of the current situation combining with different network structures, network devices, network protocols and network speeds in each LAN.

3. Integration of high speed network

Currently, the dominating backbone technology adopts KM Ethernet which provides ten times performance than the fast Ethernet, and is compatible with current 10/100 Ethernet standard. Meanwhile, the virtual network standard 802.1Q developed for 10/100/1000Mbps and priority standard 802.1p have been popularized, KM network has already been the major technology for the network backbone.

KM Ethernet will provide perfect transmission ways to properly protect investment on the network infrastructure.

Compared with previous solutions on the main network such as fast Ethernet, FDDI, ATM, KM Ethernet provides another reliable and economic method to improve the backbone connection between switches and connections between switch and server.

(1) Notes of high-speed network integration

High performance requirement of network system: Core switch satisfies the requirement of great capacity data switch, connection center's communication link bandwidth can satisfy performance requirement of network. Whether enterprise network, MAN or WAN, information applications are developing rapidly, new multimedia application and new data application raise higher requirements. According to the principles of designing enterprise LAN, first, it should be considered to satisfy the data switch capacity network scale demands of core devices and link bandwidth from edge device to the core.

High reliable and usable requirements of device in network need system integration. All the key components of core switch should implement redundant work and replace online, and the recovery time of fault can completes in second range interval. Multilevel fault tolerant design based on individual device reliability can improve usability of system further. When designing enterprise network, high-reliability and high-usability is vital, it is required not only because the components of device are redundant, but also because the links of network are redundant implementing with technologies in physical layer, link layer and the third layer, to guarantee network can provide information access service at any time and everywhere.

① Expansible requirement of network integration: It includes the expansible capacity of switch hardware and capacity of implementing new application.

② Flexible expansion requirement of core switch: The core switch should have flexible port expansion capacity, module expansion capacity to satisfy the expansion of network scale; meanwhile it improves performance to satisfy the requirements of higher performance. Capacities of supporting new application, products have the technology devices supporting new application to implement new application conveniently and fast.

When high-speed network is being integrated, first of all, requirements of network users of current scale should be satisfied, and then network should have the flexible expansion capacity of user port considering the expansion of business development and scale in future. When designing large-scale garden area network, distributed switch should be adopted to implement flexible expansion capacity of module and port.

(2) Security requirements of network integration

The security of network is vital to network design; reasonable network security control can make information resource in application environment protected effectively. In enterprise network, only system administrator can operate and control the key servers and the core network devices. Application client end only has the right of accessing sharing resource; network should avoid any illegal applications. Package filtration function based on protocol, Mac address and IP address could be carried on garden area network devices. Dividing virtual subnet on design of large scale network, on one hand can separate from lots of broadcast in subnet effectively, on the other hand, can isolate communications among

subnet to control access right of resource and improve security of network. Network security control capacity during designing garden area network must be emphasized to make network connected arbitrarily and control network access from the second or the third layer.

(3) Manageable requirement of network

Any device in the network can be controlled through network management platform; the device status of network and trouble warning can be controlled through network management platform, to simplify management work and improve efficiency of network management.

It is necessary to choose advanced network management software in network integration. The goal of network management is to implement zero-manage way and based on certain policies. The developing trend of network management software is network management interface, whose flexible operation methods simplify administrator's work. On the selection of network devices, it is demanded that network devices support standard network management protocol SNMP and RMON/RMON11, the core device should support RAP protocol to implement network management function properly. Manageability of device should be required when designing garden area network, meanwhile, advanced network management software can support functions of network maintenance, monitoring and configuration.

(4) Network devices adopt open technology and support standard protocols

Adopting standard protocols could protect user's investment and improve the interoperations of device. Devices used in network design should adopt standard protocols developed by dominating technologies, have good interoperation, support seamless connection and communication among different series of products in the same company or products in different companies. On the principles of designing campus network, special advanced technology in different companies should be exerted, meanwhile, it should emphasize the standard of technology and protocol, to decrease problems of devices interconnection and network maintenance, and effectively protect the user's investment.

It should be considered that whether the selected devices can be upgraded. After new standard appeared, system should upgrade to the new standard. Therefore, the position of company in products and technologys area and its capacity of participating in making up standard should be noted. In the modern world, the technologies of communication and computer change every day. Network integration not only should adapt to the development trend of new technology ensuring the advancement of system, but also consider the maturity on technology decreasing the risk brought by immature elements because of the new technology and new products.

Kilomega Ethernet has the advantage of bandwidth over other technologies, and still has developing space, reference standard organization are setting down the technology criterion and standard of 10G Ethernet network. Meanwhile, priority control mechanism and protocol standard based on Ethernet frame layer

and IP layer and various QoS supporting technology are coming to be mature gradually, providing basement for implementing applications requested better service quality. With the progress of optical fiber manufacture and transmission technology, transmission distance of kilomega Ethernet could reach hundreds of kilometers, making it a technology selection to construct MAN and WAN gradually.

New network technology and devices may provide better integration methods for high-speed network. We should master the principles of integration seizing new technologies and new specialties without routinism. We just remember points needed to be noted described above.

10.3 Integration of E-commerce Application System Software

10.3.1 Integration Mode of E-commerce Application System Software

Database replication may be the most popular integration pattern of enterprise application currently. Database replication which includes management of data copy for two or more databases usually leads to data redundancy. A company may need to adopt pattern of database replication in many aspects. Many companies take on distribution when operating and requiring multi-copying the same data distributed in different physical areas. Database replication is also necessary for recovering data. In many companies, generally there is a second active database to assist recovering data. If the main database is damaged and needs recovering, the second database will be used generally. So it is suitable for high-reliable system.

Database replication can be divided into two types: synchronous replication and asynchronous replication.

1. Synchronous replication

Synchronous replication represents that resource database must be totally consistent with the aim database. Its main goal is to ensure the real-time consistency of data among databases. In real operation, to ensure absolute consistency of data, some transaction process technologies need to be used. The use of transaction process monitor in synchronous replication is shown in Fig. 10.1.

Transaction must satisfy the ACID attributes which are atomic, consistent, isolated and durable as we are familiar with.

(1) Atomic: One transaction whether to be carried out entirely or not to be carried out at all. Partial results, which it carries out, should be cancelled when transaction is interrupted.

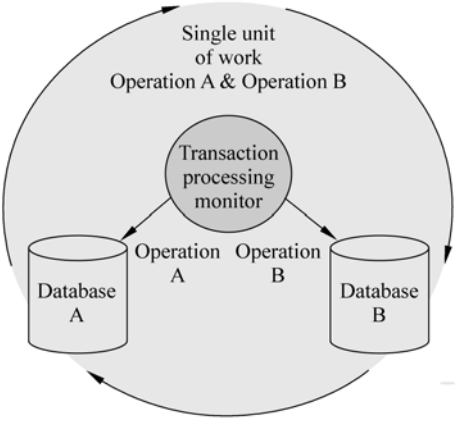

Figure 10.1 Synchronization replication using transaction process monitor

(2) Consistent: Transaction components or objects are transformed from one effective state to another.

(3) Isolated: An unfinished transaction cannot expose the results to other transactions before handling.

(4) Durable: Once a transaction is completed, the operation result of the transaction will never lose and is not related to trouble afterward.

Using transaction protocol to represent data agent of crossing database must be completed as a single work unit. The updating of discrete data in database A must be implemented in database B simultaneously. If the updating operation of database A is successful but the operation of database B is not, the updating of database A must roll back, two systems both recover to the backward consistent state. As described above, transaction can be completed by transaction processing monitor (TPM) in two systems. E.g. CICS(IBM) and Tuxedo(BEA).

2. Asynchronous replication

Demand for executing time of asynchronous replication is relatively loose. Time demand for all system is "in synchronous", or, consistency is a time measurement which can be observed. But it does not stand for the demand for maintaining transaction integrity is decreased. It still demands that transaction be the smallest work unit. Asynchronous information queue products such as MQ Series are often used to maintain transaction grammar as a part of replication process. They complete replication by using transaction queue which ensures data process will be completed only when original database inserts data package into queue and data package leaves queue to handle to the target database, data process will be completed.

(1) Single-Step Application Integration (SSAI)

Single-step application integration pattern is expansion of asynchronous database replication. Not concerning the consistency of data in two databases,

SSAI pattern integrates data in different applications from one context to another. By translating data grammar of original information, metadata is reformatted to new target information. So called single-step means an agency is needed to map the original information to target information. Typically, it is an expansion of asynchronous replication technology and use information queue middleware such as MQ Series. It generally uses uncomplicated FTP implementing in the form of batch. In this pattern, it transfers data from point A to point B not for consistency of data simply. Original data and target data are similar, if not; there is no problem, because the key point of SSAI pattern is application data integration rather than consistency of data. In Fig. 10.2 an example of SSAI pattern describes information A is transferred to information B directly.

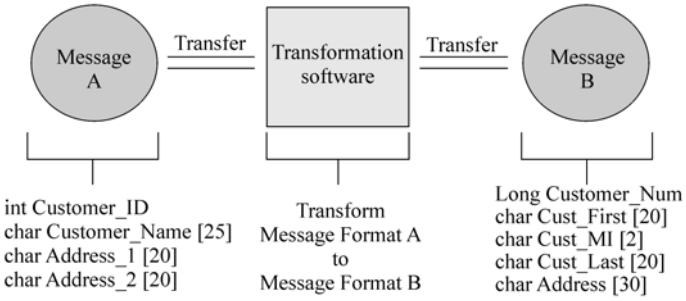

Figure 10.2 Single-step application integration

SSAI agency carries out single-step transformation which includes: translation, reformatting, mapping application of data regulation intellectually. The whole transaction is still point to point from the view of essence. Although integration of enterprise multi-application can be viewed as a series of point to point integrations, this is limited and it needs more flexible and complicated pattern.

(2) Multi-Step Application Integration (MSAI)

MSAI pattern is an expansion of SSAI pattern. It can complete integration of "n originals to m targets" applications. It is a many to many integration pattern providing sequential logical processing which cannot be provided by SSAI. In other words, in this pattern, handling process is sequential and the regulation adopted is Boolean logic. Just like single-step pattern, MSAI also needs an agency to transfer data among different applications, and it generally builds on a system based on an asynchronous transaction typically by using information queue middleware. Process methods based on asynchronous transaction create a little loose coupling. Every system is independent physically, but it depends on others logically, in other words, the independence exists in application events, which can be presented by transaction and data integration regulations. Data coming from an application could be forced to recover or handle information in another application.

Figure 10.3 describes a simplest multi-step integration example which includes three applications: information coming from application A combines with that coming from application B; information coming from application B is reformatted for the goal application C; metadata coming from application A is a key factor which leads to the request of information coming from application B.

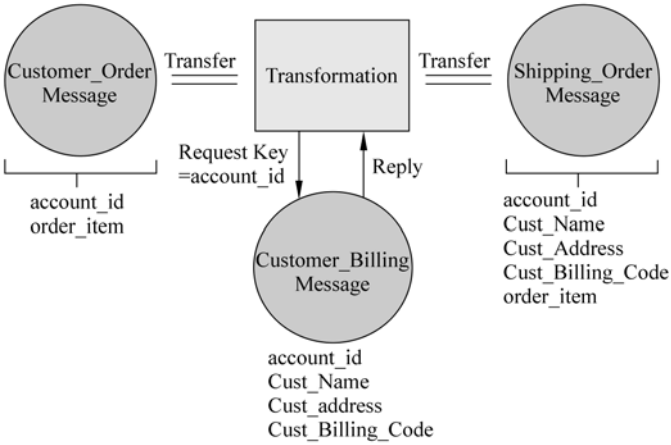

Figure 10.3 Multi-step application integration

In Fig. 10.3, metadata account_id which comes from information Customer-Order is a key metadata, and it drives a request of information Customer Billing. Metadata coming from the two pieces of information is combined and is formatted according to data conversion regulation, sending the information Shipping Order to Shipping and Distribution System. Even if in this example, you can see how the information Customer Billing generates logic dependence on information Customer Order. The last information Shipping Order is dependent on information metadata Customer Order and Customer Billing.

Of course, you may see many multi-step integration examples including many complicated variables. MSAI pattern which is an expansible and flexible pattern supports complicated application integration.

3. Brokering Application

In the integration process of e-commerce, it generally includes not just integration of data; what's more, it includes integration of business logic. Brokering application pattern integrates two or more applications by using middle application logic. It represents that client application codes contain logic of agent interaction. As an agency, client agent deals with requirements coming from different applications. As shown in Fig. 10.4.

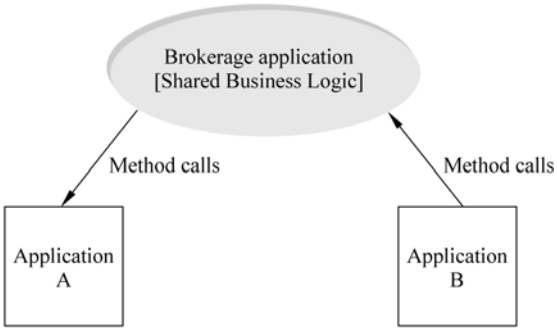

Figure 10.4 Agency application

This process pattern is especially suitable for the following circumstances.

(1) Applications needed to reuse logic

When two or more applications need to share or reuse public business logic, brokering application pattern is very effective. For instance, if application A contains business logic of specific computation and other applications can use the logic, you can write a length of middle client code to access logic coming from application A, and the middle agent application plays the role of agent server of application A.

(2) Applications linked by complex logic

Sometimes, logic binding multi-application cannot be described even using multi-step application integration pattern described above. For instance, MSAI can handle with connecting some applications by sequential logics, but it cannot deal with some very complex logics, such as truck schedule arithmetic in a truck company. It is demanded that client logic be a kind of service which other applications can take part in or be controlled directly.

(3) Applications unified through user interface

Although what we mention here are all concerning servers-middleware codes integrated by server, we should know, it is not all. Figure 10.6 displays that how two or more applications are integrated through a public user interface which is an important use of client agent application. Although user interface is usually a GUI, but, it is not necessary so.

The pattern is usually used in IT structure implemented by C/S. In the implementation of the pattern, connective client application is a fat client which is used to access multi-data or application.

Although the pattern demands a part of client logic be written, it is used widely, because many problems can be solved only in this pattern. It is necessary to use some technologies, such as server.

4. Application-to-application B2B

Integration scope of application-to-application B2B exceeds EAI, namely exceeds the scope of enterprise. We will introduce four B2B integration patterns next, but

they are not always the leading patterns. Application-to-application is the logistic expansion of EAI.

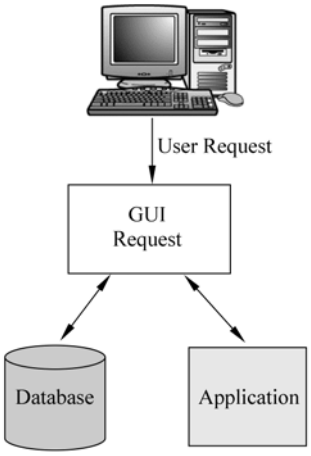

Figure 10.5 Integration driven by user interface

Application-to-application B2B generally includes that enterprise entities connect their applications to that of partner or clients. As shown in Fig. 10.6. This kind of integration is usually implemented as a part of supply chain in allusion to goods or service of client.

This chart does not represent that every application is absolutely public, but a subset of application data is public. As a part of supply chain, public application information connects with partner or clients.

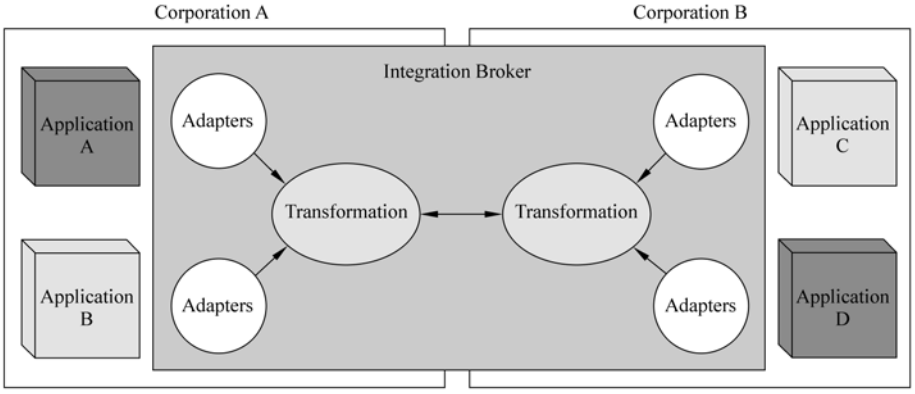

Figure 10.6 Application-to-application B2B

What are the essential differences between pattern and application integration in enterprise? In application integration inside the enterprise, multi-step application

integration or agent application pattern can be used, but application-to-application pattern includes integration of external enterprise rather than just integration of application, which is the fundamental difference from EAI. In the pattern, application uses direct entry to access an enterprise entity. The pattern also demands to use a public network such as Internet or a third-party network. The expansion of internal enterprise integration implies that a series of problems should be solved emphatically.

① Security

Security management should be strengthened because of the use of external network and collaboration of external entities. Trust layer must be created among cooperators, which means security methods should be implemented including authentication, discrimination, authorization, data encryption transmission and so on.

② Federated control

Federated control means that each partner entity can control data in its own integration environment independently and be perceived as part of integration environment simultaneously.

③ Systems management

Finally, it needs to manage the whole integration system well. It is very important to subscribe service protocol among cooperators to cooperate successfully in the long term. That means every participator ensures the reliability and maneuverability of applications.

(1) Data exchange B2B

The limitation of application-to-application B2B lies in complex implementation. The pattern demands every participant to process natural data of every application, which leads to bad expansibility of B2B mutual module. Therefore, an expansible B2B module is needed to make participants exchange data freely and almost not influence infrastructure of respective application system. Data exchange B2B pattern which is used widely in current B2B business world can make B2B exchange in the form of public data exchange format. Data exchange B2B is very effective, because its concept is very simple and it has been used for a long time. EDI produced in 1960's is the earliest data exchange B2B pattern, and it is forerunner on current Internet. B2B based on XML will rise gradually and highly improve B2B pattern based on Internet. As shown in Fig. 10.7, data package based on XML is transmitted between two enterprise entities by data exchange gateway service.

Main responsibilities of gateway service are to prepare data package and put it in a secure envelope. B2B gateway service supports security standards such as MIME, X.509 and S/Key, and it also takes charge of choosing path for data by a standard. Most B2B gateway service support many transmission options such as HTTPS, FTP and TCP/IP Sockets. Whatever, if you examine, you will see many B2B exchanges transmit XML documentation through a HTTP pipe currently.

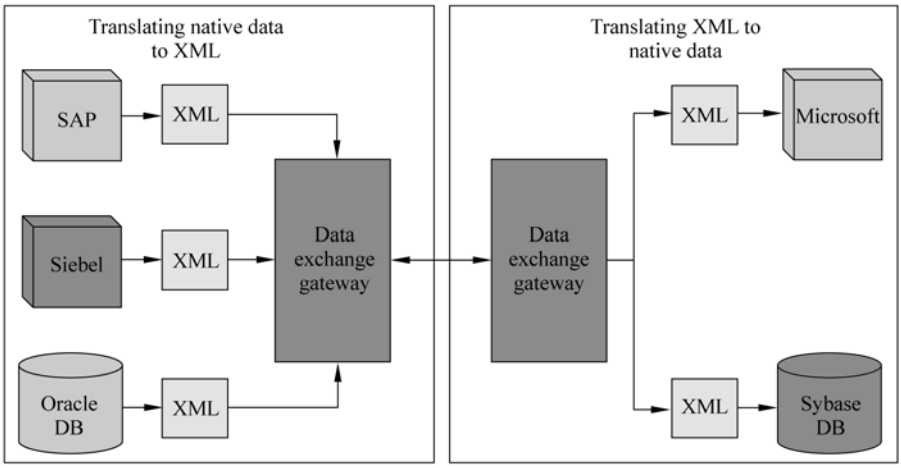

Figure 10.7 Data exchange B2B

The integration pattern still is point-to-point basically. The exchange of e-commerce enterprise is static. Many trade standards are appearing to define documentation context transmitted and make it public business process.

(2) B2B process integration

The limitation of point-to-point exchange pattern is that what it manages is static exchange.

B2B process integration pattern which makes up the shortage of data exchange B2B pattern imports Business Process Integration services mechanism. Just like data exchange B2B pattern allows participants to manage data exchange by XML documentation dynamically, B2B process integration pattern can do the same work, so, it can deal with process integration with more complicated relations among partners.

The implementation of B2B process integration patterns can be divided into two categories: Closed Process B2B and Open Process B2B. Both of them pay attention to the process, so they can be ranged to B2B process integration pattern.

(3) Closed process B2B

Closed Process B2B can be used in an organization managing internal process, whereas external key process only can be implemented by data exchange net. Each organization using BPI can monitor the states of enterprise process inside the enterprise. Referent enterprise activities are published to partners through data exchange gateway.

In Fig. 10.8, corporation A and corporation B both have already implemented BPI inside the corporation, but they both select not to explore the process to the outside. Therefore, the process between the two corporations has not been managed. A series of transaction processes in the two corporations are connected together by a public gateway of transaction event published.

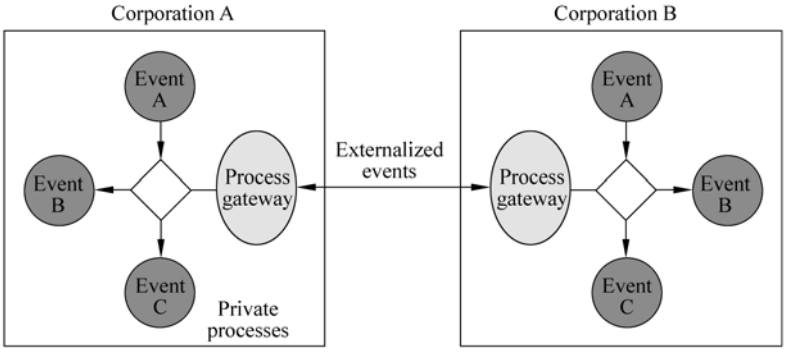

Figure 10.8 Closed process B2B

(4) Open process B2B

Open Process B2B creates the possibility of sharing process among multi-B2B corporation entities. Processes between two corporations can be managed by themselves simultaneously which demands BPI product implemented by two corporations. Process inside corporation remains as private process of the corporation to be managed and is confined to be visible inside the corporation. External B2B processes shared by two corporations can be managed as public processes.

The results can be represented in Fig. 10.9.

Open process B2B needs BPI solution to subdivide the management of public process and private process.

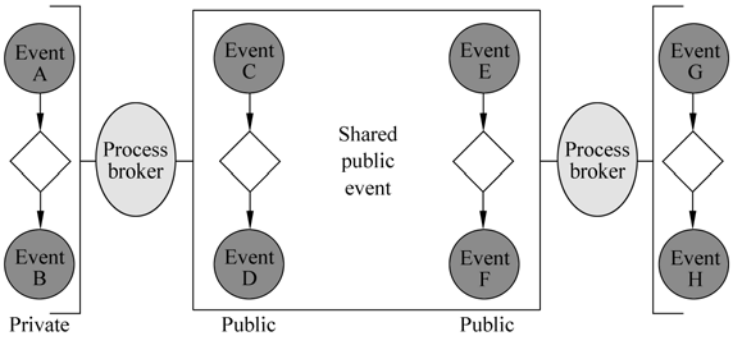

Figure 10.9 Open process B2B

10.3.2 Integration of Protocols

1. Security protocol of Internet

E-mail is the main information transformation method on Internet, and is also one of the main methods of e-commerce applications. But it does not have strong

security measures. Internet task group has drafted out referent criterion for security performance of e-mail.

(1) PEM: PEM which is the standard draft to improve privacy of Internet e-mail adds functions of encryption, authorization and secret key management, and allows to use public key and private key, supporting many encryption tools. Security measures such as encryption, authentication method, hash function and so on can be regulated on the head of each e-mail message. PEM is the informal standard to transmit security business e-mail through Internet. Concrete context about it can be referred to four files including RFC1421, RFC1422, RFC1423 and RFC1424 published by engineering task group. PEM may be replaced by S/MIME and PEM-MIME criterion.

(2) S/MIME: S/MIME (secure multi-function Internet e-mail expansion) is a protocol adding digital signature and encryption technologies based on Internet e-mail expansion message described by RFC1521. MIME is a formal Internet e-mail expansion standard format, but it does not provide any secure service function. The purpose of S/MIME is to define implementation method of security service measure on MIME. S/MIME has become widely accepted protocol in industry area, such as Microsoft Co., Netscape Co., Novel Co, and Lotus Co e.g.

(3) PEM-MIME: PEM-MIME (MOSS) (MIME object security service) is an e-mail security technology combining the characters of PEM and MIME.

2. Main secure protocol of Internet—SSL security protocol

Basic concept of SSL security protocol has been introduced above, the whole concept of SSL protocol can be summed up as: A protocol which guarantees transaction security between clients which has installed secure socket and server, referring all the TCP applications.

It should be illuminated that SSL security protocol which guarantees computer communication security protects the process of communication dialogue. For example, a client has connected with a host, first of all, handshake protocol should be initialized, and then SSL dialogue is built. Until the dialogue is over, SSL security protocol encrypts the whole communication process and examines the integrity. One dialogue is a handshake. Every connection in HTTP protocol is a handshake; therefore, comparing with HTTP, the communication efficiency of SSL security protocol is higher.

In the process of e-commerce trade, because of the participation of bank, according to the SSL protocol, the first purchasing information of client is sent to merchant, and then the merchant sends it to the bank, after the bank authenticates the validation of the client information, it notifies the merchant that the payment is successful, and then the merchant informs client that the purchase is successful and sends the goods to the client.

SSL security protocol is the earliest network security protocol used in e-commerce, and is used by many online shops currently. Of course, SSL protocol is improved partly according to the principles of mail order when it is

used. In traditional mail order activity, client firstly finds goods information, and then remits to merchant, later merchant sends goods to client. Here, merchant is trustworthy, so client could pay for the goods first. In the initial phase of e-commerce, merchant was worried about that the client does not pay after purchase or uses overdue credit card, so merchant hoped bank to give authentication. The production of SSL protocol appears under such background.

3. The second main security protocol of Internet—SET security protocol

To overcome the faults of SSL security protocol, satisfy the increasing security requirement in e-commerce trade, meet the requirement of trade and balance of cost and profit, VISA and other corporations such as MasterCard, Microsoft and IBM together set down Secure Electronic Transactions which is an open and based on electronic currency electronic payment system standard for online trade. SET adds the authentication of merchant's identity in the condition of reserving authentication of client's credit card, which is significant for trade needing currency payment. Because of reasonable design, SET protocol which gains support of many large corporations and customers has become the industry standard of global network, its trade modality will become future criterion of e-commerce.

Security electronic trade criterion provides a public standard for secure e-commerce on Internet. SET mainly uses electronic authentication technology, and its authentication process uses RSA and DES algorithm, which can provide strong secure protection of e-commerce. In fact, SET criterion which is the most important protocol in current e-commerce will improve the prosperity and development of e-commerce. SET will create a standard of using bank card securely to purchase on Internet. Secure electronic trade criterion which is a regulation providing security measures for electronic trade based on credit card is a secure electronic payment protocol widely used on Internet, and it also can expand the initial point of using credit card widely used from the current shops to customer's home, and then to PC of customers.

Because the delivery card company of credit card participates in establishing secure electronic trade criterion, generally speaking, authentication system of secure electronic trade criterion is valid. When a provider receives an order form signed by SET, he can ensure there is a legal credit card to support at the back of the order form, and then he can do the business without worry. Also, because of the safeguard of SET, client sending out order form can ensure that he is trading with an honest provider who gains the trust of the delivering card organizations, such as MasterCard or VISA .

4. Secure Hyper Text Transmission Protocol (SHTTP)

The encryption of secret key can guarantee security of exchange information transmission among Web sites. SHTTP which is generated by expanding security

characters and adding security to information of HTTP is based on SSL technology. The protocol provides security measures such as integrity, discrimination, so as not to disavow confidentiality for applications of Internet. At present, the protocol is drafting RFC out by Internet engineering task group.

5. Secure Transaction Technology (STT)

STT which is brought forward by Microsoft Company separates authentication from decryption in browser to improve security control capacity. Microsoft will adopt the technology in Internet Explorer.

6. UN/EDIFACT standard

Security measures in UN/EDIFACT standard which is the most important part of e-commerce are a technology widely used in the world to automatically exchange and handle business information and management information. UN/EDIFACT information is the only e-commerce standard universally used in the world. E-commerce on Internet has become an area which people increasingly pay attention to, and to ensure the security of e-commerce is the main task. Subordination of U.N.—UN/E-commerce E/WP4 which engages in developing UN/EDIFACT standard founded UN-SJWG in 1990 to take charge of investigating measures of implementing security in UN/EDIFACT standard. The investigation result of the work group will be published in the form of ISO standard UN/EDIFACT.

Governments and enterprises all over the world keep trying to solve the security problem of e-commerce further. But e-commerce security still has a lot of technology problems need to be solved; presently there are no satisfying results of security e-commerce on the following aspects.

(1) There is not integrated solution, module and architecture of e-commerce security.

(2) Although some systems are becoming standards gradually, there are only a few API.

(3) Most e-commerce systems are closed, namely they use particular technologies to support only some specific protocols and mechanisms. They usually need a CPU as a trustable third party of all the participants. Sometimes they need to use specific server or browser.

(4) Although most solutions use public key password, the attention paid on multi-side security is not enough at all, determination program solving dispute is not established.

(5) Anonymity and privacy of clients have not yet been considered fully.

(6) Most systems assume the relation between server of seller and browser of customer as principal and subordinate relation, this dissymmetrical relation restricts to what to carry out complicated protocols in these systems, and does not allow to directly trade among users.

(7) Most systems are restricted to be two-side, so it's hard to integrate a secure connection with a third-party.

(8) All the plans and products just consider to sell online, but multi-side trade issue (e.g. auction) and files exchange issue (e.g. sign contract, confirmable e-mail) are considered very little.

For the security of a country, some pivotal technologies particularly security theory and technology referenced in e-commerce should be developed independently. This shows that investigating security problem of e-commerce in our country not only has very important theoretical and practical value, but also has very important practice significance.

10.3.3 Application System Software Environment Integration

1. Integration based on C/S

C/S technology plays an important role in communication industry. Network computation has experienced the evolvement from computation based on host computers to C/S computation module.

Integration structure has been replaced by micro network based on PC gradually since 1980's. Adoption of PC and workstation changed the collaboration computation mode forever, leading to the appearance of dispersed PC module.

Network/file server computation mode is used to solve the sharing problem of data and device between individual PC and workstation. To share data in LAN, files have to be stored on file sever, and all users access data files through the center node which stored data file. The node also is backbone sharing external devices in LAN. But the internal design of network server computation mode does not provide appropriate service for multi-users' requests and applications of sharing data like mainframe. Network/file server computation mode does not provide the data parallel requested by multi-users, when a user blocks a file, other users cannot share the file; if many workstations request and send many files in LAN, network will quickly reach saturation status of information sending, making it a bottle-neck to decrease the performance of the whole network.

File server whose principal part is PC could not satisfy the requirements of distributed computation, whereas C/S technology just is a distributed computation pattern which accumulates advantages of large and middle scale systems and file server, having good system publicity and expansibility, namely finding an appropriate rightsizing. C/S computation mode defines how computers connect to the server to implement sharing of data and application, and data and applications are distributed to several processors using process capacity of computers. This pattern was used to share resource by work group and department.

There are three main components in integration of C/S system: database server, client application and network.

(1) Database server is effectively in charge of managing system resource, whose tasks are mainly: requirements of database security; parallel control of database access; overall data integrity regulation of client application on database front-end; backup and recovery of database.

(2) Application: In the process of application integration, the common method is to install different applications on server and client according to the different tasks between server and client, of course including the running environment installation of corresponding application.

(3) Network: Network integration has been introduced before; we won't discuss it any more here.

C/S system can provide higher performance than file server system, because client and server divide the process requests of application and implement the process requests together at the same time, so the requests of client program is implemented in distributed application process. Server manages data for several clients, and client program sending, requests and analyzes data received from server, which is a fat client and thin server pattern of network computation.

C/S guarantees the parallel of system, and reduces the data amount transmitted in network to the minimum, thereby improves the system performance. The advantage of C/S mode mainly lies in that client application and server components run on different computers respectively, and each server in system could fit for the requests of components, which represents adaptability and flexibility for changes of hardware and software, and is easy to expand or shrink the system. In C/S mode, function components in system are separated properly, that means client program integrates on display and analysis of data, whereas database server integrates management of data without coding for database for every new application development. It is a great saving to distribute large application process task to many low-cost computers connected with general network.

2. Integration based on B/S

To create WWW is to solve information transmission problem on Internet, before WWW, almost all information is transmitted by e-mail, FTP, Archie and Gopher. E-mail makes information switch among different groups and individuals widely. FTP is used to transfer file from one computer to another. Archie is used to search for various files on Internet, because information on Internet is distributed disheveled, which makes the information could not be found unless position of it can be known. It is doubtless a very important problem for people searching on the Internet. There is no information structure frame organized, so Internet could not exert fully.

Because of such-and-such restriction, a new platform-independent method needs to be developed to transmit information on the Internet. European particle physics lab in Switzerland Genovese developed HTML which evolves from a document format of SGML. HTML is a document representation language which

is easy to learn, use and transmit information on Internet, and it is easier to learn than SGML. TCP/IP which becomes HTTP later should be used, in order to transmit documentation on Internet. WWW appears along with HTTP and HTML. Web server transmits HTML file using HTTP, while Web browser searches HTML file using HTTP. Once Web server searches information, Web browser would display various objects in static status and mutual form (e.g. Text, image).

With the unification of text, image, video, sound and mutual form, WWW has been an effective way for information switch. With the help of WWW, we can browse all kinds of information resource, and easily transfer from one information resource to another through various super links. Integration of B/S system mainly refers to two aspects: integration of Web server hardware; integration of Web server software.

(1) Hardware selection of Web server

Before Web server software is installed and Web site is developed, many requirements should be confirmed, for example, selecting Internet connection and building server of Web site, bandwidth of Internet link and selected hardware, these elements are vital to the tasks that Web site can complete.

Generally, the biggest bottle-neck of Web site is the Internet link type. The first thing to build a Web site is to get a Internet connection, and apply a domain name simultaneously. The connection types of Internet are MODEM, LAN, ISDN, ADSL and DDN, generally MODEM provides the speed of 28.8k/33.6k which could not meet the needs of information publication and transmission, so it is advised to use ISDN method which can provide the speed of 64k/128k to meet the common needs of users. If ISDN method cannot be used for some reason, it is considered to use MODEM whose speed exceeds 28.8k. For the transmission speed of current MODEM rises fast, MODEM with 33.6k even 56k has been appeared, and the price is cheap, it is considered to use the high-speed MODEM.

After the connection of Internet is constructed appropriate hardware platform should be selected, which needed by Web site depends on the service provided by Web server. For general users, it is a practical method to construct Web server on Web platform based on Intel. Compared with Alpha, PowerPC server, Inter server is cheaper, and the manufacture technology of its CPU develops rapidly, at the same time the performance of Pentium Ⅱ CPU is almost the same to Alpha, so more and more sites have used Web server based on Intel processor recently.

Web server based on Intel platform currently adopts Windows NT OS whose interface is friendly, management is simple, user management mechanism is safe and convenient, this OS uses disk zone in the form of NTFS which is coverable file system to improve the security. When power has trouble and needs to recover system online, generally NTFS can rebuild disk roll and recover the system to consistent status in several seconds. Windows NT places IIS (Internet Information Server) inside; IIS is a set of mature Web server software, which integrates with Windows NT perfectly to provide an easy way to construct Web site.

(2) Selection of Web server software

Many Web servers can be used to construct Web site based on Windows NT. Different servers support different functions. Some principles should be noted when selecting Web servers. The most important one is how to make Web server easy to construct and manage. Security program provided by server should be noted when selecting Web servers. Web server must support CGI script. CGI script can make user interact with server by providing dynamic content and responding user's input timely. It should be guaranteed that Web server provides CGI script with CGI environment variable and supports embedded components which are special commands embedded in HTML file on server end. Before HTML is transmitted to Web browser, Web server processes these commands. Web server also should support log, which is useful for Web administrator understanding visit circumstance of website and making corresponding policy. The price issue is also a considerable aspect when selecting Web server.

Some functions should be taken into consideration when selecting Web server, as follows:

① Web server can generate log in the form of CERN/NCSA public log format.

② Server has the programs and tools for testing logs.

③ Server can be configured to forbid access by domain name and IP address.

④ Server can control access by requesting command based on user ID and user group.

⑤ Server can configure access to data based on IP address of user who accesses Web site.

⑥ Server supports embedded components on server end.

⑦ Server supports category browser.

⑧ CGI scripts can use all of the CGT environment variables

⑨ Server has internal database connection.

⑩ Server should be easy to construct and manage through GUI.

⑪ Server can be managed when running.

⑫ Server can be managed remotely.

⑬ Server can provide different root categories according to IP addresses of clients.

⑭ Server can pigeonhole the log automatically.

The reason why WWW is so popular is that it overcomes the defect of application which is used to publish information on Internet before Web browser came out. In the past, almost all the information on the Internet was character text format; information cannot be represented by many kinds of formats, which lead to difficulty on browsing and searching. Whereas information on WWW can have many formats, so it can be browsed and understood easily. For example, when discussing complex problems, we can use diagram, video editing and even interaction application rather than character text, making it easy to explain topic and make people know clearly. WWW integrates all the vision assistant effect to express information.

Because WWW is based on the B/S, it is platform-independent. Server is transparent for users who browse Web site. That is another reason for the success of WWW. Internet standard and protocol defined by CERN are not private standard, so anybody can implement Web server and Web browser which accords with Internet standard and regulations. The freeness and openness make some institutes (e.g. NCSA, Netscape and Microsoft) expand current Internet standard to meet the need of wider users of WWW.

Contrasting to other information publishing tools, WWW is very attractive for its low-cost and wide-coverage. In addition, to register a Web site by using various searching mechanisms and Web site sorting category database can make clients get needed information.

3. Integration based on distributed three-layer model

In e-commerce era, user application has appeared an ultimate change, traditional C/S pattern could not satisfy the demands of traditional enterprise, telecommunication and ISP application, and favoring and high efficient running of e-commerce needed to be divided again on the computation pattern. Many server manufacturers have already turned to construct three-layer e-commerce system for users.

Three-layer structure is generated in comparison to the host-end pattern or C/S pattern, its characters are that there is back-end data supporting server and there are many application servers in the terminals providing corresponding system solutions integrating with user transaction and concrete application, there are many access devices which connect with clients, as shown in Fig. 10.10.

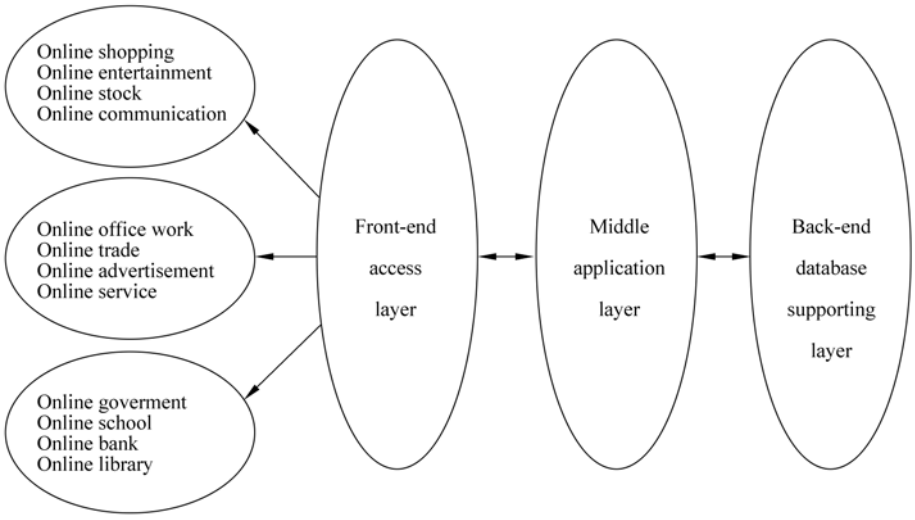

Figure 10.10 Three-layer application structure

In three-layer or N-layer C/S structure, middleware is the most important component. Middleware which is software layer defined by API is distributed software management frame, having powerful communication ability and good expansibility. Its function is to transmit data between client and server or server and server to implement the communication between client group and server group.

Many enterprises face the same problem when transferring the type of e-commerce, because of restriction of technology condition, so Client/Server structure is adopted. With the increasing of system and application, the number of servers increased from several to many even to hundred, resulting to mass of device management and disperses storage along with lots of problems. Therefore, user should begin early in IT construction in the future, along with the trend of technology development, which on one hand can improve running efficiency with the help of the best technology and product, on the other hand can avoid waste of substantive fund and human resource by updating devices. It is suggested that user consider the following elements when building e-commerce:

① Mark out to adopt three-layer architecture.

② System must have high usability and backup scheme.

③ System should have the load balance capacity.

④ System must implement storage and backup of data centrally.

⑤ System must have expansion ability online including storage and process abilities.

⑥ Enterprise must consider secure problem of data transaction.

After computation pattern is transformed to three-layer structure, the capacity of the whole system has been improved a lot, but still newer technology will be adopted with the change of user requirement. Three-layer structure includes: link service layer in the front-end, application service layer in the middle and database support service layer in the back-end.

Three-layer structure in the front-end should implement device function simplification, system standardization, device miniaturization and load balance. ISP and ASP can replace traditional towel servers with many machine frame servers, and the task of every server is very simple. For example, a Web server, which may be a standard device, can work like network device, which we usually see without displayer and keyboard.

In the middle transaction layer, standard development tools can be used to implement unification on many application structures, and implement high-usable application by module structure design. In the condition of not rewriting application, double-machine group system is generally used to ensure single point won't be disabled in the middle application layer.

Back-end database support layer is database and data integration storage system, which ensures that many kinds of data integrate in one data storage device and many servers read and write simultaneously to ensure data consistency. The database in the back-end needs to adopt high-performance database platform

to implement requirements of high-speed process of user data, centrality storage, integrity backup and so on.

The distributed three-layer system is composed of three parts on the view of software: gateway, load server and WWW server. From the point of view of hardware: several UNIX computers connected by TCP/IP network are OK. But if we consider on the view of load server, because there is no unified quota reflecting WWW response time now and machine performance of different architectures emphasizes differently, to make load data comparable, it is better to use computers with the same architecture. It's best to use totally same computers purchased in batch, dynamic load distribution in this circumstance is more reasonable and effective.

10.4 Summary

This chapter discusses how system integration technologies assist to build e-commerce system fast, securely and high-effectively under the modern e-commerce technology circumstance from the view of engineering. It introduces production, development and actuality of system integration and e-commerce; emphasizes on the methods and technologies of system integration; details the structure of e-commerce system and sorts of e-commerce; introduces components and referenced technology of e-commerce system from the point of view of composing e-commerce system; emphasizes on how to construct e-commerce system high-effectively and securely by using system integration technology in each component of e-commerce system.

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Part 5 E-commerce Application

11 E-commerce and International Trade

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Abstract The huge market demand for high quality paperwork processing in international trade gives the birth of e-commerce, and meanwhile, e-commerce brings a powerful momentum in promoting the development of international trade. E-commerce can promote international trade in several ways: decreasing the transaction cost, improving the trade quality and efficiency, increasing trade opportunity, supplying new trade means. However, these advantages are not unsolicited, and an essential question of "how to employ them properly" is still needed to be answered.

The purpose of this chapter is concerning how to fully utilize the e-commerce to promote the development of international trade with focus on the relation between e-commerce and international trade, the applications of e-commerce under international trade environment, network marketing of e-commerce and the design of international trade e-commerce system.

Key Words e-commerce, international trade, technology trade, service trade, network marketing, EDI, e-commerce system design.

The rapid development of information technology, especially the network technology and the globalization of the Internet, has brought us into a new era. A new trade way, online trade which breakthroughs the limitation of time and space of traditional trade, comes into being. It completely differs from the conventional way. In the next few years, the Internet, which offers tremendous potential commercial opportunity, will become the largest market of the world. The birth and growth of e-commerce has brought a far-reaching impact on the international trade and some new problems arise, such as the problems of how to impose duties on the online transactions, how to guarantee the security of online transactions, how to breakthrough the requirement of writing evidence required by law, how to verify

a signature, how to transfer an electronic Bill of Lading, etc.. The solving of these problems will directly promote the online transaction. Yet, since the laws always lag behind, the conventional laws have not been renewed for this new transaction, resulting in that many law problems derived from online transaction cannot be settled with traditional law. In addition, many merchants give up investing in this field without the support of laws, which in turn restrains the rapid development of online transactions. Therefore, it is necessary to strengthen the study of this new trade way and establish relevant law frame to rule e-commerce. This not only can protect the interests of all parties in the e-commerce, but also will ensure the successful execution of e-commerce.

In this chapter, we focus on three topics: the relationship between e-commerce and the international trade, the application of the e-commerce technology to the international trade, and the design of international trade e-commerce system.

11.1 E-commerce and International Trade

The development of the international trade calls for the occurrence of e-commerce, and e-commerce has enormous reaction on the international trade. It will promote the further development of the international trade. E-commerce has been widely applied and become a mature method of transaction in the developed countries while it is only beginning in China. So we should fully understand the reaction of e-commerce on the international trade, and speed up e-commerce applications in the international trade in China.

11.1.1 The International Trade Calls for the Emergence of E-commerce

The commodity economy law requires that economic resource should be optimally allocated all over the world to achieve largest benefit from the limited resource. Different socio-economic conditions such as the development level of science and technology, productivity and the size of domestic market etc., and different natural resource such as the climate, the soil condition, mineral resources, and the geographic location etc., all result in varying production costs in different countries. Adam Smith, the founder of the classical school of capitalist politics and economics, believes that every country will be advantageous in producing certain commodities according to its own socio-economic conditions and natural resource. Each country will benefit from specializing in certain products according to their advantageous production conditions and exchanging with other countries. This division of production and exchange of commodities will lead to the most effective use of a country's resources, human resources and capital on a global scale. For example, it is stupid for people in Scotland to pay 30 times the price as

that of French producing the same quality of good wine. The capitalist economists have long regarded this theory put forward by Adam Smith as the "Bible". Many countries, following the absolute cost theory of Adam Smith or the comparative cost theory of David Ricardo, have been developing their own advantageous commodities and foreign trade, and further promote the rapid development of international trade and the world economy. The international trade has become an engine that promotes the growth of world economy. Since the World War Ⅱ, the international trade grows much faster than the world economy (growth speed compared in Table 11.1).

Table 11.1 Index of international trade and economic growth

year / index	1950	1955	1960	1965	1970	1975	1980	1985	1990	1993	1994
International trade	100	148	210	310	476	605	776	862	1157	1295	1360
World economy	100	129	155	203	263	318	387	442	516	539	563

China follows this rule as well since the beginning of reforming and opening up to the outside world in 1980's (the detailed information showed in Table 11.2). China's foreign trade growth is much greater than that of its economy. China's import and export volume has reached USD2174 billions, and customs duty has reached RMB758 billions. Foreign trade contributes 3 – 4% to the economic growth. Rapid increase of international trade makes the traditional trade documents and files proliferate. It is estimated that 30 – 50 kinds of documents are needed to finish a transaction. The original and copy of these documents amount to 360, and some of them are shown in Table 11.2.

Table 11.2 Documents applied in international trade

No.	Name of documents
1	Contract (Contract, Sales Confirmation, Purchase Confirmation)
2	Order (Sometimes serves as contract and sometimes attached to a contract listing the detailed information of specifications, and assortment etc.)
3	Commercial Invoice
4	Bank Draft
5	Advice of Payment
6	Letter of Credit
7	Export Customs declaration Form
8	Packing List
9	Application for Export (seldom used now)
10	Application for Foreign Exchange control declaration (seldom used now)
11	Bill of Lading (Marine Bill of Lading, Multimode Transport Bill of Lading, Airway Bill, FIATA Bill of Lading)

Continued

No.	Name of documents
12	Cargo Receipt
13	Receipt (Postal Receipt, Express Mail Receipt, Express Delivery Receipt)
14	Customs Invoice (Canada, America, New Zealand, the Caribbean Area, the Western Africa, Jamaica)
15	Insurance Policy (Insurance Policy, Insurance Certificate, Insurance Endorsement, Insurance Certificate)
16	Certificate of Origin issued by manufacturer
17	Certificate of Origin (China Council for the Promotion of International Trade, Import and Export Commodity Inspection Bureau of the People's Republic of China, Chamber of Commerce)
18	Application for GSP Certificate of Origin
19	GSP Certificate of Origin Form-A
20	Certificate of Origin for Textiles Exported to the EEC
21	Inspection Certificate of Quality
22	Inspection Certificate of Weight
23	Certificate of Quarantine
24	Export License
25	Import License
26	Export License/Commercial Invoice for Textiles Exported to the US
27	Export License for Textiles Exported to EEC, Canada, Finland and Sweden
28	Certificate of shipping sample
29	Shipping Advice

In the process of traditional trade, all these documents are manually processed, thus cost enterprise too much energy, money, manpower with low efficiency and high error possibility. Figure 11.1 offers the procedures of the manual process of the documents in the traditional trade, from which we can find it is really complicated to do this job. Moreover, we have not taken into account the time needed for the documents to be dealt with by the government and finance organizations concerned, such as the Customs, banks, commodity inspection and foreign exchange control. A great amount of energy, time and money are required for the documentation and process of these documents.

Thus importers, exporters, suppliers, consumers, multinational companies and their branches exigently need computers to speed up the handling and transfer speed of documents and files, shorten the space span, time span, and improve the correctness. "Paperless" commercial transactions have become the common request of all the trading partners.

During the process of various commercial documents being processed by computers, it is found that 70% of the data of trading partners need to be deal with is repetitive. Unfortunately, these data cannot be exchanged directly through the network. The data need to be input and output repeatedly on different computers. The repeated input and output of the data waste large amounts of

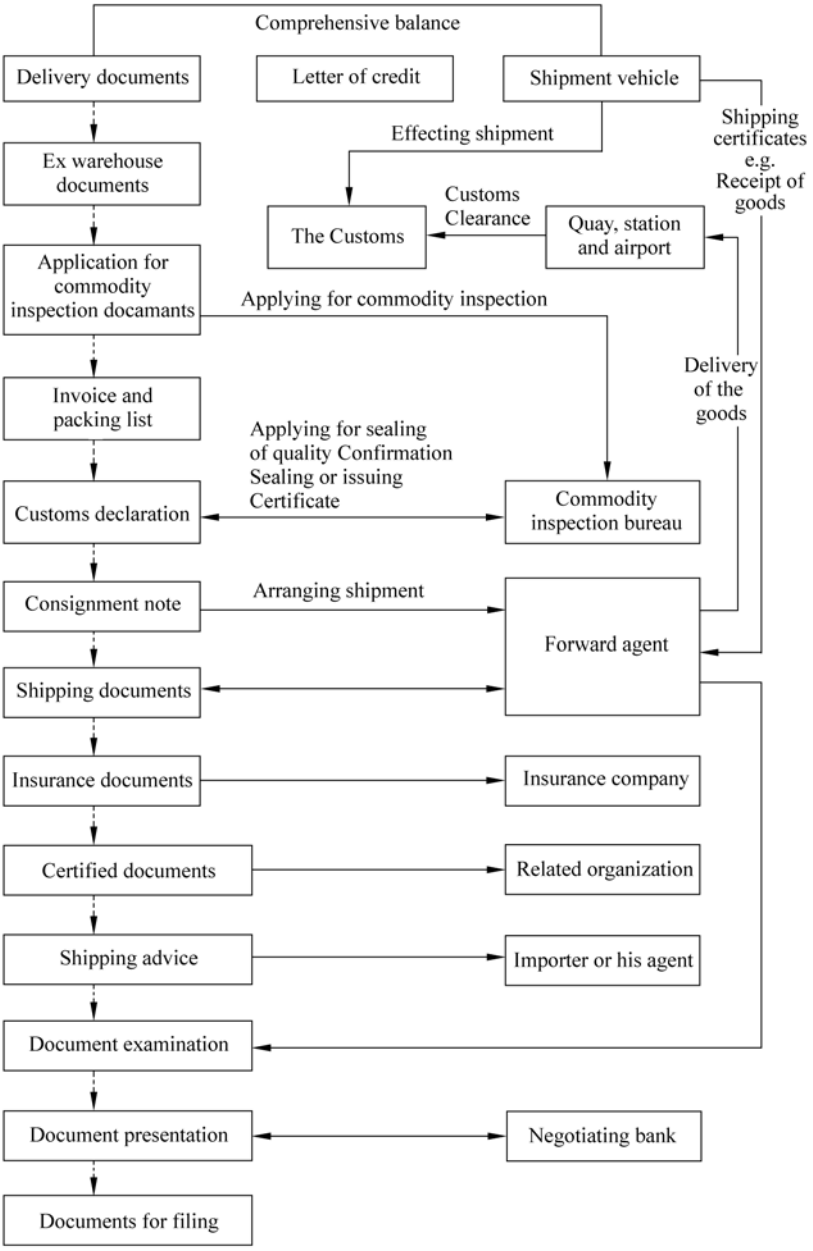
Comprehensive balance
Delivery documents
Letter of credit
Shipment vehicle
Effecting shipment
Shipping certificates e.g. Receipt of goods
Ex warehouse documents
Customs Clearance
The Customs
Quay, station and airport
Application for commodity inspection docamants
Applying for commodity inspection
Delivery of the goods
Invoice and packing list
Applying for sealing of quality Confirmation Sealing or issuing Certificate
Customs declaration
Commodity inspection bureau
Consignment note
Arranging shipment
Forward agent
Shipping documents
Insurance documents
Insurance company
Certified documents
Related organization
Shipping advice
Importer or his agent
Document examination
Document presentation
Negotiating bank
Documents for filing

Figure 11.1

manpower and time, and overfull artificial factors make the date less accurate and business less effective. Therefore, people began to try the automatic exchange of commercial data between the computers of the trading partners and this resulted in the emergence of Electronic Data Interchange (EDI), the elementary stage of e-commerce. EDI, as the origin of e-commerce, came into being in the 1960s.

In the late 1980s, EDI has been widespread in the developed countries and further driven by Value-added network services. The application of EDI has made document processing more accurate, effective and economic, which greatly promoted the growth of the international trade and displayed great advantage and good vitality. However, the use of EDI-based e-commerce has been restricted by massive investment on EDI communication systems and high cost of using the VAN. In addition, EDI cannot realize the sharing of information and is comparatively suitable for the large multinationals between which large numbers of documents are exchanged. As the information sharing requirement of multinational companies increase, and medium and small long for EDI, establishing a new kind of electronic information exchanging system that can realize information sharing with low cost is exigently needed.

The increasing popularity of the Internet over the world has speed up the development of the Internet-based e-commerce since the 1990s. With great potential applications, it not only is low-cost, but also realizes the sharing of information. With the development of the information technology and the widening of its application, electronic commerce also finds wider application in the world.

In the 1990s, commercial activities, which had long been excluded by the Internet, appeared on the Internet. The application of the Internet in commerce became the hottest issue and pushed the development of the Internet. The Internet keeps the advantages of EDI and made up the shortcomings of it with low cost and the ability to share information. So the e-commerce based on the Internet displayed great vitality and potential for application since its birth and it is developing with geometrical series more than anyone anticipated. It is estimated that e-commerce would sweep the whole world along with evolution of the international trade.

11.1.2 E-commerce Promotes the Development of the International Trade

E-commerce occurred to meet the demand of international trade, and it has taken a tremendous reaction to the international trade. In other words, e-commerce provides technological support for high quality and efficiency of the international trade; this can be showed in the following aspects:

(1) Reducing transaction costs: E-commerce makes it unnecessary to maintain a necessary office space, and makes the stock keep as least as possible. E-commerce can greatly decrease the labor cost by reducing the number of staff involved in

the paperwork, declaration of exported goods, settlement of foreign exchange, commodity inspection, after-sales service and other non-direct trade links. Furthermore, trade negotiation and information collection and exchange are all carried out through the Internet. This means of communication is not only faster but almost costless compared with traditional means such as telegram, telephone, fax and so on. Trading online saved the traveling and accommodation costs and investment of trading facilities in the traditional trade and greatly reduced the expenses for business travels and negotiations. This is the basic reason why e-commerce develops so quickly and is widely used in international trade. It is estimated that 40% of distribution cost can be reduced by e-commerce, or even up to 70% for some enterprises. For example, in software exports, the cost of every transaction is only 0.2 dollars through electronic means compared with 5 dollars by telephone, and 15 dollars through traditional retail transactions.

(2) Improving trade quality: All the people engaged in the international trade find it troublesome to handle the complicated and rigor documents. While under e-commerce conditions, all documents are produced automatically by e-commerce systems according to the contract and the letter of credit, and they are made consistent, complete and tidy.

(3) Improving trade efficiency: For the full set of documents can be produced effectively by e-commerce systems, and the paperwork speed of e-commerce is much higher than that of human power. E-commerce can also speed up all the trade process, including information collecting, negotiating, customs declaration, communication etc. In some countries, such as the United States, encourage the adoption of e-commerce technology for American trade by giving priority in handling import and export using e-commerce. So the trade efficiency can be improved greatly.

E-commerce enables the enterprises to communicate with customers at any time, get to know the customers' demand for products and services and adjust themselves to the customers' needs, which can improve the quality and efficiency of trade.

E-commerce offers a new approach and driving force for the development of the international trade. The rapid growth of e-commerce has changed the traditional way of international trade, and has had a far-reaching impact on the development of the world economy. It will become the major motive power for economic growth.

(4) Increasing trade opportunities: By dramatically shortening the marketing channel between the exporters and end-users, e-commerce enables the exporters to sell their products at lower prices and enter the target market easily instead of dealing with the traditional importers, wholesalers and distributors. Meanwhile, through e-commerce, first-hand business information of international market can be found so fast that enterprises can get in touch with their customers to understand their needs and the needs of the international market in order to adjust their production strategy to the ever-changing market conditions in time. In this way

they can obtain more trading opportunities, make more profits and avoid unnecessary losses.

(5) Providing a new trade means: E-commerce enables enterprises to provide 24-hour product information and services without the limitation of time and space, and then enhance market competitiveness greatly. For instance, General Electric Company of America saves 2 billion dollars annually by initiating the online purchasing system, automatically contacting customers, harmonizing business online. A similar case appears in Hewlett-Packard, which saves 8 million dollars every month by using the Internet, and the end-users can enjoy 24-hour real time service. By surfing on the Internet, the enterprises can contact the overseas end-users directly and shorten the complicated trading channel and therefore improves the competitiveness of their products. According to the estimation of the World Trade Organization, if all the international trade are shifted to the Internet, the cost saved will be up to 100 billion dollars. Moreover, 7×24-hour business model of e-commerce makes enterprises be able to receive orders and marketing at anytime, makes it possible for enterprises to obtain more business opportunities and compete in the market equally regardless of their size of capital and scale.

Finally, e-commerce promotes the development of the service industry, and makes many seeming impossible things come true. For example, staying home, we can enjoy the financial services, health and medical services, investment advisory services, and educational services provided by companies in any other country.

11.1.3 E-commerce Brings about Changes to the International Trade

It is predicted by the World Trade Organization that by 2006, the international trade through the Internet may account for 30% – 40% of total world trade. To 2008 this ratio may reach 60%.

In the United States, 95% of enterprises take e-commerce as their major means of trade, and 85% of new business relationship is established through e-commerce. Currently, most countries consider e-commerce as an important approach to developing import and export trade, widening the application of information technology in their local enterprises and actively exploiting the international trade market. The major trading countries like the United States, the EU, Japan, Southeast Asian countries and China's Hong Kong etc., are promoting the active use of e-commerce in the international trade, and it will gradually occupy a dominant position in international business and social life.

Ministry of Commerce has worked out the 11th Five-Year period Plan for China's e-commerce project in the field of the international trade, which mainly concentrates on the following aspects:

(1) Constructing international trade network center project of the ministry. It

includes the constructing of network servers, high-speed Internet, international and domestic main network lines, user access facilities, structured cabling system and demonstration systems. Its construction should reach the advanced international standard.

(2) Speeding up the construction of remote synchronous network, completing and initiating the back-up system of the specialized foreign trade and economy network.

(3) Speeding up the construction of Chinese economy and foreign trade network.

(4) Enhancing the research of electronic commerce technology.

(5) Although e-commerce and traditional trade coexist at present, it is doubtless, as the effort of information endeavor, that an era of virtual reality characterized by "PC" plus "mouse" will arrive in the near future, and the businessman in international commerce will say goodbye to the age of doing business using paper, pen and fax, and the age of doing business with fixed concrete building together with traveling around the world by plane and train. A businessman can do business with the people all over the world by just clicking the mouse at home. A big transaction can through e-commerce happen at anytime anywhere. It may happen late at night or early in the morning. The limit of time and locations in international trade will be broken through.

In the process of a traditional trade, foreign trade workers must engage themselves in the arrangement of production, paperwork, shipment, commodity inspection, customs declaration and so on which require careful attendance instead of innovation. The e-commerce system can free people from that half-intellectual and half-manual work, enable them to focus on the more challenging, innovative work such as collection and processing of information and business negotiations, and it can finish these works better and faster. E-commerce can create more trade opportunity and make more profit. Although sounding amazing, this is not far away, since some people have already started making money through the paperless transactions with e-commerce. We should take a serious consideration of what we can do in this e-commerce era at the beginning of this new century.

11.2 Applying E-commerce to International Trade

Here we stress in the aspects in which we can use e-commerce to reduce the work load and trading costs, and achieve a higher trade efficiency and service quality, and therefore enhance the overall competitiveness of the enterprises and the ability to make profits, bring about the substantial increase in the export of our country and more rapid growth of the national economy, and at the same time set the exact direction of the application of e-commerce in the enterprises.

11.2.1 Using E-commerce Technology to Obtain Commercial Information

Applications in information obtaining: In e-commerce, trading personnel will be free from the heavy work of preparing goods, arranging shipping, paperwork, and other work, and can focus on collecting, analyzing, making use of relative information and negotiating. Therefore, the international trade staffs are mainly concerned with the question of how to use e-commerce to collect relative international trade information. e-commerce can be used in following way to obtain relative international trade information:

Firstly, if one knows where the information is, he/she can directly type the domain name (Web address) or IP address in the address bar of an Internet browser such as Netscape or Internet Explorer to get the related information.

Secondly, if one does not know where the information is, he/she can fill a key word of the information in the search box of any search engine such as Yahoo, Google, BAIDU, SOHU etc, and then just click the search button to search the relevant information.

Thirdly, one can also join relevant USENET or mail list to obtain some information.

One can also use the data mining module of e-commerce system to get relevant information, and use the intelligent problem processing module to filter, process, and refine information from obtained information to assistant his/her decision making.

Applications in negotiation: Negotiation is a very complicated, challenging and creative process involving a variety of factors. E-commerce system cannot play a great role in this part, but mainly provides useful information helping negotiation.

For example, a company engaged in garment export trade receives from a client an inquiry of 100,000 shirts at price of CIF OSAKA USD5.25/PC, with detailed style, size, fabric specification, color, packing, and shipment date. Assume that all the necessary information of this example can be found in the database of the e-commerce system. Then the e-commerce system will query the database to get the historic transaction price with this client that comes from contract database, the price of fabric that comes from commercial resource database, and the price of accessories such as button, lining, thread, paper card, inner box, carton, freight etc that also comes from commercial resource database, and then call the intelligent problem processing module to calculate a reasonable price of the shirt for the reference of businessman. If the majority of these data are not available, then e-commerce systems will provide related correlative information for reference. At the same time, they can use the security mechanism provided by the e-commerce system to negotiate through the Internet. The confidentiality of negotiating information can be guaranteed, communication costs can be reduced and the efficiency of trade negotiations be improved.

11.2.2 Using E-commerce in the Business Negotiation

1. Applications in preparing goods

An example will be taken to show how to use e-commerce to help business. Taking a company engaged in garment export as an example, if the businessman in an import and export corporation, through repeated negotiation with customer, signed following contract (only the main terms are listed, general terms and conditions are omitted):

```
COTTON SHIRT: 50,000 PCS (fabric specification 21×21 / 69×61)
SIZE ASSORTMENT: S/M/L/XL=2/4/4/2
PRICE: CIF NY USD7.00/PC  TOTAL AMOUNT USD350, 000.00
PACKING: 1PC (WITH PAPER CARD) /POLYBAG AND INNERBOX, 12 INNRBOX /CARTON
SHIPMENT DATE: MAR.2002
INSURANCE: TO BE COVERED BY SELLER FOR ALL RISKS
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If these export shirts are produced in the international trading company, e-commerce system will calculate the amount of fabric and accessories (buttons, lining, thread, bottom plate for packing, inner box, cartons) needed to execute the contract and corresponding shipment date, find out in the database the suppliers of these fabrics and accessories, and place orders (containing quantity, price, quality, packaging, delivery date) with the suppliers in time by means of the Supply Chain Management System. The e-commerce system will make special arrangements for delivery of the fabrics and accessories ordered so that it will not affect the normal production on one hand and the goods will not be delivered too early to avoid the occupation of capital and storage space and therefore the costs are reduced. Production can be arranged through the ERP system, so that the productive resources can be most reasonably and effectively used.

If the export goods are bought from suppliers, the e-commerce system will chose, according to the quality, cost, shipment date, credit of suppliers, one or two suppliers to place orders (including detailed instructions on the product, quantity, specifications, packaging, shipment date, Sales packing, shipping marks, inspection organization and its certificate of inspection).

2. Applications in inspection

The main applications in inspection include making certificate of inspection, quality inspection reports, automatic data interchange with inspection institutes such as Inspection and Quarantine Bureau for imported and exported commodities, Inspection companies, or foreign commodity inspection agencies to fix the time for inspection or quarantine. If the contract stipulates the commodity should be inspected by the importer (or the inspection agency appointed by him), the e-commerce system will notify the importer to inspect or authorize an inspection agency to inspect the commodity in factory at fixed time.

3. Applications in the delivery

E-commerce system can provide cargo name, quantity, volume, weight, packing size of each piece of cargos and shipping notice to the shipping companies in time, in order to charter a vessel or book space and arrange the domestic transport so that the shipping capacity can be effectively utilized, various transportation tools can be timely linked up, and costs be lower.

4. Applications in the covering insurance and customs declaration

E-commerce system is able to, according to the production of goods, the vessel chartered and space booked and the coverage stipulated in the contract, arrange insurance in advance or on time and automatically produce an electronic form of insurance policy online. Also, it can automatically connect the customs declaration system in order for the Customs to accept automatically export declarations. After the goods are loaded on board the vessel, it will send the customer a shipping advice automatically.

5. Applications in obtaining export licenses

E-commerce system is able to provide the information to foreign trade management institution and apply the export quotas and export licenses in the electronic form in accordance with administrative policies for commodity exports. In 1998, former Ministry of Foreign Trade and Economic Cooperation declared that since 2000 it will no longer accepts the traditional quota applying and the quota tendering. It only accepts application for quota and tender online, which greatly pushes forward the development of e-commerce in international trading enterprises and improves the efficiency of the application and issuance of licenses. Meanwhile, the international trade enterprises can exchange data and share information with the international trade administrative organization through e-commerce and keep informed of the use of quotas and issuance of a license.

6. Applications in export rebates

Tax bureau can directly inquiry the actual amount of exports through e-commerce systems, and enterprises can apply for export tax rebates timely instead of waiting for a long period of time rush about between tax bureau and themselves, thereby capital invested and business costs are reduced.

7. Applications in export paperwork

E-commerce system can produce all the documents in written or electronic form according to contracts and letters of credit and automatically make settlement with the bank. This is the most significant role of the e-commerce system.

The automatic realization of the above aspects frees people from rushing among the insurance companies, Customs, commodity inspection and quarantine

departments and foreign trade administrative departments, and reduces errors and costs, improves efficiency and saves a lot of labor and financial resources.

These applications must be advanced step by step. The successful use of e-commerce can save 70% of the time of business man and more than 50% of its operating costs, and improve trade efficiency by 200%. A Company can expand its trade several times by using e-commerce.

11.2.3 Application in the Technology and Service Trade

1. Applications in the international technology trade

Technology is the systematic knowledge that is used to manufacture products and provide services. Technology can take the tangible form of words, language, forms, data, formula or ingredient, and it can also take the intangible form of practical experience, personal skills or ideas in people's mind. Technology can be taught, and can be used to bring about certain economic benefits. Technology cannot be restrained by the physiological characteristics of individuals. As the object of technology transferred (including text, language, forms, data and formula etc.) is very suitable for e-commerce transactions over the Internet, the international technology transfer will be the first field in international trade to enter the era of e-commerce. Particularly because of the development of multimedia technology and virtual reality technology, without going abroad, the two sides in the transaction will be able to carry out the "overseas" investigation, trade negotiations, technology submission and technical training. The whole process of the international technology trade can be fulfilled online. E-commerce can greatly save transaction costs and improve the efficiency of technical trade. This will promote more rapid development of the international technology trade.

2. Application in the international service trade

E-commerce makes many formerly impossible services possible; this is mainly reflected in the services provided by the service enterprises. For example, the international information service (including international technology and management consulting services-such as engineering consultation, law consultation and financial service etc.), the international expert services (such as those in education, health care, financial expert service) can all be "delivered" through the information network. People will provide services to audiences around the world by staying at home. On the contrary, fundamental changes have taken place in the means of accepting services. Instead of accepting services face-to-face or through the traditional postal system and telephone system, people can now obtain the services they need through multimedia technology or they can also take the initiative to ask for services. They may click the mouse to log on the home page of the service provider to download and share the software and

information needed. It is one form of the service trade since all the services are obtained as long as the consumers pay in advance. Owing to the communications and information technology improvements, a number of technical consulting firms in the United States have achieved a tremendous amount of trade surplus. In this way, real-time service can be obtained without traveling a long-distance, paying expensive cost and waiting for long.

3. Applications in international financial trade

Internet bank has been possible and it has changed the mode of operation and competition among banks radically. Internet bank breaks through the business mode of business halls and branches, made of reinforced concrete, that are limited by space and time. Customers can now log into the Internet bank through any Internet access and enjoy the "24 × 7 service" (i.e., nonstop service of 24 hours a day and 7 days a week,). The content and quality of service, innovation will determine competitive position of Internet bank instead of the size in the past.

Internet bank makes low-cost, high-efficiency possible, and provides new tools for bank to improve traditional bank's competitive ability and profit ability. The Internet banks do not need huge physical buildings or many workers; all its business activities are carried out through computers and the Internet. Paperless operation will greatly reduce the operating cost of banks (It is estimated that the operating costs of telephone banking transaction is 10% of the costs of the traditional means of transactions, and that of the online banking is only 10% of the telephone transactions.). Since the Internet is featured by its connecting all corners of the world with fast transmission of information. Funds to be transmitted en route can be reduced to almost zero. Internet bank can improve the economic efficiency of the social system. On the other hand, making full use of the unique advantage of the Internet, Internet banks can collect as much information as possible, improve risk management and enhance decision-making efficiency, thereby enhancing their competitive edge.

Internet banks can establish a "seamless" customer contact environment. The development of IT and popularization of Internet has made it possible for the IT enterprises and not-banking financial institutions to gradually enter into the banking industry and seize the market shares of the banks. Under such circumstances, traditional banks are faced with tremendous pressure and increasingly severe challenges. But the emergence of Internet bank also provides the traditional banks with a powerful weapon to win this battle. The convenient and flexible means of service provided by the Internet bank strongly attract the attention of the customers—especially those high-level, high-salary prosperous young customers. This kind of attention will be the focus for the 21st century businesses and the source of their profits. Meanwhile there is a bright future for the diversified and personalized new bank services such as corporate banking, intermediate business (such as securities trading, charging online etc.), online payment functions and diversified means of electronic payment and banking services like call centers.

This means a good prospect for development of Internet banks and makes "seamless" contact possible between banks and their customers so as to realize the so-called "zero distance" communication.

The applications of e-commerce in the financial field make online shopping, online foreign exchange market, mobile banking, non-bank financial services, electronic capital transfer and other new financial operations possible. Online bank enables the banking industry to improve service quality, enhance competitiveness and increase profitability. Internet banking provides enough room for planning a bigger step of development in this field.

4. Applications in international tourism

Tourism is one of the most appropriate forms of electronic business products and adapts well to the development of a network. The application of e-commerce in tourism industry makes personalized travel possible. Tourists can communicate online with the Internet website of tourism enterprise and the enterprise may arrange the tour according to the requirements for transport and accommodation put forward by the tourists. During the entire trip, instead of being accompanied by the traditional tourist guides, the tourists will keep in touch with the websites through the Internet and enjoy personalized services at any time and place. This makes it unnecessary to join a tourist group organized by a tourist agent and avoids the problems of hastily rushing for scanning the sights and spending too much money. This can also help arranging eating, accommodation and transportation in self-served tourism and lowering traveling costs. The conventional forms of tourism will be surpassed, which has the disadvantage of costing the whole tourism team too much time waiting for someone or being guided shopping in the tourist attractions.

The amount of tourism customers can be expanded in that customers can also help marketing a tourist product by self-promoting and inter-recommending. Suppose one customer hopes to continue his trip to the famous scenic spots and plan in advance the adventure tour in Yunnan and Tibet. Meanwhile, another tourist books the adventure tour to Xingjian and Tibet. With the function of cooperation and information filtering, the e-commerce system can recommend the adventure tour to Xingjian to the first customer and the adventure tour to Yunnan to the second customer. Through the system, you can let the customers who share the same interest make recommendation to each other.

11.3 E-commerce and International Trade Network Marketing

It is not mature to make full use of e-commerce currently because the network infrastructure, the level of information technology in enterprises, the qualification

of the e-commerce personnel and the legal environment conditions are not up to standard. It is a realistic consideration to carry out the network marketing in the international trade through the Internet.

11.3.1 The Foundation of Internet Marketing

Network marketing, which is based on the foundation of the Internet, is a necessary part of enterprises' overall marketing strategy. Network marketing is the basis of e-commerce. According to the development of Network marketing, it can be divided into three stages: no-site marketing, web-based network marketing and e-commerce marketing.

(1) No-site marketing is the primary stage of network marketing. This is the stage most companies have experienced and the duration of this period may vary significantly for different enterprises.

(2) Establishing one's own website is the foundation of e-commerce, which is an advanced stage of network marketing. Information can be disseminated and gathered through the website, data mining, trade negotiations and consumer services can also be done through website.

(3) Complete e-commerce stage: Online transactions and online payments can all be fully realized through the e-commerce systems. Therefore complete electronic transactions of the international trade are realized.

Network marketing of the international trade gives the buyers more choice than that in the past. They can, in accordance with their individual characteristics, search for the commodities worldwide and compare the performance, quality and price in a wider range without any geographic restriction. More relevant information, range from small bags to big houses and villas can be collected through access to relevant website belonging to different enterprises.

Marketing can enable the exporters to carry out invisible network operating and operating without the limitation of business space. With the technology of electronic data and electronic data transmission, international trade network marketing enables the import and export businessmen, wherever they are, to communicate with their trading partners around the world placing orders and concluding transactions, and this information exchange is fast, accurate, two-way. Network marketing can enable exporters to display their products in the network showroom almost without any restriction. No matter how big the exporting capacity is, network marketing can adapt to it without enlarging the operating space. And the form of operation is also very flexible. In this way you can easily sell various types of commodities worldwide.

Network marketing can make commodity information and trade standardize: the standardization of commodity information makes it easier to send and receive information and facilitate understanding and recognition of these messages which are translated in mind without misunderstanding, thereby enhancing trade

efficiency and lowering the cost of information exchange. The standardization requirement for commodities trade in the network marketing for the international trade is much higher than that in the traditional marketing. Being similar with that of price terms used in the international trade, the standardization for commodities trading can shorten the transaction process, and reduce transaction costs.

Network marketing can also make commodity marketing individual, low-cost, and break through the limitation of time and space. According to the information of importers, exporters should establish websites to the taste of importers in terms of the characteristics of products and special needs of the importers like Amazon. When the importer's first visit to an exporter's website, he saw that the website which everyone else saw. But after the importers logged in a few times (for example, since the fourth time), he will see a website specifically designed for him. The information he was most interested in has been put in the most obvious position and the information that failed to attract him disappeared. One of the most attractive advantages of international trade network marketing is that it can reduce the cost of the transaction, and speed up the transaction process. It can also reduce the cost of procurement. The integrated information transmission and information processing system enables the information to be updated online, thus greatly reduces the printing, packaging, storage and deliver costs and cut the marketing and research costs. At the same time it can improve efficiency and greatly reduce the operating cost. The international trade network marketing can greatly reduce communication costs since the cost of e-mail communications can almost be ignored compared with the cost of international telephone and fax. Internet can break through the limitation of time and space, and online information can be obtained in any place. Therefore, through network marketing, marketers can timely communicate with customers 24 hours a day without interruption.

11.3.2 Network Marketing Tool

Network Marketing tools used in the international trade involve information processing and transmission technology, including e-mail, search engines, Web technology and knowledge discovery technologies, etc. Of course, these technology cannot only be used in the international network marketing, but also in domestic business activities, and they play a greater role in the former one.

1. E-mail

It is commonly used all over the world. Almost all enterprises have their own e-mail addresses, since e-mail application does not cost much money and a large number of free e-mail services in cyberspace can be used. It is a common opinion that e-mail is a killer user of Internet. Sending and receiving e-mail is the most important and frequent thing in the common application of the Internet. The main purpose of ordinary people's using the Internet is to send and receive e-mails as

well. E-mail combines the advantages of the traditional mails and fax—It is speedy, convenient and does not need expensive long-distance call expenses and postage. According to the Silicon Valley Times, Forrester reports that in the latest marketing activities, more than 70% of businessmen consider e-mails as an effective marketing tool and that e-mails will play more and more important role in the network marketing.

E-mail has become an effective marketing tool for its huge coverage and superior functions over the original communication tool. In daily work, e-mail advertisings are often received and it is reported that the responding rate can reach 20% – 30% if the receivers are interested in the information provided. This shows the tremendous power of e-mail for marketing, which has the advantages of low cost, conciseness, friendly and one to one marketing.

A principle should be followed when using e-mail in marketing: mail to those potential clients who made the first contact with you and those who provide the same product as you do. For example, if you are a garment exporter, then you can firstly send e-mails to the garment importers in other countries. They will not complain about receiving valuable information. The following points deserve one's attention as well: try to obtain useful e-mail addresses, use pure ASCII text format to express business information, convey the most important information first, take the document name as the subject, make your e-mail as short as possible and carefully check your mail before sending it.

2. Search engine

Search engines, known as the Internet navigation signs, classify all the Internet information and become a most important way to find useful information. According to statistics, more than 70% of foreign businessmen use search engine to look for exporters. The search engine used in international trade network marketing has functions in two aspects. Firstly, the enterprises can find their own potential clients, and take the initiative to get in touch with them. Secondly, with a search engine, potential clients can find the enterprises if the enterprises have set up their own websites or home pages. Then, search engines will become a channel through which buyers and sellers may communicate with each other.

To make full use of the search engines, we should make clear the principles for designing and organization of them. The internationally famous search engines have their own basic designing and organizing principles and processing system. The marketers in the international trade enterprises should have a correct understanding of them and a good command of the necessary skills in using search engines.

Search engines are important marketing tools for exploiting market that need full understanding and good application. General search engines are designed to search information in following sorting principles: Key words in the website are prior to those in the title, those in the title are prior to those in the text, and those in the previous part are prior to those in the latter part. Therefore, you should put the key words of core part of your business into the website title. In addition,

many search engines rank the enterprises according to the different amount of fees paid by them, which is a way some search engine websites make profits. We should notice that the enterprises that are placed in the top part may not necessarily be the most powerful enterprises, nor may they be the most closely related businesses.

Some commonly-used Chinese Search engines are as follows:
http://www.baidu.com
http://www.sohu.com/
http://www.sogou.com/
http://e.pku.edu.cn
http://sina.com.cn/
http://cn.yahoo.com/
Some commonly-used English Search engines are as follows:
http://www.google.com
http://www.yahoo.com
http://www.altavista.com/
http://www.excite.com/
http://www.webcrawler.com/
http://www.infoseek.co.za/
http://www.lycos.de/
http://www.embl-hamburg.de/HotBot.html

3. Log File

Log File is a daily file generated by the server to show statistics of the visits to a website. It uses the special three-dimensional analysis software Web trend to analyze the amount of visits to a specific website. Log file is an important tool and an important reference for international trade network marketing. It is the obligation and duty of the ISP to produce log file periodically when hiring a virtual host. You may get a lot of useful information through the log file and the following are some of them:

General Statistics (or counter): Number of Successful Hits for Entire Site, which is an accurate visit data. Number of Page Impressions (visit by the number of pages): The more successful design the website be, the more times the website be visited, and the more it can attract people's attention. At the so called age of attention economy, the more attention is attracted, the more the chances of success of one's enterprise. Average Number of User Sessions per Day (number of visitors entering website). Average User Session Length (average time visitors staying at a website). Number of User Sessions (the number of visitors entering the site). User Sessions from a special country (the ratio of the number of visitors from a particular country). International User Sessions (percentage of international visitors, as an international trading company, percentage of international visitors is an important indicator to judge whether a website is reasonably designed). Most Active Organizations (organizations with larger number of visits. Which countries

are visitors from? Visits from the foreign companies have special significance for the trading company engaged in the sales of industrial products to the international market). Top Search engines (They provide the information about the search engine and key words used by the potential clients to find your website. If your website has been registered in the search engine, you will find the search engine your potential clients used to find you). Most Requested Pages (the most popular page requested to be visited): After a period of testing the most requested page can be set as the home page.). Least Requested Pages (the page with the fewest request for visit): After a period of time of statistics, if the page with least visits remained to be the same, the page can be replaced by other pages. Top Entry Pages (It shows the page entered by the user to visit your website: The pages with the largest number of entry can show what information is valuable to potential clients and what information fails to arouse their interest). Top Paths Through Site (When visiting the site the line which is most frequently linked up can be used as a reasonable judgment for the classification of different content modules of a website.). Most Submitted Forms and Scripts (The frequent use of the forms and scripts made in the website shows that the interaction mechanism with potential customers is a more reasonable). Most Accessed Directories (From the directory with the largest number of visits can show the most attractive module to the customers).

Web trend can generate about 30 data items. In addition, it is more effective to use the data automatically generated by virtual host and other free services provided by statistical analysis together. We should review these data regularly and we also need to make a comprehensive analysis of the data over a period of time and sum up the information for a week on average, keep the latest development of the website and the customers, and adjust website design and the services provided to continually enhance the effectiveness of Network marketing.

4. Mail List

Mail List, an important Internet tool, is used for the exchange and dissemination of information among groups in which managers can send information while users can only receive information.

Information can be sent directly to each member whose e-mail account is in the mail list. Mail list can prevent junk mail more effectively than news group can. However, if one e-mail account is used to join the list of many items, a large number of e-mail messages still cause obstruction and might affect the normal communication. Therefore, it is advisable to use different e-mail account (preferably with more space for the free e-mail) to subscribe different mail lists.

For subscribers, instead of spending a lot of time gathering all the relevant information on the website, they can join the mail list they are interested in and check their emails to get information such as the updating of a website, latest information in this industry and product information. Meanwhile, they can obtain the information concerning their competitors by subscribing their competitors'

mail list. For example, if you are interested in the work of the World Intellectual Property Organization on intellectual property protection, you can mail your subscription to the World Intellectual Property Organization and receive regularly the mails about the agenda and contents of the meetings for intellectual property protection organized by the World Intellectual Property and the legal protection of intellectual property rights and so on. You can also mail your own views and opinions to the meetings or make further inquiries on the details.

Mail list is of great significance for international trade enterprises and it is even regarded as a decisive factor for the success or failure of their business. It can be used to provide product information and improve customer relationship. If your business is engaged in the international trade, you may register a mail list at the relevant international website. In this way, you cannot only receive information related to this industry, but also send, through mail list, the information concerning your products or advertising messages to other companies who are interested in these messages. The effect of such e-mail, which aims at relevant clients, is much better than advertising.

The amount of subscribers is a main factor for the success of mail list marketing. However, different types of mail list have different measurable standards. For public readings or news items, 20,000 subscribers might not be necessarily large, but for some specialized fields, perhaps 500 has been very successful, for example, for the sale of aircrafts and large ships, the mail list with 50 subscribers may have been a huge success. In marketing the "positioning" is often stressed, and the higher the degree of positioning of a mail list, the greater the value of its sales. As for enterprises that produce consuming products, the number of registered mail lists will be great, while for enterprises making industrial products, the number of those will be very small.

For most readers, it is not necessary to understand the working principle of mail list.

You may first usually select the mail list which you're interested in among mail list catalog (Mail lists can be found on the websites of American online, USA Trade online. NETEASE, 163.com etc. and other relevant websites), then enter the e-mail address and click on "subscribe" button, and the subscribing is finished. To ensure the accuracy of users' information and avoid false subscription, it is sometimes necessary to confirm the information of subscribers. System will not add the user to the list until the confirming information is received.

As staffs engaged in network marketing, they need not only to subscribe mail list from other websites but build their own mail list. So it is necessary for them to understand the way to create mail list. It can be realized by either operating mail list program at their own website servers, or using mail services provided by the third party.

Suppose you need to send mails (such as electronic magazine) to all your mail list subscribers through easylink, you can just send it to mylist-abcexp.com.cn. A few minutes later, you will receive a confirmation mail automatically produced

by the mail list at easylink—"information which needs to be processed by the managers". You may reply to the mail after confirmation of your own mail, and all the rest are up to the easylink electronic publishing system. Perhaps a few minutes later, all the subscribers will receive your mail.

As for how to create a high-quality electronic magazine, how do you attract customers to join your mail list and how to use the marketing function of the mail list, different people have different opinions and methods.

11.3.3 Network Marketing Technology

Any international trade enterprise needs marketing skills in order to maximize the use of the Internet and obtain the best economic returns whenever it is in the stage of understanding Internet, establishing website or mature e-commerce application. The following are some of marketing skills.

1. The stage of understanding Internet

Free publication of supply and demand information: On the Internet, many websites provide free platform for enterprises to release supply and demand information (such as the Asian Resource website—www.asiansource.com). Some websites also allow enterprises to set up free online stores. Many website allows users to release information free-of charge, and the information will be released at certain position according to the characteristics of products or services related. Sometimes this simple method will bring about an unexpected effect. You may pay only a little bit for the Internet access, and would probably have made tremendous gains. This is the charm of network marketing!

Directly sending information to potential customers: The Internet is a sea of message in which people should search for the information in accordance with their needs. The Internet, as a marketing tool, can be used to find information about the potential clients, and then deliver the information to the targeted potential clients for the purpose of marketing promotion. For example, the sellers can find information about the buyers through the online information platform and frequently visit the economic and trade information network and electronic bulletin boards (such as the Import and Export Website—http://www.wbe.net/, the Asian resources website—http://www.asiasource.org/. the buyers' website—www.buyers.com, the website of Alibaba—http://china.alibaba.com/) to find potential clients. You may introduce your products or services to them through the contact information shown in their demands.

Search potential customers by search engines: You can also seek your potential customers by means of search engines, which is suitable for raw materials, semi-finished products and group purchasing products. You may inquire about the relative companies using a search engine or classified catalog. According to the result the search engine returned, you may choose to visit some websites of

potential customers to be aware of their operating scale, geographic location, product structure and contact information. Then you may contact them respectively according to their specific business scope. However, pay attention not to send too many e-mails to a potential customer; otherwise it would seriously affect your corporate image.

Join professional trade information network: This approach is similar in some aspects to the previous way of "free release of supply and demand information". The difference lies in that some professional websites can provide more services, for example, a fixed site (generally not independent domain name), and the design of simple website. Professionally classified information network makes it convenient for the customers to search for the information of suppliers, and registering in such information network will help visitors to this website find you more easily. But it is sometimes necessary to pay certain costs for such services, so it's proper for the companies engaged in the international trade to have a try.

Join industry information network: An industry information network is a web portal offering information of the whole industry, pooling the resources of the entire industry for suppliers and customers. It is also a convenient platform for suppliers and buyers to understand the industry information, and a specialized virtual market. So it is a necessary means of network marketing provided such a professional information network has already been established in your field, and it is necessary for you to register in such a network even if you have set up your own website.

Establishing your own online shop can be a very complicated or simple task. Many ISP provide free service of establishing customized websites. You may forward your requirements step by step and the website will generated a fairly good online shop for you according to your choice of the functional requirement in each step.

2. Network marketing stage

How to conduct a comprehensive marketing after websites' establishment becomes a critical issue. First, you should make your customers familiar with your marketing website, which involves the issue of use and publicity of websites, and potential customers know it.

(1) Publicity of web sites: Except updating the websites, many companies set them aside after their establishment. It is really a pity since the establishment of a website is just the beginning stage of network marketing. It is the point to attract potential clients by interaction through the Internet, which will be fundamental for the further development of e-commerce. Making more customers know your websites is as important as making them know the name and telephone number of your company. If a potential customer knows your website, once he needs your company's products, he would have to take the initiative to visit your website and contact you, while you can stay home waiting. The specific methods include registration at a search engine, exchange of advertisements, advertisement

campaigns and combination of the old and new media. You may use some small specific skills or give full play to your imagination and creativeness to generate some specific skills, for example, small screen, rewarding sale, automatic recommendation and website popularization. Since most visitors enter your website through by search engines, the first step is to ensure that visitors can find you through the major search engines. You must make your potential customers be able to find your website through main search engines. First, register your website in search engine. Different search engines have different registration methods, so before registration read carefully the instruction or seek professional help. Also, an appropriate domain name is also crucial. Attention is needed to use the key words most frequently and naturally in your webpage and title because the search engine retrieval system (HOTBOT) give priority to domain names, and then come the title and the first paragraph in an article.

(2) Searching business opportunities by means of Internet: It is common to use search engine to inquiry about economic or business information by entering keywords (imports and exports products, electronic components, medical equipment, business and investment) in the search box. This may be free, but the efficiency is low because you will find so many entries with so simple introduction. A more effective way is to use the mail list provided by a website, and entering the type of information you are interested into the proper category of mail list, and you will receive mail correspondence, which saves time and labor. Of course some websites also charge for such service.

(3) Analysis of customers' needs: All international trade companies should well use statistical reports and statistical principle of e-mail, with correct method, to analyze whether your customers are interested in your products, which part they are interested in, where they come from and how long they spend reading your webpage. This information can help analyze specific demands of specific customers. It makes you know which country's customers are interested in which items. This will guide you to take practical measures in accordance with the market requirements so as to avoid the tremendous losses resulting from the wrong decision-making, which is difficult to achieve in the traditional marketing.

(4) Establishing customer groups: It is also very important for international enterprises to build up their own customer groups. It is very convenient using website and mail list to establishing one's own customer groups. When you have accumulated hundreds of e-mail accounts of potential clients, it will be a big asset. If customers added to your mail list voluntarily, it will be much more profitable than copying the directories.

(5) Market exploration and research: The information in the Internet is varying every second. This provides a cheap and effective way to conduct market research and exploit new markets. It makes one conveniently understand all aspects of foreign market. It may provide the most direct information for the international trade enterprises to make decisions and export goods. This invisible process of marketing investigation and exploration is efficient and low-cost, and it also increases the popularity of the website and enterprises.

(6) Effective control of the market: It is crucial to let your clients know you are the best trade partner. If all the information on cost reduction, new technology adoption and improvement of product and service quality are publicized on the web site, the existing customers can have a continuous understanding of the development your enterprise. They will feel they share with you your development, will trust you more and be more confident in your enterprise. So it's a good habit to update your website regularly.

(7) Internet marketing: It is an important aspect of Internet marketing to establish a good image before the public and provide product information to them. Marketers can send information products and services in two ways through the Internet. First, in order to make the information about new products and service manners known to the clients in a timely manner, you may send the information to the new groups in the Internet (There are network companies specialized in creating and maintaining new groups). Second, you may sponsor the important meetings, public information, government and non-profit activities and issue advertisement pages in them. Of course, the activities you sponsored should be related to your products and services.

Good network marketing needs many Professional personnel who know both network technology and the international trade. In the Internet era, the competition between enterprises is finally the competition of their professional intelligent persons. Enterprises' competitive position and its long-term competitiveness are decided by their discovery and cultivation of professional personnel. The key is to train personnel who are good at both foreign trade and network.

11.4 Designing an International Trade E-commerce System

In knowledge-based economy era, e-commerce system is the core of the international trade and will directly affect the business performance or even the survival and successful running of an enterprise. A good e-commerce system for international trade should be able to automatically handle all the structural and most of the semi-structured problems. For unstructured problems (those requiring creative work) and a small part of half-structured problems, the e-commerce system can provide the necessary information to help international trade clerks handle business problems and make decisions. In what follows, we start studying the problem of how to design a good international trade e-commerce system according to above principle.

11.4.1 The International Trade Business Analysis

As mentioned above, a good e-commerce system should automatically solve all the structural problems and most semi-structured problems. As for unstructured

and the minority of semi-structured problems, e-commerce system can provide the necessary information to the businessmen to help them make decisions. This tells us the first step of designing an international trade e-commerce system is business analysis. That is to analyze, in the whole business process, which parts are structured processes, which parts are semi-structured processes, and which parts are unstructured processes. And we also need to conduct an in-depth analysis into these treatment processes and consider whether the process is reasonable, whether it can be handled through the information technology to make it more rational and more efficient. So that we can make clear which parts of the business process can be handled by the e-commerce system, which parts should be handled by clerks with the help of e-commerce system and which parts should be completely handled by man.

Figure 11.2 offers a typical flow chart for a business transaction in the international trade. Details follow.

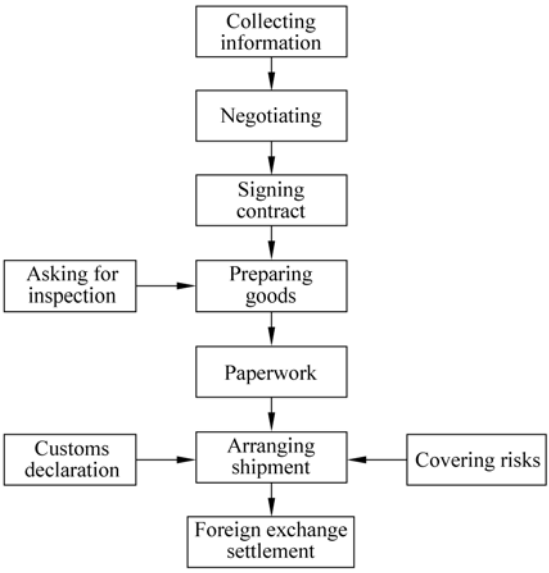

Figure 11.2 Typical business flow chart of international trade

In the flow chart above, businessmen need to, with their business experience, query, analyze, and judge relevant information, or mine relevant knowledge with related algorithms. And then synthesize relevant information so that eliminate the false and retain the true, eliminate the useless and remain the distillate. This is a half-structured process for problem processing.

Trade negotiating is a very complex process which requires the businessmen's ability to control the situation. This ability involves the depth and range of their knowledge, psychological quality, business experience and ability, cultural quality

and the art of negotiation. This is completely an unstructured problem processing process and it is the field where the businessmen may freely play.

Signing contract is the outcome of successful trade negotiations. It involves only putting the details such as name and descriptions of goods, quantity, quality, unit price, shipment, payment of goods etc. and general terms and conditions into written form to be signed. Since it involves completely formalities, there is no problem to handle.

Preparing goods is a complex process. Under the present conditions of China, this workload amount 50% of the total workload in an international transaction. This process involves a number of structural problems and unstructured problems which need the cooperation of both the e-commerce system and businessmen. But most of them are structural problems.

The remain processes involve the banks, customs, tax (export tax rebates), commodity inspection and quarantine institute, foreign trade administrative authorities, the import and export chamber of commerce, the international trade transport enterprises and insurance companies etc. It is necessary to produce a large number of documents, which have strict requirements. The general requirement is that the export documents should be correct, complete, timely, concise, and clean.

(1) Correct: Export paperwork must follow the principle of strict consistency. Two things must be agreed, i.e. documents must be consistent with letters of credit, and documents must be consistent with documents. Even one misspelling would not be permissible.

(2) Complete: The types and the number of copies of the documents should be in accordance with documents stipulated in the letter of credit and the trade common practice. Lacking of one copy would result in that the importer refuses to pay the money.

(3) Timely: The required documents must be supplied timely.

(4) Concise: The content of the document should be concise. Get rid of the things that are unnecessary.

(5) Clean: The appearance of the documents must be clean and tidy, with least amendment.

The documentation process in the international trade in China is featured by complex procedure, complicated links, low speed and common quality. This directly affects the performing of the contract and timely receiving foreign exchange. Sometimes 46 types and a total of 360 copies of documents are required for one transaction. An experienced business paperwork staffs must spend 36.5 hours on average on producing these documents, and the average cost of paperwork amounts for 7.5% of the product price. Paperwork is really the most troublesome thing for an inexperienced person. It may take him over 100 hours to deal with the documents, together with the time he spends on contacting the commodity inspection bureau, Customs, insurance company and transportation company, this part of the workload amounts to about 30% of the total workload

of a international trade transaction. But the work is structural, and can be programmed. It is for this reason that the information processing technology first demonstrated an incomparable superiority in the international trade paperwork.

Based on the analysis of the international trade business process, we can conclude that the e-commerce system should be employed to finish most parts of the goods preparation, commodity inspection, customs declaration, paperwork, insurance, transportation, foreign exchange settlement and export tax rebate. And it can also help businessmen gather information and make them focus on information processing and trade negotiations, which are more creative and challenging.

11.4.2 Frame of international Trade E-commerce System

From the analysis above, we can see that an international trade e-commerce system requires the following modules to accomplish the above tasks:

(1) Communication Module.
(2) Document generation module.
(3) Database module (DB).
(4) Data Mining module (DM).
(5) Supply Chain Management (SCM) module.
(6) Customer Relationship Management (CRM) modules.
(7) Related department relationship management module (RDM).
(8) Intelligent problem processing module.

In China's international trade industry, an international trade enterprise usually does not have its own production enterprise. Even if they have, the production capacity is very small compared with the volume of trade they can have. They usually purchase the exported goods from relative manufacturers or just act as agents for manufacturers. In contrast to many large multinational companies engaged in both production and trade such as IBM, HP or General Motors, the very important enterprise resource planning (ERP) modules seems dispensable to these enterprises in the international trade. However, in view of the future development of the international trade, in the design of e-commerce systems, an ERP module interface should be kept.

E-commerce rises from meeting the need of improving quality of paperwork and strengthening information exchange. Information sharing and data exchange is the most basic functions of e-commerce. Therefore, the communication module is the most basic e-commerce module.

Document generation module is necessary because of the uniqueness of e-commerce system for the international trade, and there is great need to produce a large number of documents with strict requirements. Therefore, it is also the basic module of e-commerce system for the international trade.

Database module is also the most basic component of all e-commerce systems. E-commerce system database for the international trade should include law database, business database, customer database, contract database, management database and human resources database.

Data Mining module can help businessmen find out, from the database in the e-commerce system or the Internet, the implied information and knowledge that customer relationship management, supply chain management, department relationship management and intellectual processing modules need to handled, and that is needed by relative business departments.

Supply Chain Management module integrates upstream and downstream enterprises by means of Internet. It takes export enterprises as the core and combines upstream suppliers of raw materials and spare parts and downstream dealers, logistics, transportation companies, product service businesses and correspondent banks to create a complete e-commerce supply chain linked to the end-users. The aim is to reduce the procurement and logistics costs, increase the enterprises responsiveness to the end-users' needs and ultimately enhance the competitiveness of domestic enterprises. It includes the management for supply, demand, and purchase of raw materials, markets, production, inventory, orders and distribution.

CRM module automatically responds to customers' demands, timely sends feedbacks of customers to the businessmen, and provides customers with high-quality after-sales service. It keeps track of relevant information about the production and delivery of the commodities, such as production speed and delivery date (arising from the ERP system) and transportation of the commodities. Such information will be publicized on the website for customers' inquiries. This is a key technology to improve customers' satisfaction and keep old customers.

Related departments relationship management module (RDM) is a special component of the system, which depends on the feature of management of the international trade. Unlike most production enterprises and domestic trading enterprises, the international trade involves, apart from the upper and lower enterprises and consumers, customs, commodity inspection and quarantine bureau, chambers of commerce, tax, insurance companies, and government departments in charge of the international trade and so on. The relationship between these departments and the international trade enterprises is different from that between business and consumers and that between enterprises and suppliers. It is relationship of managing and being managed, supervising and being supervised and it calls for a special processing by special modules.

Intelligent problem processing module is the core and key part of the e-commerce system and can intelligently deals with all structural problems the e-commerce system encounters. For those that cannot be dealt with independently, it submits them to the businessman and coordinates all aspects of the e-commerce system by providing required data and information and helping the businessmen to cope with the problem.

11.4.3 International Trade E-commerce System Design

The structure of the e-commerce system for the international trade is showed above. In the following, we discuss how to design the various components of e-commerce system.

(1) Communication Module: It has been proposed as a module just to show its important role in the international trade. It does not need to be specially designed, but keep a data communication interface in e-commerce system. The interface for the e-commerce system can be connected to EDI and used to communicate with the customers through the Internet or telephone. This requires that the communication interface can be connected to EDI, the Internet or telephone network. In the communication module, the security of the information must be taken into account and the Intranet and extranet must be separated by a firewall. Access control mechanism must be set up for the visit of the extranet to the intranet. Special encryption mechanism must be taken to protect the confidentiality of important business information.

(2) Documents generation Module: In this part, some application programs must be developed based on the database. All documents can be generated on the basis of defining some views in light of the contracts and letters of credit. Due to the large number of documents used in the international trade, designing views is a rather arduous task. The content of the views must meet the requirements of the all documents, and the format should be exactly the same.

(3) Database module: It is the infrastructure of the entire e-commerce system, but database technology is so mature that both the large-scale and small-scale database is available in the market. The major part of designing a database is the preparation of a large number of applications programs and the interface between the database and the application programs. It is suggested that large and medium-sized enterprises purchase Oracle, Sybase or SQL and small companies buy the small-scale database such as INFORMIX or MYSQL.

(4) Data Mining Module: There are various types of data mining software, and some are already quite mature. To develop our own data mining program, we must carefully choose the data mining algorithms to ensure its rapidness and accuracy. This requires careful study and detailed analysis of the variety of data mining algorithms.

(5) Supply Chain Management and Customer Relationship Management Module: Software such as Oracle SCM and CRM software, and IBM's CRM and SCM can be bought in the market. Some domestic enterprises also provide some CRM and SCM software. If the financial strength and technological level of an enterprise are insufficient for the self-development of such software, it has no choice but to buy from others.

(6) Related departments relationship management modules: There is not software available in this field. If we are to set up an e-commerce system, I am afraid that this part has to be developed by technical staffs of the enterprise. It is

a complicated task because this is not just an internal affair of an enterprise. It often involves the different databases, different information, and different format requirements of the Customs, banks, insurance company, commodity inspection and quarantine bureau, taxation and other departments and so on. Coordination with them is necessary, and documents must be processed online. Serious consideration must be given to these issues.

(7) Intelligent problem processing modules: It is the core of e-commerce and there is no software available for this part possibly due to the difficulty. Intelligent processing module needs to be designed under the cooperation of the businessmen and software developers. During the design both the business knowledge and the computer-related professional knowledge and expertise in artificial intelligence are necessary to come up with an expert system to deal intellectually with the issues in the international trade enterprises.

After all the above parts being designed or bought, we should test each part after completing the designing. If everything is OK, there still exist some problems to be solved, such as application design, the design of the interface between modules, and a more important problem is to integrate these modules. After integration, an important task is data loading. We must understand that software we purchased is often a software system. If we compare the database system we bought with the actual storage system, what we have bought are just a warehouse and a warehouse management system. We also need to build the road links and put our goods to the proper positions in the warehouse.

The integration of e-commerce system is not simply linking various modules together; we also need to consider the hierarchical structure, which can be divided into four levels according to their respective application.

The first is the user interface of the e-commerce system, known as the user interface.

The second is intelligent problem processing system which can give command, control and coordinate the respective parts.

The third is the other application modules, including CRM, SCM, communication, knowledge discovery and data mining.

The fourth is the foundation of other applications, including various databases.

Then, each module can be linked through the interface between modules and form a hierarchical structure, and the process is called system integration. After that, there are still testing and data loading for the final evaluation.

11.4.4 EDI-based International Trade E-commerce System

The various technologies of EDI are relatively mature since it was born in 1960 and has been developed for nearly 40 years. EDI service is reliable and secure, and its technology of partner management and dispute arbitration is mature. It has been widely used in the international trade, customs declaration, transportation,

government tenders and public affairs. It is the main e-commerce form from the 1970s to the early 1990s. At present, most international trade companies have EDI system, so in order to save the investment on EDI, when designing the new e-commerce system we should make full use of the existing system. This will make businessmen fell that the new e-commerce is similar to the old EDI. So we will introduce the designing of a new e-commerce system based on EDI.

Currently, there are mainly four methods to build e-commerce based on EDI:

(1) Internet Mail can achieve the electronic exchange of business data and information through the Internet ISP (Internet Service Provider) instead of VAN. The ordinary information can be sent and shared instantly through e-mail but for important information, the security of the e-mail has become a major problem. We may use the encryption technology to send e-mail so that the confidentiality of the e-mail content can be preserved. This technology can solve part of the security problem. It is much cheaper to use the Internet compared with the VAN, which will greatly facilitate the small and medium sized enterprises to do business through e-commerce. As e-mail is easily forged and the sender can also denied that he has sent an e-mail, electronic authentication is needed to ensure the authenticity of e-mails when designing an EDI-based e-commerce system. Again, in order to reduce the loss of e-mail and keep the sender informed of its loss, a confirmation of sending an e-mail is needed in the application level of the Internet Mail.

EDINT group in Internet Engineering Task Force (IETF) has published the security standards of doing EDI using e-mail and HTTP on Internet. The standards offer two main approaches, using PEM (Privacy Enhancement Mail) to enhance private communication, and using PGP (Pretty good privacy) to guarantee the security of the e-mails. PEM keeps the e-mails confidential by using encryption and the mechanism of authenticating sender, ensures the completeness of the contents of e-mail by using the algorithm for integrity checking and achieves the confirmation of authenticity of the e-mails. If a public key system is employed, PGP can provide encryption and certification for e-mails.

(2) Standard IC (Standard Implementation Conventions). In the process of using EDI, different industries or enterprises must make different choices on the basis of their needs of the standards and eliminate the unnecessary parts. IC refers to selected versions, and hence there are a number of IC versions. Developing IC need sophisticated analysis, so the development cost is very high. A message system that uses some special version cannot process message of different versions. The standard implementation agreement focuses on solving this problem. It is a special cross-industry international standard aimed at special application and is the middleware of the various IC versions. This standard differs from the previous industrial and national standards, and even from the previous international standards. It is very simple to handle without too many options for the items and it takes into account the previous IC which enables EDI to be employed conveniently on the Internet.

(3) Web-EDI is the most popular method of integrating EDI with the Internet. It is a perfect idea to combine EDI, which offers a secure exchange of business data, and the Web where information is shared. HTML provides a tool for the processing of business matters on the World Wide Web by allowing users to create forms and to provide a method of transmitting the information in the forms to business application.

One of the participants in the e-commerce develops or purchases the corresponding Web forms according to every EDI message, make them adapt to his/her own IC, and then put them on a Web site. In this way the forms become the interface to EDI system. Another participant of the e-commerce activities logs onto the Web site, choose to fill the forms that he is interested in, submits the results to the Web. The server makes legitimacy inspection, and translates the filled forms into normal EDI messages. Since then, the news is dealt with exactly the same as the traditional EDI message. To ensure the messages are returned to the participants, the messages can be converted into e-mails or Web forms. The conversion fee is charged only once for all transactions. The costs of EDI software and mapping are paid at the side of the server. This scheme needs only a browser and Internet connection. The companies which have set EDI interface can enjoy the full benefits of EDI, e.g. the low rate of making mistakes in the transactions and low cost of each transaction. We only need to do some minor alterations to the existing applications in an enterprise, which can facilitate the rapid expansion of applications so as to protect the existing investment without re-development of the database.

(4) XML/EDI method

XML/EDI focuses on solving the mapping problem in EDI. XML/EDI introduces the concept of templates and the templates do not describe the data information but the structure of information and the way explain the message in order to map information without programming. In the users' computer, the software agent uses the best way to explain the templates and process the message. Through templates supported by the software agent, users can get the best system integration of their environment. Templates are stored in different places and dynamically combined into the local application process. If a user's application programs have achieved XML/EDI, the software agents can automatically map and produce the correct message. At the same time the agents can generate a Web form. Automatic mapping can be completed automatically and is very cheap.

11.5 Summary

It is a new issue to use e-commerce technologies systemically in the international trade field. In this chapter, we introduce the relationship between e-commerce and the international trade, the application of e-commerce in information

collection, how to use e-commerce technology to reduce business cost and improve trade efficiency, and designing principles of the international trade e-commerce systems. Finally, we discuss the construction of e-commerce system based on EDI and the integration of it.

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12 Network Application Psychology

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Abstract Psychology often applies in the fields of education, management, business activities, etc. There is no denying the fact that psychology provides guidance to the activities mentioned above and plays a vital role in working processes. With the development of electronic commerce, some interactive virtual community activities such as virtual enterprise management, remote education, and online game are born. These virtual social activities create new features such as virtual, anonymous, no corresponding legally binding, moral constraints and so on. In such a virtual social environment, psychological activities of people will inevitably have some new characteristics. In order to guide and manage these psychological activities correctly and effectively, we should fully understand the law of psychology and study relative behaviours under virtual social environment. Network Application of psychology is analyzing the points above. The contents of this chapter can be summarized as following questions: Why the psychology of network application appeared? What are the issues concerning network interactive mentality, psychological and network application management under the networking environment? This chapter also analyses the potential regulations of psychology in the network communication.

Key Words e-commerce, psychology, interaction, addiction, online game.

Network application psychology comprehensively applies the modern computer network technology and psychology knowledge, explores and uses corresponding computer network and psychology resources to study the law of various psychological activities in virtual community and use these laws to guide the construction and management of virtual community. Network application psychology

is a new interdisciplinary science following the development of computer network. It has distinctive computer network features.

This chapter introduces the basic contents of network application psychology, including the subject of network application psychology, man-machine interactive psychology, network interactive psychology, innovative network applications psychology and network management psychology.

12.1 Introduction to Network Application Psychology

Psychology is a young discipline with long history. Psychology has become a part of mankind with his appearance in the world. The sentence engraved on the step of an ancient Greek is—"Understand yourself". Since then, "what is human?" and "what is the self of human" has been attracting people to study psychology. It is young because it had been a part of philosophy before it became an independent branch of science in the end of the 19th century. And as an independent branch of science it appeared by the end of the 19th century. It was just 100 years since then, which makes it as young as a teenager in the big family of science.

In ancient times, "psychology" was a problem frequently talked about by the philosophers. At that time, "psychology" was usually described as "spirit" and "soul". Aristotle, in his "On the Soul", discoursed upon his thought on psychology. Modern philosophers went further, and came into two psychological thoughts, empiricism and rationalism. In the end of the 19th century, with the development of natural science, scientific methods were applied to studying psychology which promoted the scientific development of psychology. In 1879, Wundt, a psychologist at the University of Leipzig, established the world's first psychological laboratory, which symbolized the independence of psychology from the philosophy and divided psychology into philosophical Psychology and scientific Psychology. After that, psychologists began to try various scientific methods to study psychology, and gradually formed the schools of structuralism, behaviorism, psychological analysis, humanists, and cognitive psychology and so on. Then the veil of mystery over psychology was gradually lifted.

1. Comment of philosophy on psychology

There is a narrow-minded view which holds that it is necessary for a branch of science to exist only when it can serve the practical interests and is used to solve practical problems. The truth should be so worthwhile that it can be respected. There is another view that truth exists to meet the requirements of ideal, and that people should be devoted to finding the truth without considering how much benefits it can bring about. This kind of devotion and the enthusiasm to popularize knowledge often leads to reluctance to put theoretical psychology into the actual needs of society. Some people even think that psychology will loss its dignity if it becomes the servant of daily life.

However, it is also narrow-minded not to care about the practical application of science.

The latter viewpoint has its social causes. Now in the society, there are many fake psychologists using mass psychology to cure diseases. There are also many quacks that simply do not understand psychology but give psychological treatment. Real scientists are unwilling to be associated with quacks and pseudo-scientists. Court proceedings are often linked to psychological processes by the public who are not interested in the scientific study of the witness or in the psychological analysis of offenders. They are basically talking about the hypnosis and things everybody was curious about. These were things psychologists and lawyers always avoiding to reinforce. Psychological theory has been used to promote the fashion in education and strengthen bias in education, and wise educators and psychologists are content to be yielding. In many areas of real life, the excessive popularity of the fake psychology is the real obstacle to the development of application psychology.

2. Localization of application psychology

Application psychology is a very important and valuable subject. Perhaps in the near future, it would be taught in every educational organization. Finally labs for application psychology will be set up. But do not overestimate the present achievements with this faith and hope. Do not expect a very big step at the beginning stage of the development of a branch of science. There is a wide gap to be filled in order to form the complete sections for application psychology in the future. With the development of independent methods in this new subject, these gaps will continue to be filled. When the practical application is only the byproduct of theoretical science, the progress is occasional and unstable. When the scientific work directly faces the practical problems, there is hope for a stable development of application psychology.

On the actual application, we should avoid drawing wrong conclusions from the right facts of psychology, which is caused by the complex nature of the actual conditions. In each special circumstance there are many complex factors. If we focus our attention on a certain psychological element and neglect other elements, the result will be the misuse of psychological knowledge. It is the same as a doctor who may make mistakes if his treatment of a disease is based on an isolated symptom. Psychologists must focus their attention on the elements of the entire portfolio, and the failure to consider the integrity of the elements will lead to ignoring certain influential factors. It is also dangerous to make use of psychology in a narrow-minded way and ignore other branches of science. Mutual cooperation is better than fulfilling a task alone. The novelty and speedy application of application psychology will make it supercilious to the slow old methods of changing the world.

Application psychology theories must never go against the natural instinct, nor be a substitutes for the training capacity. In case plain direct response is needed,

we cannot interfere a spontaneous act with application psychology and impose a so-called scientific thinking attitude. Psychologists are probably unaware of all the factors; they may not success with the thoughtful analysis of the situation and the rational planning of the necessary steps. For example, people walk and climb stairs without considering the physiological mechanism of muscle contraction. Of course, a physiologist can find out the activity of the type of muscle which can effectively help people climb the stairs under different circumstances. But if physiologists are trusted to study the issue each time we climb the stairs, we cannot take a step unless there are exceptional circumstances. But as to eating, there is a need to pay more attention to diet. The choice of food is determined by instinct. Obviously if physiologist tells us the successful collocation of various types of food can bring in good working condition and greatly benefit our lives. Such advice is more important when people are ill.

Thus there is a gradual transformation from taking care of the body out of natural instinct to the strictly scientific consideration of the field of the highest value. We can find the similar principle of small-step transformation in the field of psychology. The calculation of certain information or description of something imagined is just like walking or jogging, in which we follow the natural instinct instead of considering the smooth implementation of the whole process. Psychologists will tell us that it's impossible to rely on instinct to find out the way to recall the memories that have disappeared, to try to focus one's attention on something, to spend as little as possible effort remembering certain things, or to be engaged in certain psychological activity without fatigue.

The scientific treatment of psychological situation is aimed at eliminating simple response. On the contrary, we spend time thinking at present in order not to think in the future. Do not forget that people seldom do something without hesitation out of their instinct. One spends a lot of efforts playing piano and writing at the beginning stage of learning and gradually learns to combine movements and attention until he can do it without hesitation. It's true in pure psychology as well. Through an awareness of the analytical skill, one may fully master the various psychological functions, and make them more natural to become almost instinctive behavior. If a doctor has made efforts to the study of abnormal psychological activities carefully he can gradually make an appropriate response to some pathological symptoms without conscious analysis. The so-called simple and instinctive reaction usually means the abstraction of the conscious, customary and activities need to be focused on. The scientific interest is the highest attention to the various parts of the psychological stages of the process and there is no fundamental paradox between simple attitude and scientific attitude, either on their own or on other people's psychological state. They can be transformed into each other and support each other in fulfilling an endless stream of new tasks. Application psychologists therefore are unwilling to change or eliminate the significant evaluation on the so-called instinctive psychological response.

Application psychologists should understand that psychology is used only to find the means to achieve certain goals and should not be used to choose the goal.

Educational Psychology cannot determine the purpose of education. Instead psychologists can at most point out the specific means to achieve maximum educational purpose. They can understand the psychological mechanisms on attention, memory or imagination, and show how to use memory, attention or imagination. But they cannot not tell us what is noteworthy, what should be the ideal behavior for imitation and what should be the most essential knowledge which needs to memorized. Psychologists know how to achieve the goal but they are unable to judge the value of this goal.

Of course, this is not a weakness of psychology which we need not overcome since other scientific branches also have the same limitation. Physicists can only tell architects whether the place will be suitable for building a house, bridge or rail and technical means that should be used to achieve this purpose. But physicists, from the ideological point of view, cannot tell why it is in this place rather than elsewhere that people should construct a bridge or building. The crucial factor for this is the economic and social conditions. Generally, the nature of science is not to guide the assessment of an objective and science can only represent a certain aspect of reality instead of the natural result of it. Practically people choose a special purpose based on the general (the final is the ideal) aims and we need to identify the appropriate way to achieve a special purpose.

The purposive and causal treatment of people's experience should be inextricably intertwined together and it will be impossible to realize the goals without proper approaches. If people try to understand the internal and external world just from the perspective of the causal relationship, no target can be chosen. Real desire has its purpose while the ethics and religion in the life philosophy are constantly helping people choose targets. Science is the provision of appropriate means to achieve these goals.

12.1.1 Appearance of Network Application Psychology

Nowadays, there are more than 450 million Internet users worldwide. More and more people will find efficient access to information from computer networks directly or indirectly with the publication of the Rules of Global Information Infrastructure Cooperation, the construction of the information superhighway (ISH), and China's third largest of information network construction project—Construction of online households. There is no time to delay in research on cyber-psychology.

More than 2,000 Psychological websites in English are available abroad, a large number of which are professional sites sponsored by universities or medical colleges. China's network psychological cause is still at the fledgling stage, and is more backward compared to the development of network technology with their foreign counterparts. Since the early 1990s, from the quiet emergence of several psychological websites such as China Psychological Hotline quietly emerging to recent surge of a large number of psychological websites like Heart Bridge and

Network Psychological Space, the number of Chinese psychological websites has reached more than 300. The total number is surprising if such comprehensive website with psychological columns as the Three-Nine Health Net is added to the list. Generally speaking, although the development is fast, most of our websites are in lack of strength and far from meeting the growing needs of the people from the content of the websites to the number of professionals without successful use of the existing network technology. Therefore, it is necessary that psychological professionals familiar with the Internet or network experts good at psychology be engaged in cyber psychology cause to explore the unknown fields of psychology and make unremitting efforts in preventing and solving psychological problems in the virtual and real society.

Along with the constant development of network application psychology, a growing number of network high-tech will be applied to study psychology. Through continuous research and practice, the network communication combining all the senses is not far away, and the application of holographic technology to simulate the real-world in psychology will no longer be strange to us. All of this may also need developing and improving, but it will continuously improve human health and the quality of human existence. Network application psychology will promote the development of the psychology so as to make a significant contribution to the cause of human health.

Network application psychology is still in a preliminary and exploratory stage, but its importance has been recognized by the human society. With the cyberization and virtualization of human life, network psychology will be more and more important.

12.1.2 Research Content of Network Application Psychology

Since the emergence of ARPANET (the predecessor of the Internet) in 1969, a profound information revolution impacting on the process of human history seeped the world, running with unprecedented vastness of the Internet information. It also set an unprecedented speed, the high standard of human mental development, and quickly infiltrated into every aspect of human life. How to apply computer network technology to discover, study and solve psychological problems and study people's psychological problem in networking activities have become the new world—network application psychology. That is a interdiscipline science which makes comprehensive use of the modern computer network technology and knowledge of psychology and which explores the corresponding computer network, resources and means of psychology to learn how to build and manage the virtual world with the law of network information.

1. Network society and psychology

In the future network society, production and lifestyle are different from the

present, which will have a tremendous impact on people's psychology. It is unlike the impact of the Internet on individuals. The development of network directly affects the social life, and social life consequently affects individual psychology. This impact is not clear yet, but at least which affection may appear is known to us.

(1) In the Internet community the psychological and educational advantages of the elderly will be replaced by the quality advantage of the young. In computer studies, an obvious and strictly confirmed trend is that the young people learn computer skills much faster than the elder people. People with high level of education may not necessarily have the advantage of using computers; middle-school students may have a better command of the computer skills than doctors majoring computer. In the future, the people with the biggest advantage are those with better quality of learning.

(2) The psychological tactics used by website operators is to attract users with people's curiosity and network contests. The impact of such tactics on the psychology of the netizens is their great expectation for services free of charge and the curiosity about unhealthy contents.

(3) The present impact of concept of success in the network is that a good idea brings about overnight wealth. The spread of the success stories of Bill Gates, Jerry Yang and the Amazon online bookstore strengthened this belief. This may affect people's traditional concept of success, hard working assiduity and fortitude.

2. Network and psychology

The emergence of the network will play a tremendous role in promoting the development of psychology, manifested in the following aspects:

(1) Accelerating communication of psychology: As the network connects large amount of psychology websites, a lot of information concerning psychology can be obtained on the Internet. At present, thousands of websites about psychology can be found on the Internet as follows: 246 in Yahoo (yahoo.com), 297 in go yoyo (goyoyo.com.cn) and over 1,000 in 163.com (yeah.net). As communication in the network is more timely than articles written and professional articles published, writing can be distributed within a few seconds, so it is convenient to communicate through BBS. There is heated discussion about psychology on the net (Address: wpsy.com or wang.aipsycho.net.cn, choosing on the website of "professional discussion" column), and the main participants are graduates of the training course on psychology consultation co-sponsored by China and Germany. Chat rooms on the website can be used irregularly to hold discussion about psychology. Discussed article can be published on the websites, such as the Psychological World and Crazy Discussions about Psychology.

(2) Psychological services on the network: The network can be used to carry out the simple preliminary psychological counseling, mental measurement and the introduction of psychological knowledge. That can be found in many psychology websites (entering "counseling, mental measurements" through search engine).

(3) Psychology research through the network: The network can be used to carry out the surveys and tests of psychology which have not yet been done about them. This should be a revolutionary method and have a broad development prospects. But the reliability of survey, measurement and certification require technical assurance.

3. Construction of network application psychology

The appearance of the network plays tremendous role in promoting the development of application psychology and mental health education. It is illustrated in the following features. Firstly, employees can exchange their opinions speedily and conveniently through the Internet and obtain a large number of professional knowledge and dynamic information from domestic and overseas websites. They can also express different viewpoints or even publish professional articles through the Internet to publicize the results of their thoughts in the possible shortest time. Secondly, application psychology, whose service is calefactive gradually, will be gradually improved.

With the development of network technology and many psychological problems highlighted by the rapid changes in the network application process, it is necessary to analyze the psychological problems of the human society in the application of network and guide people to better use the tools to better facilitate the work and create wealth. Application psychology emerges as the times require.

12.1.3 Significance of Network Application psychology

1. Attention should be paid to the importance of network application psychology

The task of science is to reveal the objective law and truth of development of things as guidance for people to rebuild the world. If a branch of science has found ineffective law to conduct people in changing the world, these laws may be unreliable. Practice is the sole criterion of truth and it's true in psychology. The task of Psychology is to expose the law of psychological phenomenon and the practical application of these laws for human services. If the law of psychology cannot help people to rebuild their subjective and the objective world, it will be difficult to maintain its position in the field of science. Even if the law of psychology is an objective truth, it is difficult to play its role in serving the human society if it is not understood and accepted by people in all walks of life. In 1964, Yao Wenyuan, the cultural scoundrel, said that psychology was a pseudo-science that consists of ninety percent of useless things and ten percent of distortion and that such nonsense should be smashed into pieces. Facing such brutal and unjustified persecution, no one had stood up to say a few words for psychology. One of the reasons is that psychology had not been popularized for

the acceptance and command of people in all walks of life and did not play its due role in the production and people's lives. In fact, after 100 years' development, there are such brilliant achievements in this field that it should be able to play an important role in building socialism.

Certainly, the stress of psychology is not to obtain people's sympathy but to allow the psychology to play its role in the building of socialism with Chinese characteristics.

Psychology should play important part in the course of socialist construction, because all of people's activities in rebuilding the subjective and the objective world are in the control of psychology that follow some law. Psychology's task is to find the law of psychological phenomenon. If the majority of the manual and mental workers can master the law of psychology, they can forecast and control their behavior and enhance the awareness of their behavior, thereby enhancing the efficiency of the various activities. It is showed that psychology can offer good service for the modernization of socialism through the stories of people's success in education, health care, management, military, industry and other fields of application psychology.

2. Significance of network application psychology research

Network application psychology has done its part to the entire psychology research to make psychology and modern network technology fully integrated. On the other hand, it applies itself to research of the impact of network technology influence on individual and social psychology so that the individual develops better in the information era and the network community gets along well with the physical community. The network application psychology will be able to fully develop its skill in the information age because of the close integration between network technology, a means of research, and network space, its research content. That is the combination of network technology and cyberspace. Its significance is displayed in the following three aspects:

(1) Application psychology Research will promote the improvement of the psychological system and the development of psychological theory in the information age

Network technology-based testing develops the psychological measurement. For a long time, paper-and-pencil test, as the most universal and most practical tests, was in a dilemma. At the beginning stage the test are aimed at all students with the same questions. In practice, however, only part of the whole test questions were suitable for students been tested. The remaining part of the questions which is offered in the tests not suited for students are therefore unable to provide the necessary and effective information. This resulted in the appearance of Item Response Theory (IRT) tests and theoretical knowledge-based space (KST). Using network technology, two new psychological tests can be applied and put into practice in large-scale examinations. Meanwhile, along with the further popularization of the network, network tests may be done in a real dynamic manner.

As to psychological experiments, they have been popularized on the network and can be found everywhere in the Internet. The topics for the experiments include cognition, education, social management and many other fields.

This shows that research on network application psychology will greatly improve the research methods in the whole field of psychological research. In addition, the conversion from offline psychological study to the online psychological study has produced a lot of issues with the spirit of the present era in the network application psychology. We can say that the impact of the network on psychology spreads to almost all areas of it just like that on all fields of the world. In the field of developmental psychology we should study the impact of network on the individuals, especially on youth's growth. In the field of social psychology we should study the mutual effect of the network community and the real society. In the field of abnormal psychology we should study the distinction between the addiction of people to the Internet and the addiction to other things, the hazards and the way to control it etc. From theory to practice, network is changing the psychological network system and rebuilding some basic concepts such as self and behavior.

Perhaps the more significant influence is that the study of network application psychology will provide a new opportunity to integrate psychology. For a long time, the Marxist-oriented scientific and humanistic psychology is confronted to each other. In the past, to a large extent, the study of psychology is to construct its theoretical background based on the scientific and philosophical concept formed in the industrial society. The distinction between science and humanities is actually based on a simple linear relationship of the industrial society. And the network itself is born in the thoughts on post-modern society and conversely offers marvellous portrayal for formally post-modernist ideas. The nonlinear, self-organizing characteristics of psychology and the inner correspondence between network and post-modernism lead the psychologists to a self-introspection on the blunders in defining such concepts as self and communication which formed the basis of psychology. The network psychology will provide the network psychologists, especially theory psychologists, with new horizon and expression, which transcend a series of psychological concepts on the basis of naturalism and positivism, and enter the room created by post-modern thought through the digital space.

(2) Application psychology Research will help improve the status of Psychology in the entire system of science

Kedlov, the former Soviet scholars, have used a scientific spindle to describe the central position of psychology in the scientific system. In practice, however, the internal split of the current system of psychology results in the wrong orientation of each specific psychology subjects, e.g. cognitive psychology is obviously at the upper part of the spindle while social psychology is at the lower part. Despite such differences of research orientation psychology has got considerable tension and the theoretical research is colorful. However, it also

shows that the science of psychology is still a frontier subject. The difference leads to the unsteady research on psychology and the failure to real display its central position in the scientific system.

As the basis of the information age the network integrates multidisciplinary research results, and network application psychology, placed in the center of the spindle, has strong influence on the various dimensions of the spindle. This is determined by its characteristics. Network application psychology is based on the network technology on one side, and research on the psychology of the individual on the other side. The rapid development of the network will allow itself to become the foundation of an era so it is destined to play an important role in the information age. Kedlov pointed out that the psychology of this century will replace the biological science as the leading discipline. It is expected that the network psychology will flourish in this historical process.

(3) Application psychology Research has important significance in guiding the social practice

There is a cartoon published over the Internet: in the same room, a couple addict themselves to the cyber world. The husband can only use ICQ to ask his wife: "How about the kids?" Network novel writer Li Unhand has similar description in his novel *Game on the Edge*: "LaoHou has become a super net worm. Every night he will be such wholeheartedly on the net that we contact him only online. I really do not know whether the Internet is to improve efficiency or reduce efficiency." The impact of Internet exchanges on the traditional face-to-face exchanges has not been limited to cartoons and fictions; it also appears often in real life. Is this a step forward or a step backward?

In addition, along with the popularity of the Internet, there are also a large number of issues of social practice. The China News reported that in the evening of 19th, 1999, after being online for 32 hours continuously, a middle-aged man was suddenly engaged in disordered thinking, and cut his wrist with a fruit knife resulting in hemorrhagic shock. According to the hospital, this is the first case of self-injured patients out of network psychological barrier discovered in Sichuan. Another example is the analysis of the Internet shopping system. Page layout design of online shop has been one of the most important factors affecting the development of electronic commerce. Preliminary research found that virtual reality mode will have a significant positive impact on the shopping behavior of consumers online. Research on the significance and impact of engineering psychology through characterization of online shopping and the human resource management in network environment are highly practical issues in the field of psychology.

Since networks became universal in just a few years, even in the United States with the well-developed psychology and network, such topics are still very popular. However, we must attach importance to the study of network psychology. With the implementation of online government projects, the further execution of the Athens Project and the Nǔwa Project and the improvement of the net, there is

reason to believe that China is and will eventually come into the network society. Instead of mending the sheepfold after losing the sheep, it is better to take precautions. The network psychology studies provide people's social practice with a new frame of reference.

12.2 Network Interaction Psychology

12.2.1 Network Interaction

1. Content of network interaction

Judged from the perspective of media evolution and human behavior, the essence of the interaction is human behavior interactions. With the increasing popularity of the Internet, the topic of online interactive is gradually warming up. In the future the information industry will undoubtedly become one of the earliest and largest departments of socio-economy. The computer network can provide a social, economic and rapid access to information. The network has become the most important information infrastructure of the whole world. From the application's point of view, its main purpose is the resources sharing, network communication, interaction and cooperation. Network interaction is an important form of application.

The content of network interaction is more extensive, including users information transfer, exchange of emotions and communication between hearts of people. That is a phenomenon for information exchange between users. Users shift between the reality of social environment and virtual network environment, which leads to a wider scope of interaction.

Usually network interaction is achieved by using specific software in some dialogue model on the basis of network communications. Due to the wide area covered by the network, Internet interaction is extremely wide-ranging in scope without the limitation of the geographical distance. In the following part we will analyze the composition of the network users and the form and feature of network interaction. Such detailed introduction of the content of the network will offer the readers a perceptual knowledge and more profound understanding of network interaction.

2. Form of network interaction

Network interaction based on web communications is a method of interaction which uses all means of information, including text, data, voice, graphics, and images to implement a modern interactive way for the cooperation between the network customers. The wide range of interaction includes network coordination, press releases, information exchange, online discussion, online conference, network management or online entertainment. The forms of network interaction can be

divided into various forms based on different standards or perceptions. Several specific divisions are as follows:

(1) From the connection of network communication, network interaction can be divided into two-person interaction and multi-person interaction. Double interaction is relatively simple and the direct point-to-point transmission can be used. Communication can be conducted in an equal or unequal manner. Communication in an equal manner means both sides are in the equal status and can send information to and receive information from each other, enjoying the sharing of resources. Communication in an unequal manner means both sides are in the unequal status and sending or receiving message of one side may be restricted to just one side. Only one side can manage the resource and offer service while the other side can use the service. As a point-to-point direct link is used in two-person interaction, communication control is relatively simple. As long as the transmission network allows, we would achieve most of the interactive function, such as real time interaction, non-real time interaction, and equal visualization.

Multi-person interaction is complex. The ways of communication link include distributed multipoint-to-multipoint connection and centralized single-point-to-multipoint connection. Communication can also be conducted in an equal or unequal manner. Specific forms of communication links can be further classified according to different applications, e.g., network press release only requires the link between every customer and the service center to achieve the dissemination of information from the customer service center and customers sending their request. Such application as network office, network collaboration, network entertainment, etc., also require the link between every customer and the service center to enable all the customers to handle the resources on the server that response to them at any moment. In addition to the link between every customer and the service center, online conferences and online chat also require the transmission channels between each customer achieve the equal visual picture of the scene between the various clients.

(2) Network interaction can be divided into real time interaction and non-real time interaction according to the time requirement of interaction. The real-time interaction requires people participating in the interaction to keep linked to each other so that information is transferred immediately. The typical examples are online games, online conferences and online chat. Its real-time characteristic requires high network bandwidth, short-term storage of information and dynamic client groups. If multimedia interaction is needed, there is higher demand for network bandwidth. Off-line interaction does not require participants in the interaction to keep linked to each other during the interaction. Interactive information and operating results can be stored temporarily and the transfer of information delayed. Network office is a case in point. Its non-real-time characteristic requires low network bandwidth, long-term information storage and the steady-state of the participants during interaction.

The real-time feature of network interaction will affect the internal design of the server and client software of interactive systems such as data storage and management, static user management, dynamic role control, information processing, concurrency control, consistency control of information sharing and choice of services. It will also affect the design of communication protocols such as telecommunications, transmission mechanism, and remote synchronization.

(3) According to the transferring form of interactive chat, network interaction can divided into multimedia interaction and non-multimedia interaction. Multimedia information should be considered in multimedia interaction, while in non-multimedia interaction multimedia information needs not to be considered. Multimedia interaction puts forward higher requirement for transmission performance of networks and terminals. So it does for the data storage and processing, and compression coding design.

3. Characteristics of network interaction

Mankind is entering into the Internet era. This unprecedented information technology revolution results in the changes of the production and lifestyle of the whole society. From interpersonal relationships, the network endues the relationship between and structure of people with a new content. It fundamentally changes the traditional way of social interaction and communication between people from time to space and forms many unique concepts and criteria. Meanwhile, the development of computer networks brings about many political, legal, ethical and social issues. The direct impact on the human contacts forces mankind to re-examine this era and society and reflect on the pros and cons of the network.

The network provides such a unique interpersonal communication space and it is this feature of the network that determines that interpersonal communication is different from the real social life. Taking advantage of these new features will help people correctly and healthily expand exchanges space and establish new inter-personal relationships. Compared with traditional society, the network interpersonal contacts have following basic characteristics:

The first characteristic is its openness and multi-polarization. Internet exchange exceeds the space and time limit and eliminates boundary between “here” and “there”, expands the interaction between people and interpersonal relationships, and makes interpersonal relation more open. The birth of e-community makes people living in different areas communicate and entertain “together”. Meanwhile, an ever-expanding range of contacts will make people’s social relations develop in the direction of diversification and complexity.

The second characteristic is its independence and arbitrariness. The members of network can maximize their participation in the information production and dissemination. This offers the members of the network more freedom instead of external constraint. Meanwhile, the network is based on the purpose of sharing resources and mutually benefit and reward, the Internet users have the right to determine what to do and how to do it, but due to the lack of necessary restraint

mechanisms for the Internet users, they have to control themselves. Therefore, some people would indulge themselves in the Internet, arbitrarily lie and hurt others, and some of them may even play a variety of roles for false communication with others, which has resulted in the great arbitrariness of online exchanges.

The third characteristic is its indirectness and extensiveness. The network has changed the contact between people. A clear feature is that it changes the face-to-face interaction between people into the interaction between man and machine. Its indirectness is obviously shown. Such indirectness also determines the extensiveness of the network exchanges. In the past, the time limit has been a major obstacle to conduct more extensive exchanges, but in the network society, that obstacle no longer exists. As long as you like, you can conduct direct "dialogue" with anyone on the Internet.

4. Form of network interaction in realistic society

In this era of information technology, time and space is no longer an obstacle. In this network global village, all information and resources has become so cordial. Making more use of the Internet can enhance the quality of life and give users more interesting things in life. Now let's look at the form of the network interaction in the real society.

(1) Network teaching

The traditional teaching pattern is a single-direction transfer as well as a combination of theory and practice. It has been proved that such a low-efficiency teaching mode lacks exchanges between teachers and students. The teacher plays the major role in teaching while the students learn passively. This approach called by some experts as the "spoon-fed" teaching method, which refers to cramming and irrigation of knowledge, irrespective of whether they can absorb. The course of teaching reforms in recent years, many people put forward the "discussion", "questions and answers" teaching mode, a certain degree of improvement compared to the traditional "spoon-feeding". In the recent years, the campus computer network in universities is gradually established and such a network-based information-sharing facility offers convenient advantage for the university teaching and research and provides a new platform to facilitate the teaching reform in a very favorable conditions. Relying on the network, it provides a new environment for teachers and students to teach and learn respectively according to the characteristics of the network. That achieves a flexible and efficient two-way interactive teaching and truly lives up to "teaching" and "learning". The interactive immediate network brings so flexible space for teaching and changes the invariable teaching mode in the past. Networks can be used to promote the cause of education takeoff.

The advantages of "network teaching" through network interaction will be briefly introduced below. Such advantages of the network are just the reflection of the advantages of network interaction in reality. Now, let us see what new changes the network interaction can bring to teaching.

Firstly, the network has its own unique characteristics: The network is a two-way interaction that both sides on the network can communicate with each other, talk to each other and put forward questions. Further more, because both sides are not really visible in network exchanges, some more introverted students can express themselves, then it is such a fair and extensive way of exchange that all students have the opportunity to ask questions. Thus, it offers a wide range of opportunities for the teachers and students to exchange ideas, and help students promptly solve the problems encountered in the learning process, avoiding loopholes in the existing knowledge and eliminating the remaining questions.

Secondly, it brings about the feature of real-time contact on the network. In class teaching the students can only learn in class. Instead, the Internet is open 24 hours a day, so teachers can put the teaching material on the Internet and students can learn online not only in several hours classroom time a week but also at any time in a week through the Internet. At the same time, the missing part of the classroom can be made up after class. Thus, this would make full use of students' spare time for study since learning is not confined to the classroom. Network everywhere also brings convenience for teaching. Students on the campus can learn online through any computer connected to the campus network. Now computers connected to the network can be found everywhere in many universities and colleges, in the practice rooms, public rooms, libraries, classrooms, and even a lot of student dormitories. So there are more opportunity for students to learn than going to the classroom. Previously, the students had to contend for classrooms, nowadays, study areas are everywhere, it is not necessary to do that.

In addition, the network can provide both the teachers and students with real room for discussion and there are far more "discussion" opportunities here than in the previous "discussion" model of teaching. Compared with the discussion in common sense, Internet "discussions" has many unparalleled advantages. First of all, such discussion can be conducted at any time. Regardless of whether you are in a dormitory room or in schools or other public places, you can discuss with other people through the Internet, removing the time limit and the shyness of meeting each other. Is not such discussion exciting? Moreover, such a "discussion" can be held real-time or at intervals. People can fix the time for discussion in advance and get together in "live" discussions. Discussion can also be held in the way of leaving message which truly reflects its convenience, because such discussions can be conducted at any time, and there's no need for any appointment. As long as you are online at a certain time every day, leave your question on the Internet, then when you have access to the Internet next day, I am afraid there will be a lot of people leaving message, and you can still express your points of view. Both the teachers and students can participate in this discussion in which the students can explain their own viewpoints and the teachers can provide appropriate guidance. It is believable that such "discussions" will bring good results.

Network teaching is currently feasible and effective. By using the network in

teaching, we can develop appropriative network learning system or use the common application platform for teaching that is now able to meet the basic education needs. The existing teaching methods can be used to achieve the following:

The teacher may first establish a home page on the Internet, and then upload contents and the solutions relative to difficult problems on the home page along with the progress of teaching. Students can have access at any time to the contents of the course for online learning.

In addition, the teacher can use e-mails to establish a "mail-box for difficult issues", through which students can put forward the problems encountered in the learning process. He (or she) can also establish a "Teaching BBS", on which students can put forward various problems encountered in the study, elaborate their views, discuss with the other students. Meanwhile, the teacher is able to offer some guidance, in this way an active learning atmosphere is formed. Maintenance of "Teaching BBS" can be carried out by the teachers or monitors.

Then chat room can be employed for real-time exchange. The teacher and students can agree on a fixed time in a week when the teacher presides and all students participate in the chat. The teachers give on-the-spot answers to the problems students have encountered in a week, so in the most expeditious manner, the remaining questions are all resolved promptly.

Test work also can be uploaded onto the Internet. The teacher places the test questions on the home page so that students can conduct their own online test and understand the result of their study, and the answer is also sent back to teacher through the network so that he (or she) evaluate the students' grasp of the knowledge and make some adjustments to the focus of his (or her) teaching in the future.

The existing network has become a very good platform for teaching, we must take advantage of it so that it really plays its role in teaching. The idea of network teaching should be forced into every teacher's mind in order to change their inherent viewpoints on teaching and totally discard the traditional "spoon-feeding" teaching model. Now that high technology has provided us with an excellent teaching environment, interactive teaching should become the main mode of teaching for a qualitative improvement in teaching and prepare for the education takeoff in this century.

(2) Internet broadcasting

It should be said that the Internet broadcasting is a kind of network stream media. In the Internet sites, it set up broadcasting server, on which special software runs to broadcast program. Through the installation and operation of receiving software connecting to these stations we can conveniently listen to the radio program and read messages.

People can replay at any time the music, images, or fragments of any article through the Internet broadcasting, which has extensive coverage, fast speed, large volumes of information, convenient query, repeat broadcast, simple reproduction, and which contains data, text, graphics and image. Although network stream

media includes not only Internet broadcasting, it is the most easily understood and accepted. The term Internet broadcasting mentioned in this paper refers to audio and video network services. Internet broadcasting has both the flexible and lively character of the traditional radio and the interactive character of the Internet, and is also in accordance with the instinctive characteristics of mankind to receive information in the form of audio-visual better than in the form of characters. Therefore, this form of media is widely popular with network users and become a bright star on the network as soon as it appears.

At the present age when wideband network technology is changing everyday, it is relatively easy to set up network broadcasting with relatively small investment as its inherent advantage. Countries all over the world pay great attention to the development of the network broadcasting. According to incomplete statistics, on the Internet there are more than 3,400 video broadcast websites and 3,600 audio broadcasting websites using Real Player, more than 6,000 hours weekly broadcast/audio programs and more than 2,300 hours of VOD programming. Judged by the contents of the broadcasts from abroad, single-topic audio/video broadcasting websites account for 60% of the total amount and integrated content audio/video broadcasting websites account for 40%. Domestically, the Pearl River Economic Radio Broadcasting Station in Guangdong launched the first real-time broadcasting on December 15, 1996. CCTV in 2001, 2002, made a live broadcast of the Spring Festival Gala of 2001 and 2002 on the Internet. How can people keep uninterested facing such rich resources of the network broadcast media?

Network broadcasting is a new form of media, and is slowly becoming an important means of sales promotion. Its rise brings inevitably impact on radio and television, but a new channel for network broadcasting has been opened up by a combination of the information resource of radio and television and technological advantages of the Internet. Like radio and television, multimedia network can offer a reappearance of the scene of the incidents and the voice of people. Meanwhile by providing background information and analysis with words and pictures and providing links to other related information, multimedia network can make the news closer to the objective facts so that the audiences feel personally on the scene. And its digital interactive contents lead to the integration of various types of information and the change from a single media performance in the conventional way to the use of multimedia in broadcasting. From the point of view of the masses, multimedia network radio will be the first choice for them. It can be seen that along with the continuing development of the Internet technology, it is an inevitable trend for the Internet audio and video broadcasting to be a part of the Internet. Although broadcasting network is an immediate service, the rich Internet database enables the audience to store and record many of their favorite program information so that they can repeat listening and also release broadcasts by themselves in the network. The above-mentioned functions are impossible for the present broadcasting. At the same time of broadcasting, all listeners can also enter the chat room directly and do immediate interactive

communication with the host by words. In addition to live broadcasts, repeated highlighting programs and the interactive games, people can also lead the e-commerce sales through e-commerce shopping mall and the function of the social groups on the net.

(3) Online Chat

Internet is a new language communication media appeared along with the arrival of the information era. Its appearance leads mankind into a new world. This invisible "network" always provides us with countless amounts of information and detailed services. Its unique charm has been attracting more and more users and increasingly changing people's traditional ways of communication. This new type of communication mode, known as total "computer media communication", includes e-mails and so on. In this communication process, the network created its own language and resulted in a unique linguistic phenomenon.

Online chat is a type of communication across time and space in which the participants input words through the keyboard, read words on a computer screen and this makes words the information carrier. This is a two-way exchange in the same time period, receiving and imparting information being a continuous ongoing process of the same period. Being different from the traditional face-to-face exchanges, online chat lacks specific social context information. Without specific social settings, the exchanges between the two sides cannot rely on gestures, body language, facial expressions and other nonverbal accompanying features to assist communication. As the network chat requiring keyboard input, the words are used to record the changing instable mental activities of human beings. That makes it easy for people to express and remember their ideas, so it has the advantages of written exchange. At the same time, because of its strong time effect, random expressions and free use of grammatical structure, it also has the strengths of the oral communication. This brings online chat with the features of both oral and written language, blurs people's traditional understanding of spoken and written language and form a unique linguistic phenomenon.

Developing from the original text to present audio and video chat, online chat is deeply loved on the Internet and video chat has become a trend in today's society of leisure and recreational activities. Hardly can we find people online without chatting experiences. Interactive chat has been regarded as an important part of a network by the overwhelming majority of the netizens. The focus of this chapter is to analyze the psychological state of online chat users in interactive process.

12.2.2 The Appearance and Analysis of Network Interaction Psychology

1. The need of acquiring information, help and study

The rapid development of modern information technology provides more

convenience for the study of the human condition and prompts people to be more active and efficient in development of self-learning in order to deal with the challenges posed by knowledge-based society. Especially after considering the current network technology (Internet) developing rapidly, people felt more urgent about the impact of information technology on people and the challenges it brings about the concepts and methods of human study. For this reason, the concept of network learning is brought forward here to discuss people's continuous requirements of knowledge in order to make constant progress and win the fierce competition in the society in the background of the rapid development in information technology and deepening of knowledge economy from concept to practice. Along with the rapid development of global information networks technology, individuals as the members of society should change the inherent learning concepts and build up new learning concepts based on knowledge and information. In the rapid development of information technology, network learning has been gradually transformed from possibility to reality. In the future of knowledge-based society, only those who not only have network learning concepts but also have the network learning ability have the foundation and conditions of surviving, learning and self-development in the future.

Reform of learning concept: network, if only from the literal interpretation, is rich in its implications. The network, here, refers to the information network established by using computer and communication technologies. Usually, it refers to the Internet (the Internet) and enterprises internal network. And the latter also adopts a general agreement and norms to have access to the Internet, and become an integral part of the Internet. Learning network mentioned here is Internet-based, though it is not confined to that.

The Internet develops astonishingly fast and has increasingly strong effect on people's living and studying. The latest statistics shows that during the last few years, online computers as well as the number of Internet users have reached several times as before. With the development of networks, we also have the possibility of a new learning and cognition. With the pervasive use of the Internet, the earth seems to become a small village. People get all the information on the Internet, study computers and other new technology, learn, work and lie fallow, obtain free resources and connect people from all over the world conveniently. With the in-depth development of network technology, the Internet information age will arrive inevitably. In the Internet age, everyone can meet their own needs and interests through a computer or other equipment connected to the information network, access to thousands of libraries and resource base, and the ability and ways of individuals to obtain information will be greatly enhanced. Accordingly, people's life and work, particularly the self-education and self-learning methods will undergo major changes.

Internet is full of various forms of complicated information, which is updated very quickly, in addition to the efficient exchanges between people, acquiring the

knowledge needed from the network has became an important channel for people to update their knowledge. In this situation, people, at least face two options. One is to sit by the information network and cling to the study and learn idea that they have become accustomed to. The other is to consider seriously the far-reaching impacts of the network and then adjust their ideas and actions to make them living in the tide of the times. The latter way of thinking, in fact, is a future-oriented learning concept, or called "Learning from the future". The concept of learning from the future stresses the insight and foresight training, imagination exploitation and creativity, and policy and strategy formation. It is a process of exploring the unknown, and calls for comprehensive analysis and choice from existing information, through the ideas and planning to imagine the possibilities for the future. Although it has yet to be defined, we have the wisdom to form a basic understanding of the future; with this basic understanding, we can create the future we want step by step. Therefore, the basic pattern of "learn from the future" is cognized through imagination and experience, thereby creating the future. Learners adopting the learning from the future strategy can give full play to their imagination and creativity, obtain an advanced knowledge and experience of the future before others do, understand the future status, and then establish the most suitable strategy for their own learning and development according to their own conditions. The use of such a concept to analyze study choices facing in the information era will help people find that in the information society, the individual's capability of accessing to, using and processing information will increasingly become an important factor in its development.

Under such far-reaching impact of the network on the environment, people who do not adjust themselves to the sea of information certainly cannot strut their stuff in the information age. It is hard to imagine that the individual in the information age can achieve self-learning and development by solely relying on the original and effective ways. The development of information technology not only breaks the boundaries of time and space of education but also speed up the progress of updating knowledge and information. Individual development level, to a greater extent, depends on the individual capability of making use of new information for self-examination and self-learning rather than his inherent knowledge.

In fact, each person's life, study and work will become increasingly close together. People learn from their study, be educated in life and learning is fused into every process of the daily life as an integral part of work and life. You will be very difficult to distinguish between conscious learning and unconscious learning, and learning will become a necessity rather than something driven by external force. In this way, education for the individual is more of an opinion or awareness, or a conscious or is a spontaneous action or behavior rather than a specific indicator or specific forms of learning. As a mature individual, when choosing appropriate way of learning, one needs to consider whether to choose traditional

learning habits or to adapt to the requirements of the information age. In summary, learning in information age should be active learning, learning based on the information, learning with multimedia as a primary means, and learning established on the network. This learning concept can be summed up as network learning. It can be seen as a study options based on the reality of the age of knowledge and information. We should take forward-looking vision to think about the future and meet the challenges; network learning is just the weapon to cope with such challenges. The rapid development of information technology, taking network as the core, will not only make network learning possible, but also turn it into a realistic and natural choice.

2. The need of Emotional Interaction and mental communication

Human in itself is the type of creature who needs emotional interaction. All the people need mental and emotional exchanges no matter how great they are or how profound their knowledge and ability are as long as they are human beings. Psychologist Maslow (A. H. Maslow) deemed that the actions were carried out by the need and there were different levels of people's needs, e.g., the physiological needs, the need for security, the need for subordination and love, the need for respect and the need for self-actualization from low level to high level. Along with the growth and psychological maturity of people, such needs develop from the junior level to senior level while constraint each other. The high-level needs, in particular, can adjust and tolerate the low-level needs. Psychological research shows that for different kinds of people there are different levels of confusion and desires varying in degrees and forms. They anxiously need mental and emotional exchanges, guidance and help.

Today, at the same time when people are actively creating and fully enjoying the material and ethical progress, they are more clearly aware of the adverse effects of the scientific and technological progress on social development reflected in the increasingly complex relationships between people and the relationship between people and the environment. The quickening pace of society, growing competition and the difficulty to strike balance reflect on people's psychological contradictions and conflicts. The psychological stress of life events have led to increasing social factors so that psychological problems increase. Depression, neuroses, adjustment disorder and all kinds of psychosomatic diseases have indeed disturbed people's mental health. When you feel helpless in busy work, complex interpersonal relationships, parent-child relationship or husband-wife relationship which caused unsustainable burden on your mind or severe psychological conflicts, put aside all the troubles for the moment.

With the development of society, the ever-accelerating pace of life and the intensified competition, interpersonal relationships are becoming increasingly complex. The rapid development of science and technology and explosively increase of knowledge force people to renew their knowledge. The highly

concentrated population and urbanization result in living and traffic congestion as well as that of people's heart. Changes in consumer attitudes and concepts of modern life result in the conflict between generations. The pursuit of self-responsibility and self-enjoyment causes mental confusion and conflict. These can give people tremendous psychological pressure, which poses a serious threat on people's health. Therefore, in reality, there will be inevitable conflict or psychological pressure on the health of either individual or groups of people. They may cause psychological stress, psychological crisis, and psychological disorder. It have become a pressing need and common concern to prevent and eliminate all these psychological problems, enhance mental environment, improve the quality of life and psychological health and create harmonious space.

In reality, there is a universal problem in people's inner world which is ultimately caused by a lack of emotional interaction. The network generously meets the needs of the people's emotional exchanges. As long as one knocks the keyboard he will see a brand new world displayed on the computer screen, where there is an inexhaustible wealth of knowledge and experience offered by others and where there are good teachers and friends who are always very patient to provide knowledge, treat people equally and deal with things fairly without asking for return from others and regardless of the troubles caused them. There people can learn from each other about the cognition of the world, the way to do things and get on with others and the skills for survival. There people can be understood, respected and loved by friends; and people can communicate and exchange theory and analyze difficulties.

People use the Internet to chat, to learn something, to display themselves to others and to fully satisfy their own development needs like swimming fish in the sea and flying bird in the sky. For example, a poor-looking student once has little confidence facing the teachers and students in the classroom in class discussion, the comment he made was always overlooked because of his poor appearance. then he simply refused to give his opinion. But later, he finds that people were not judged with their appearance on the Internet where people only see the words by which he and others express ideas, feelings, and manner, and other types of interference are naturally excluded. In his first online discussion, he displayed profound ideas with precise language with witty humor. In no more than two days, several key pals wrote to him agreeing with his viewpoints and stood at his side in the debate. He was very excited and thought that the Internet offers him respect regardless of his appearance and give full play to his potential.

Like telephone communication, network communication has played an important role in life, but its safety must be also considered. In some case, it causes the double hidden troubles to people's mental safety and personal safety. However, the benefits are also obvious. Nevertheless, to a natural person in the society, time is too precious to be spent in chatting. Network chatting is not to be popularized, nor should it be totally banned. If we use network chatting properly, it can become an important means for study and communication.

12.2.3 The Effect of Network Interaction Psychology

1. The network interaction speeds up the development of the network

Network Interaction is the soul of network and an important aspect of network applications. Moreover, network interaction has speed up the development of the network to a certain degree, mainly in the following two aspects:

(1) Love of network interaction makes the enlarging numbers of the Netizen

The process of user's interaction promotes the development of the network into thousands of households. Most of the Netizen began to surf on the network and enjoy it because of the charm of the interactive network. From the 16th survey report of the China Internet Network Information Center (CNNIC), it can be seen that total number of the Internet users in china is still growing quite rapidly. Network interaction has played an irreplaceably important role in the growing number of Internet users in China.

The effect of the network interaction on the growth number of Internet users is reflected in the composition of information flow. Now, the rapid growth of the total number of Internet users in China has been the attention of the world. However, the number of 210 million of the Internet users in China occupies only 16% of China's total population. This shows that despite the large number and the fast growing rate of Internet users in China, Internet penetration is still very low and there is plenty of room for development. It is believed that in a few years, network interaction will continue to make contributions to the growth of the Netizen.

(2) Network interaction software and media develop rapidly with the boom of network interaction

Since the day of its birth, the purpose of the network is to facilitate people to share resources and exchange information. Therefore various types of user interaction software and the media for the Internet are available and the methods of interaction are varied. Some common methods are electronic bulletin board (BBS), e-mail, website, Microsoft's MSN, Tencent's OICQ etc. Large numbers of BBS hosted by various universities for exchange on academy and science and comments on popular information have become a major online enjoyment. The development of such famous BBS forum as Shuimu Tsinghua, Little Lily (Xiao Baihe), Terracotta, Making the best of both worlds, Becoming like Old Friends at the First Sight Gratitude for the Sources of benefit and so on has provided a tremendous impetus for our academic progress.

Even if exchange on the Internet is so rich and colorful, some software developers, together with web designers in enterprises, are still exploiting new software or designing new websites, and some perfecting the existing software. To meet the needs of users, Internet broadcast and other online services have been launched, promoting the Internet as a platform for the development of related businesses. People show their demands in the course of the information

exchange, which promote the development of search engines. The Chinese search engine (www.baidu.com) was inaugurated by Mr. LI Yanhong and Mr. Xu Yong by the end of 1999 in the Silicon Valley of the United States, and in 2000, BAIDU started its development in China. With the unique "hyperlink analysis" technology, the high processing speed of over one hundred million Chinese web pages per second and a huge server group, they have established the quickest Chinese search engine with the biggest amount of data and fastest updating speed, and set up a banner of Chinese Internet technology. Since it entered the Chinese software and the Internet market, Baidu relies on its own strength to offer an excellent search engine for the majority of the Chinese people, the most advanced network marketing tools and enterprise application software with intellectual property rights for the Chinese enterprises. The ranking of the small-and-medium-sized enterprises in Baidu has become a competitive marketing tool for these enterprises.

2. Fun with the network interaction

Let's surf on the Internet and cruise in sea of information. Let's pick up the mouse and keyboard and enter into the mysterious digital world. Books are not the only means of acquiring knowledge, TV is not the only way to read news; and the exchange between people is not only conducted in oral discussions. Perhaps all these are realized because of the network.

In the past, a computer could not be connected to the network and served as an entertainment for playing games at leisure. Since a modem was installed on the main board, many people have been fully engaged in a wonderful world although the transmission speed was only 56 kbps. They use the Internet to look for information, learn knowledge, understand the state affairs and exchange ideas with others, all of which bring about endless fun for people.

On the Internet, there is unlimited knowledge waiting for exploitation. It's a treasury and a Gold hill! Being different from learning at school, people can have access to knowledge; make learning more convenient and more interesting without any restrictions of the weather or holidays.

On the Web, news event will be immediately released and people can be informed through the Internet of the New York terrorist attacks or the Chinese football team crashing into the World Cup finals immediately. People enlarge their horizon of knowledge and current affairs not only through the newspapers, radio and television. As long as they click the mouse, all the news is unfolded before our eyes. We can make the right decision to achieve success from a place thousands of miles away while staying at home!

On the Internet, tens of thousands of friends share views and exchange experiences and share interests and hobbies with you. Nowhere in the world is a better place for unconstraint communication irrespective of the national boundaries and languages. When you are lonely, just chat online; when you have something good, just share with friends online. Now, in an era of rapid development of

technology, only the network can drive you progress toward a better tomorrow! There is endless fun on the network.

3. Network interaction—coexistence of happiness and unhappiness

Network Interaction brings positive and negative impact at the same time. With the acceleration of globalization of information, it is an inevitable trend that more and more people surf on the Internet. A major part of netizen are young people, but young people lack of ability to tell right from wrong since they are not yet ripe ideologically and do not have a complete knowledge of the society. People have tried their best to conceal their social class, gender and occupation so there is no natural authority and no privileged figures outmatching others, which is impossible to be achieved in reality. However, the intricate and complex network information has a lot of adverse effects on and a lot of harm to young people. This is the worry brought to people by network interaction.

A survey reported that in large and medium-sized cities the young people contacting with the network account for 70% – 90% of the total. Survey report on the status of young people using the Internet and the impact of the Internet in Beijing, Shanghai, Guangzhou, Chengdu and Changsha shows that the number of males is slightly more than that of the females. The higher the grade means the higher the proportion of users. The higher the educational level of the parents, the higher the proportion of their children using Internet. Nearly 80% of the young people use the Internet from the beginning of 1999 and 27% of users connect to the Internet through the modem. As to the location of getting onto the Internet, home is the highest proportion (58%), the net bar (20.45%) is the second. The average time online of the young Internet users is 212 minutes per week and the frequently accessed websites are www.sina.com, www.sohu.com and www.163.com. 60.3% of their online time is spending on the mainland Chinese websites. The majority of parents restrict the time of their children online, but there are still plenty of young people going to bars. The main online task of most young people is making friends, chatting, playing games, and checking information. The most valuable and the most rewarding thing for young people are information searching and learning, but its time accounted for less than 5% of the time of young people online. Of course, there are still a small number of students who can make good use of the Internet. They exploit data, learn knowledge, make study friends and exchange experience, and also play a game only when they are tired.

Online friends are an important form of international contacts for teenagers, and also an important way of socialization. However, because of the virtual nature of the network, there are machine barriers between people's contact. This interactive exchange wipes off many social natures of the two sides, with the feature of "socialization" features, but is far different from that of realistic society. Moreover, the contacts are mainly between compeers and there are little communication and interaction between generations. The little Netizen riding the

whirlwind on the Internet are often just “Internet fool” who may not be able to adjust to the society when they are offline.

The soul of the network is interaction, and the most direct form of interaction is the communication among people from different places. Unlimited communication is the essence of network. It is its own feature of being virtual that offers enough imagination and exertion space, thereby achieving the purest soul collision. There are many ways of exchanges, chat undoubtedly being the first choice, and the desire of young people for friends pushes the appearance of chatters the number of OICQ registered users has rapidly increased up to 50 million with the number of users online exceeding one million. Because of the flourish Web chat rooms and the sweet voice chat, it was declared that the Internet have degenerated into cheap Internet chat tools. The benefits of the network exchange should be taken advantage of. There should be a proper degree of enlarging our horizons or making friends. We should stop where the limit is and go beyond the limit is as bad as falling short.

4. New campus fashion: online moral education

It has become a new trend among some educators to extract the ideological and moral education of the students. Generally, both the teachers and students hold that comparing with the face-to-face exchanges, network exchange has at least two advantages. Firstly, it protects the privacy of students effectively and ensures that teachers are just solving problems without hurting the students. It greatly reduces the psychological pressure of face-to-face exchange. Many students feel that they are sometimes contradictory. They are in need of the teachers’ guidance and help; on the other hand they are just afraid of walking into the teachers’ offices. They feel it is a kind of invisible pressure to walk into the office to make an initiative appointment with the teacher. Secondly, the unique equality and relaxed atmosphere of the network facilitate the equal exchange between teachers and students. Even a serious or terrible problem can be discussed and resolved in a relatively relaxed atmosphere through the network, which reflects the greatest degree of equality.

Experts pointed out that at present there are not enough teacher-student exchanges in many schools, one of the major reasons of which is that time cannot be guaranteed. Many schools arrange 9 classes a day, so that the teacher can find no other time to communicate with the students instead of the noon break, especially when teachers want to communicate with more students. These web-based exchanges are only a small part of the normal moral education. Teachers also worry about that too much communication and education via the Internet will add to the fascination of some students to Internet and produce a negative effect.

Information are highly concentrated on the Internet, from science and technology to the cultural landscape, from music to video, all is displayed to the world all the way as graphics and text in the face of people through the Internet. Click a mouse,

then the information will be shown to us. Young people's initial purpose of access to Internet is to catching up with the trend, but now more young people are attracted to the abundant information online. The fast, and convenient systems of obtaining information online have been used by the youth and bring great convenience in acquiring knowledge, which indicates the change of the teenagers from passive acceptance of knowledge into initiative learning.

The Internet develops fast with the short updating cycle and a high degree of openness. As the crystallization of the modern high-tech and advanced technology, the Internet organically integrates modern science and technology, and various information resources to let people feel the impact of the latest achievements of science and technology in the first time; and this precisely meets young people's curiosity for novelty and change. The growth of youngsters is a process of constantly accepting new things, new concepts and new ideas which can be promoted by the rapidly updating network technology and the information.

As a tool for the exchange of information, network provides the youth with a platform to display their talent on. Some of them who are good at computers establish a personal web page on the Internet to publish their personal learning experience, exchange ideas and provide free technical support for those people who need help. Meanwhile their own talents can be recognized by others. But we should also see the Internet's negative impact on the growth of young people. The rich-informed network provides the youth with health and practical knowledge. At the same time it brings them much useless information. Besides, the net is full of obscene or violent information input by some websites for attracting more visitors. According to incomplete statistics, 40% of the non-academic information on the network is yellow information which appears very arbitrarily. But since young people do not have enough capability of self-control and certain standard for obtaining information, it's very likely that they will be easily affected by such unhealthy information which is a hidden danger for their growth.

In fact, the network is a society and in such a virtual community where people appear in the form of symbols. Moreover, the network is a highly free place where the inexperienced young people cannot fully understand key pals and can only get some information about them through words and deeds. The young people are not able to control their own words and deeds and sometimes make evil friends, which result in disastrous consequences. When asked whether to meet network friends, 39.36% of the young people said no, 37.72% choose to meet their key pals accompanied by parents or friends, and nearly 20.71% choose to meet themselves.

Many educational and psychological experts point out that the network has become a "pit" in many young people's growth. The school and the families cannot shirk their responsibilities to help young people get cross the pit successfully. On one hand, the schools should strengthen ideological and moral education of students with Marxism-Leninism and Mao Zedong Thoughts, guide them to their belief in communism and the firm confidence to take the socialist

road and establish a correct outlook about life, world and values. On the other hand, the schools should give the students appropriate training on computer and the Internet skills to enhance their judgment, guide them to choose friends and to tell right from wrong. The parents should improve their own level of operating the computer so that they have certain understanding of and offer guidance for the children's surfing on the Internet.

Science and technology is a double-edged sword, which is the eternally unchanging truth in the history of the development of science and technology. Network, as a newborn baby of the information society, also have such a feature. The network improves the quality of life with its efficient and convenient technology while it also displays it negative impact thoroughly. The high degree of openness of and mixed information on the Internet make some weakly self-disciplined young people unable to control their own words and acts on the net, and with the lure of harmful information, rebellious thoughts gradually sprouted more or less in the ideology of these young people.

12.3 Network Application Psychology

12.3.1 Psychology Characteristic of Network Application

1. Psychology problem in network

According to the China Internet Information Center statistics, up to Dec. 31, 2007, the number of the Internet users in China has reached 210 million and non-adult users accounted for 84.2% of the total number. Each school and every family are gradually covered by the network which brings great convenience to people's life, work, and study. However, the rapid development of the network brings a lot of hidden danger to the physical and mental health of people, especially young people.

Psychologists worry about the generation who will grow up suffering from "emotional apathy syndrome", which is shown by lacking corresponding emotional response to the stimulus from the outside world, being cool to friends, losing interest in things around, expressing in stiff face, lacking inner experience of mind, and the worst of all, being indifferent to everything. In fact, emotional indifference is just one of many psychological problems and more serious psychological problems (and develop to the psychological barriers and mental illness) are not revealed in a lot of the young "netizens". According to reports, a sophomore girl in Wuhan abandons herself to network leading to mental disorder and increasing negligence to study. Changchun Central Hospital for Neurology recently found more than 10 cases of patients with mental disorders because of uncontrolled surfing on the Internet. According to observation, in the network environment psychological problems mainly manifest in the following aspects:

(1) Lying: People roaming on the network need not real name and identity. "On the Internet, no one knows you are a dog." this aptly reflects the main features of online communication—you cannot only anonymous, but also hide your gender, race and social status. In this virtual space, there is no responsibility and obligation for exchange between people. Therefore, some unhealthy psychological problems hidden in human nature will be generated or reinforced, lying being the most serious one. A teenaged netizen once said: "No word on the network is credible. You can prove yourself to be an idiot if you have been cheated and you are said to be a fool if you do not cheat" The survey showed that many primary and middle school students learnt to lie from the network society and enjoyed it.

(2) Isolation: On the information itself, the Internet is open and can make young people arising from a more comprehensive, lively and vivid information, but to the accepters of information, the process of accepting information is relatively closed. Although a lot of websites are interactive, but it relies on the cold network, computers and other equipment acting as intermediaries. Once the young people leave the Internet, it is difficult for them to express themselves or communicate with others. "I had been online for so long a time that I even forgot how to speak." This is the confession of a netizen. This inevitably results in young netizen feelings lonely. Psychologists have pointed out that when a person focuses on a particular thing, there are different degrees of negligence on other things. Dependence on the virtual world of the Internet will inevitably cause a psychological loneliness.

(3) Impulse: On one hand, virtual space is a bottomless pit you will never be able to have a full understanding or even a real touch. However, you cannot resist the desire of diving into it. The more you indulge in, the bigger you'll find it is. When facing unpredictable and too large things, people will have the psychological fear and manic; on the other hand, due to the lack of normal emotional exchange on the net, it is difficult for people to accurately express themselves on the network. In addition, because of the stimulus from the blundering words and pictures on the Internet, young people cannot keep calm and usually behave impetuously when facing incidents.

(4) Violence: The more serious problem than impulse is the psychological tendency for violence under the ill network environment. Some young people who have seen little of the world indulge themselves in the large numbers of violent games on the network resulting in the worship for violence. They expect to resolve all the problems or achieve all their goals through violence. Therefore, the Internet bar fights or arguments and killing caused by conflicts on the net happen frequently.

(5) Licentiousness: Pornographic websites are good at seducing people's sexual impulse and stimulate people sensory. Its dirty language, pornographic pictures and obscene sounds are attractive to young people in the period of sexual bud. Puppy love, sex indulgence phenomenon and the lack of basic awareness of chastity exist in many middle-school students surfing online.

(6) Inanity: The network is excellent as well as virtual. The reality is objective but often harsh. It is for this reason that some youngsters uncontrollably spend a lot of time and energy on the continuous Internet chatting and browsing and attempt to shake off the burden in life and study and reduce the spiritual pressure. But unfortunately, being online not only continuously damages their health, but also causes lower self-evaluation, slow down in one's ability and thinking and directly leads to school drop. The result is that it brings about new worries while the old worries have not gone. And because of the huge contest between the network and the actual life, it inevitably leads to some people's frivolous psychology and feeling that it is so pain to be alive.

Psychological problems exist in the network, and there is an increasing tendency for them. But the concern of the schools, families or communities for mental health in the Internet age is not enough. For instance, there are few books about network psychology in China, and even the related books imported from abroad are in lack of people's concern. This is a very dangerous signal.

Due to the above-mentioned psychological problems on the network, it is suggested that all the net worms be careful about mental illness. With the popularization of computers, computer has permeated all aspects of society and people obsessed with computers can be found everywhere. The psychological obstacle caused by the network, born with the development of computer, has drawn widespread attention of psychologists and the medical field.

The psychological barrier caused by the network refers to the phenomenon in which patients, without a reason, uncontrollably spend a lot of time and energy on the Internet continuous chatting and browsing, thus affect production quality, reduce work efficiency and do damage to health. It is also manifested in the appearance of all kinds of abnormal behavior, mood disorders, personality disorders and some sympathetic functional disorders. A typical manifestation includes depression, loss of a sense of pleasure or interest, sleep disorder, circadian clock disorder, decreased appetite and loss of weight, lack of energy, mental emotional exercise retardation and excitement, lowered self-evaluation, slow thinking, suicidal ideation and behavior, less social activities, a lot of smoking, drinking and using drugs.

At the early stage of network mental disorders, patients feel fun for all at first and then the time online is extended, therefore memory descends. Some patients get upping at night could not help turning on the computer and log onto the network to have a random browsing. At the beginning appears the mental dependence on and eagerness for the Internet, but then it is developed to physical dependence, such as getting up in the morning depressed, thinking slowly, feel dizzy, hands trembling, lassitude and loss of appetence. But these patients return to their normal psychological state only when they are on the Internet again. At the late stage of this disease, the patients will lose weight and have low spirits which are not caused by physiological factors; and they will spend a long time online everyday. Once stop, they will be in a sudden withdrawal syndrome and

even take a possible means of self-harm and suicide endangering the safety of individuals and the community

People aged between 15 and 45 are most likely subject to this kind of disease and 98% of the patients are males and only 1.5% female. 20-30-year-old single males are the susceptible crowd. Once networking psychological barrier appears, doctors and patients should pay attention to it. The current treatment for the disease is still at an exploratory stage and the measures taken are as follows: encourage patients to actively participate in social activities, gradually shake off their dependence on the network, and also the comprehensive treatment of antidepressant drugs and psychotherapy.

12.3.2 Analysis on Psychology Characteristic of Network Application

Internet technology breaks through the space limitations and restrictions (such as identity, occupation status, etc.) and makes the life, learning and work convenient. At the same time, it also results in the uncontrolled use of network for some users, affects their lives, study and work, and damages their physical and mental health. This phenomenon first attracted the attention of American psychologist and was named as “Internet addiction” (for short, IA), “Internet addiction disorder” (for short, IAD), or “pathological Internet use” (for short, PIU).

The study of Young shows that the damage of excessive use of the network to the users is displayed in various aspects, damaging people’s health, leading to interpersonal communication barriers, declining of academic performance and affecting the normal work. Another study of her indicates that those who rely on the use of the network are of specific personality traits. Kraut find that excessive use of network brings about less exchange with the users’ families, narrow social circle, and increased feeling of depression and loneliness. Subsequent study shows that more usage of network has a positive impact on the extroverted people and people with more social supports, while it has a negative impact on the introvert people and those with less social supports. Johnson brings forward using disinheriting to explain the difference of people’s behavior in the network space and the real life. Disinheriting means that under the impact of some exogenous factors, the inhibiting force (especially the social inhibit) is weaken, so the behavior is less controlled. Disinheriting is thought to be one of the factors resulting in the network addiction. It is verified that for some highly anxious users, part of the reason causing network addiction is the characters of the network exchange for people to be more familiar, more self-disclosed and more uncertain of one another.

Internet addiction has attracted more and more attention in psychology. American Psychological Association (APA) officially recognized in 1997 the academic value of studying Internet addiction which has become an outstanding

problem. To promote research in this field, this article commented on correlative existing research from four aspects: the definition of Internet addiction, the measurement tools, the advantages and disadvantages of investigative methods and psychological explanation of Internet addiction.

1. Concepts of Internet addiction

Internet addiction concept was firstly proposed by Goldberg and Young proved its existence. Among Young's study of 496 network users, there are 396 users seriously dependent on the network. Qian Zhou modified the WHO definition for addiction and defined it as a chronic or cyclical state caused by repeated use of the network, and the desire of reuse which is hard to resist. Meanwhile the tension and tolerance of increasing the time online, restraint and retreatment of addiction and other phenomenon will appear. There will also be the psychological and physiological depending on the pleasure brought about by the Internet. Armstrong gave a more comprehensive description of Internet addiction in which he thought it was a very broad concept, and people addicting the Internet had a great deal of behavior and impulse control problems. For example: (1) Cyber-sexual addiction, meaning indulging in adult topics of the Internet chat rooms and pornographic literature. (2) Cyber-relational addiction, referring to indulging in making friends through online chatting and pornographic websites. (3) Net compulsions, referring to an impetus hard to resist, indulging in online gambling, online auction or online trade and shopping. (4) Information overload, referring to compulsively browsing websites to find and collect information. (5) Computer addiction, referring to compulsively addict to computer game or programming.

The concept of Internet addiction is questioned by many scholars. Some suggested that the term addiction refers to a certain psychological and physiological dependence of an organism on drugs, and is used for the behavior of the intake of certain chemical substances or anesthetics, e.g. narcotic taking. The addiction on the Internet is different from the chemical substances dependence. Because of this, Davis advocates using the term pathological Internet use (for short, PIU) to replace the term Internet addiction. Others think Internet addiction is exaggerated by mental health professionals and researchers who call long time online as addiction. However, many people spent much time on reading, watching TV and working, consequently neglecting their family, friends and social activities. But nobody regard this phenomenon as a type of addiction. In addition, the current study cannot determine that the excessive use of the network is a new disease of addiction or characterization of a mental illness, or people with certain mental illnesses are more susceptible to excessively use the network. For instance, according to the US Cable News Network (CNN) on May 31, 1998, nine people among the 14 network addiction users Dr. Nathan Sharpie interviewed have manic depression, seven people have anxiety disorder, three people have bulimia, four people have impulse control problem, and eight people have the problem of addiction to alcohol or other drugs.

2. Measurement tools of Internet addiction

The diagnostic criteria for Internet addiction was discussed in the annual meeting of the American Psychological scholars of 1996 and 1997. Seven symptoms for addiction including the tolerance, withdrawal symptoms, are listed in the criteria. According to this provision, if the users have three of the symptoms listed at any time in more than 12 months, they are Internet addicts. Measurement tool for the large amount of studies for Internet addiction is the questionnaire prepared by Young. As one of the earliest psychologists research Internet addiction, Young thinks that in the diagnostic criteria listed in the *United States and the Diagnostic and Statistical Manual of Mental Disorders* (DSM-IV; American Psychiatric Association.1995), the diagnostic criteria for pathological gambling is the closest onto the pathological features of the Internet addiction. Thus, Young revised diagnostic criteria for pathological gambling to form the measurement tools for Internet addiction. There are eight questions in the questionnaire; one may be diagnosed as Internet addiction, if he gives a definite answer to five subjects of the questions.

With the increase in clinical cases, scholars' interest of research in this area is also growing, but there is not a measurement standard of Internet addiction agreed by all people. Existing measurement tools presently used in the study have defects in methodologies mainly as follows: (1) The names and items of measurement tools can inform the people been tested of the contents of the test. (2) Items are not predictable and are just a qualitative description and a simple list of the disease and symptoms. (3) Measurement tools for Internet addiction fail to be prepared by rigorous procedure for psychological measurement. Grohol doubts the validity of the questionnaire prepared by Young. He believes that Internet addiction and pathological gambling are two totally different concepts and that even if there are some similarities, there still lacks sufficient reasons to equate the two. Furthermore pathological gambling should not be taken as the basis for the preparation of measuring tools.

Such criticisms promote the development of the measurement tools for Internet addiction. Davis compiled the *Davis Online Cognition Scale* (for short, DOCS). The scale includes five factors: security, socialization, impulse, coping with stress, loneliness-reality. It is a seven-self-report questionnaire with 36 items altogether. If more than one hundred scores or over 24 scores in any dimension are measured, the person tested is called an Internet addict. The improvement lies in the following aspects:

(1) The scale name "DOCS" do not definitely show the test content to the tested.

(2) Items are not the list of the pathological symptoms for Internet addiction, but designed to test the thinking process rather than behavior of the people been tested. Therefore, the scale has a certain degree of predictability. Preliminary studies indicate DOCS is more efficient, but need strict test for trustworthiness

and efficiency. Shu-hui Chen compiled *Chinese Internet addiction Scale* taking college students as the sample. It includes the following five factors: forced online acts, retreat addiction response, Internet addiction tolerance, time management, and human exchange health. It is a four self-assessment scale with totally 26 items. The total score represent the degree of Internet addiction. The higher the score means the higher Internet addiction trend. The scale integrates diagnostic criteria for addiction and various cases of clinical observation of the DSM-IV, follows the traditional model for the diagnosis of addiction, and is compiled according to rigorous psychological measurement procedures. Preliminary studies indicated that the scale had good reliability and validity. In 1999, the retested reliability was 0.83 and in 2000, consistency coefficients in the internal factors of the scale were between 0.70 and 0.82 with that of the whole scald was 0.92.

3. The advantages and disadvantages of investigative methods of Internet addiction

Online surveys or case investigation are always adopted for the research on Internet addiction. By using online surveys, the researchers submit their questionnaires or scales to the popular search engines, for example www.google.com, then users can find them just by entering the keywords (such as “Network” or “addiction”). They may also put a brief description of their research to those popular BBS to enable users to understand and participate in the research or send questionnaire to users’ e-mail. Case investigation means selecting some objects of remarkable Internet addiction characteristics to do research on and draw the general conclusion from. Online investigation, which is convenient and economic, can also help researcher collect a wide range of information. It still cannot only contribute to cross-cultural research, but also have easy access to information except the student sample. But there are problems with online surveys:

(1) It bases on the exploratory study and descriptive research, and causal relationship between variables cannot be drawn.

(2) It requires the users input keywords to find online survey questionnaires, which will easily lead to the divergence of samples, and the reliability of conclusions will be doubtful.

(3) The self-selected network users participate in the study are from different places, then it is hard to control the samples and the information is often incomplete, so it is difficult to compare the different study results.

(4) The rate of questionnaire returned, filled and answered is relatively low and the phenomenon of several questionnaires filled by the same user is hard to be ruled out. The virtue of case investigation is that the researchers will be able to gather detailed information of the individual Internet addict. But the selection of case is often affected by subjective factors, so the conclusion is often drawn unilaterally, thus affecting the typicality of the conclusion.

4. Academic model of Internet addiction

As to the explanation of Internet addiction, the most representative models are the ACE model of Young, the cognitive-behavioral model of Davis and the stage model of Grohol.

(1) ACE model

In the ACE Model, the letters A, C and E stand for Anonymity, Convenience and Escape respectively. Young thinks it is the three characteristics that result in the Internet addiction. Anonymity means in the network, people can hide their true identity, so they can do anything they want to do and say anything they want to say without considering the harm to others. Convenience means they can do things they want to do just by moving the fingers at home, such as Internet pornography, online games, online shopping, and making friends online. Escape means when unfortunate day comes, Internet users might find consolation from the Internet. So on the Internet, they can do anything and be anyone. Such psychological feeling of freedom and infinity lure the individual to escape from the reality of life and stay in the world of network.

The cognitive-behavioral model proposed by Davis tries to explain the development and maintenance of the pathological Internet use (for short, PIU).

As shown in Fig. 12.1, factors close to the nearness of the pathogen chain are the sufficient conditions of the occurrence of PIU, while those close to the farness of the pathogen chain are the necessary conditions. The main factor is maladaptive-cognition, which located at the nearness of the PIU pathogen chain, and is the sufficient condition. Davis thinks that the cognitive symptoms appears before the emotional or behavioral symptoms and leads to the latter two. The individuals of PIU symptoms have major cognitive impairment in some particular aspect, which exacerbates the symptoms of the individual's Internet addiction. In the model, pathological behavior affected by bad trend (susceptibility quality of the individual) and life events (the source of pressure), located in the farness of the PIU pathogen chain and is the necessary conditions. The model also give a

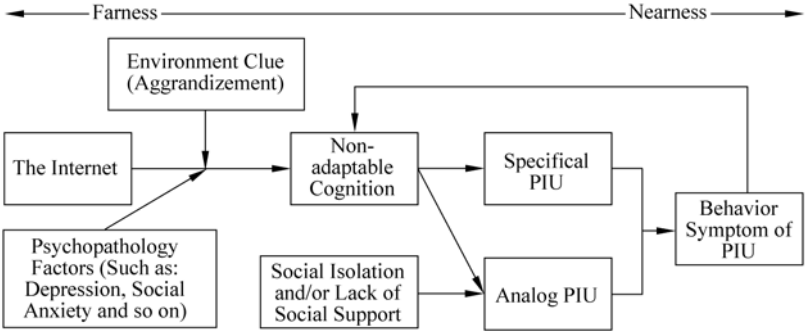

Figure 12.1 Cognition—behavior model of Pathological Internet Use (PIU)

partition between the specific PIU and the analog PIU. Susceptibility quality of the individual refers to the fact that the individual are more subject to the pathological Internet use behavior when he is in the state of depression, social anxiety and substance dependence. Source of pressure (stress stimuli) means the continuous development of the Internet technologies.

(2) The stage model of Grohol

Grohol deems that the so-called Internet addiction is just a gradual act. As shown in Fig. 12.2, users generally have to go through three stages. At the first stage, he newcomers onto the Internet are captivated by it, or the experienced users are captivated by the new application software. At the second stage, users start to avoid being addicted to the Internet. At the third stage, the network activities and other activities reach a balance. In the opinion of Grohol, all the people will reach the third stage in different time. Those considered to be a user with Internet addiction are trapped in the first stage, and need help to get over it.

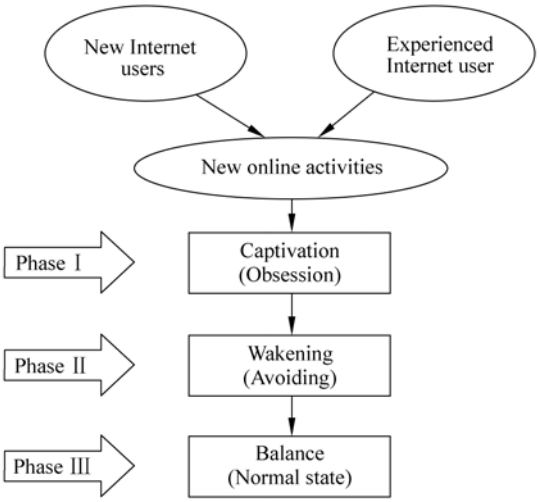

Figure 12.2 Stage model of grohol

Internet addiction has both similarities and differences with the drug addiction. The psychological dependence on the network needs to be studied from the psychological aspect. Subsequent researchers should follow the characteristics of Internet addiction to define it scientifically and accurately. They should compile strict and scientific measurement tools based on this definition and in accordance with the principles of psychological measurement. They should also make comprehensive use of investigation, case studies, experimental methods research and other methods to do in-depth and comprehensive study on the characteristics and formation mechanism of Internet addiction. In a word, there is still a long way for research on Internet addiction.

12.4 Network Management Psychology

12.4.1 General Psychology of Network Management

1. General psychology of online game management

During the course of the game, none of the physical needs of the players were satisfied, but why are games such powerful temptation for them? That is because the game can satisfy some psychological needs of the players (as some self-transcendence cannot be achieved in real life). Therefore, an analysis psychological activities and needs of the players is helpful for us to design good games.

Ultimately the player's behavior in the game is exchanges (or interaction), one of the most basic and simple patterns of human behavior. And the behavioral patterns will also be divided into two categories according to different types of games: human-machine interaction (That is exchange and interaction between users and the pre-defined procedures; the stand-alone games are of this type), and human-human exchanges (This is exchange and interaction among people on a platform set by procedure). The different psychological momenta of the game are as follows:

2. Trend of human-computer interaction

Human-computer interaction pattern has been seen in most of the stand-alone games, because the stand-alone games process is planned beforehand. The players face something with its own principle, so there will be certain law of psychological momentum as follows:

First they may find a target, and obstacles appear so that they have to find the solutions to overcome them. Finally they may achieve the target and find a new target. The players feel curious when finding the target, and then they feel the pressure and motivation when obstacles appear. Finally they have a sense of accomplishment when achieving the target (the feeling is in positive proportion to the pressure) and feel curious again when finding new target, thus forming a circle of psychological momentum.

It should be noted that in such a psychological momentum of playing the game enjoyment is brought about in the process of the appearance of and solution to the obstacles. The two psychological factors (motivation and pressure to solve the problem) seem to be at the two ends of a psychological scale. When there is greater motivation than pressure, the players are interested in the game, but if there is far greater pressure than motivation, they will give up the game. We should note two points: Firstly, heart endurance varies from person to person. In playing the same game, different people have different levels of motivation and pressure and that's why some difficult games will still attract some players. Secondly, the psychological process of playing the game is not static, and

pressure and motivation may keep moving up and down on a seesaw. The greater the frequency of the movement is, the greater the sense of accomplishment after success will be. However, the campaign will not exceed the endurance of the players, or else the player will abandon the game. Moreover, if the process of the game cannot make players feel like playing on a seesaw, it would undoubtedly be absolute rubbish.

3. The psychological momentum of the human-human interaction pattern

It is impossible to describe the psychological momentum of human-human interaction pattern, which the same as that in the real life and different from that in human-machine interaction, for it's dynamic with uncertain factors, resulting that there is no law to be followed.

That is the success of human-to-human interaction games, but is also the failure. The success lies in the fact that the interaction objects are animated and their interaction course is dynamic. This brings the particular sense of interest and devotion, which the human-machine pattern cannot outpace. The process of playing the game is full of changes and players will never feel bored. However, the sense of interest and devotion is based on the effective interaction. In the online games, the interaction is not always good. Bad interaction is unavoidable in the world of online games (such as cleanup, baleful PK, robbing measure and so on), so the reasonable design of game systems can maximize the effective interaction between players and avoid the bad interaction. That is also an important direction of online game design.

In modern western psychology, there are two conflicting thoughts. One is the deep-seated psychology studying the inner spirit world; the other is the behavioral psychology studying the human's behavior. In the view of the behavioral psychology, human's behavior is rooted from the environment, and is the reaction to the various stimulations, thus it is focused on the research of the various behavior reaction patterns. Just like the professors doing research on the way the mouse get through the maze, psychologists are doing research on the human reaction to various types of stimulation, and recording the mass statistic data. In fact, the research on the spirit is ignored in the behavior psychology, and the research is limited to the obvious objects and the observable human behavior. Behavioral psychologist admits that there is spirit in human beings, but how about the animals? They think the mental activities are not important; one reason is that mental activities are purely subjective and cannot be studied. But the more important reason is that emotions, thoughts and imagination are secondary to behavior in human life, because the occurrence of any act can be dated from specific stimulation and accord with the law that can be discovered.

Obviously, such psychology method is unlikely to meet the imagination of the public. Laboratory test data collected every minute is hard to make people excited, even the person collecting information. Pavlov behavior belongs to the behavior of the actor; behavior cannot exist without the actor. According to the

psychological theory, human behavior is governed and promoted by some motivation rooted in the material and spiritual need of human beings. According to psychological analysis, the psychological structure of human beings has three elements: cognition, emotion and will. The process of people's behavioral psychology is explained in the following part. Firstly people's material or spiritual needs lead to the behavior motive, the psychology of obtaining some expected benefits. And subsequently due to the inertia of thinking, mental habit formed in people's long time production and life practice, and set out the behavior pattern to meet such psychology in the mind. This is the first stage, cognition. Then according to the knowledge and experience, they understand such behavior pattern and analyze the possibility of obtaining such benefits, which is the second stage, the emotion. Finally they make the choice of carrying out the behavior or not, or modifying the pattern, and in the end form the positive or negative will and achieve the behavior pattern or cancel it. At last it is necessary to point out that the specific factors of the different individuals, e.g. physiological and psychological factors, can also become the basis for the different behaviors of the individuals. But which factors will practically become the basis for the criminal behavior of the people depends on the external conditions they encountered and interacted with, e.g. emotional factors or natural environmental factors.

In online games, there has been a group of people touting "professional abuse of people" everywhere. If you pay a certain amount of virtual currency and designate the person to be abused, they would keep abusing the person 24-hour online until the person is infamy in the online games community. Such business is booming.

Online game players are looking for accumulated points to arrive at a higher status. But many people want to take a shortcut to quickly achieve a higher level, and they even do not hesitate to "kill"; then the person "killed" looks for someone else to shout abuses to vent his anger, which results in "professional abuse of people". Although it is not correct and is disreputable, business is still booming, which just proves the saying—where there is demand there is a market.

If the players are taking the right path and accumulating points according to their ability, they will never "be killed". If the master-hands with better skill do not kill person and seize his goods casually, they will never suffer from professional abuse. There will be no market as long as players are not opportunistic. Some players will take all means in order to dominate dummy world, and they will employ people to conduct personal attacks on others to take revenge. Though these deeds happen in the virtual world of the Internet, they can reflect the bad psychology of some young people. In their points of view, the law of the jungle rules the world and they should achieve their goals by all means. If such thoughts are applied into the reality, is not it impossible for the world to be in chaos?

The appearance of the full-time professional abuser resulted from the revenge of person "killed" in online games. In real life, it is normal for someone to have hostile feelings or the desire to take revenge when he is hurt. Such vengeance

mentality appears in the network with the transfer of some social functions to the network, and the professional abuse of people is an example.

In reality, there is also revenge, but why does not retaliatory act spread? The reason is that there exist the laws, which prevent people from taking revenge by hurting others. But it is different in the virtual world, where some people take revenge deliberately and even find other people to help them ("professional abuse for people") basically without taking any responsibility.

Generally, the exercising the right of freedom should not hinder the freedom of others. For instance, you have the freedom to curse another person but other people also have the freedom not to be cursed. In this case both of you are equal. If you curse a pig in the wilderness, no one will protest, because you are not against the freedom of others.

So, is the network the wilderness? No. Is the Netizen the pigs? No. In the virtual world created by human beings, people also have their interests. Obviously, protecting their own interests is the instinct and natural right. Therefore, the Internet is a community reflecting the realistic interests in which anybody has to follow certain ethical standards. Similarly, the network is not a fairyland for abusing others and anyone who seriously damages the interests of others will also pay the price. As to the act of paying for "professional abuse for people", such "service contract" is in itself a violation of public order and good morals, and a void civil behavior not protected by the law. Moreover, is there any business registration or qualified certification for those who engage in the abusing of other? Has he paid taxes?

Those unscrupulous people on the Internet will surely think that no one knows what they have done since they abuse others in a corner. There exist ethical and legal issues. A noble-moral person knows he should be careful about his behavior even when he is alone. Such psychology reflects the necessity of sound network legislation. As a minimum of social behavior norms, the laws are actually drafted for those who do not follow the moral principles of the society. One's behavior need not be moral, but at least he should not act against the law.

4. The demand psychology of network information service user

From the user's point of view, evaluation of the effectiveness of the service determines whether users continuously take advantage of network information service website and the length of time they use. It is mainly manifested by users' service experience and evaluation.

In the process of information service, owing to the different user's expectations for the services and the differences in their personalities and experiences, users' service experience could be divided into three levels: satisfied, basically satisfied, dissatisfied. The three levels can be fully reflected through website design, service attitude, information quality and the ease of access to information. If the user is satisfied he will act actively and be willing to choose the site continuously to receive information. If users' satisfaction reduces, he will reduce the time of

and lower his trust in receiving services. If users are dissatisfied with the service, they will do everything possible to avoid receiving the service. Because users are likely to have three different experiences, attention should be paid to user's experience in the network information service and a full range of quality services should be provided to maximize the user's satisfaction when he receives information.

In addition, users' services experience and the evaluation may affect their information using behavior in the next time and are likely to influence others' attitudes and behavior on the network information service website. On the other hand, the well-known reputation and influence of network information service website will undoubtedly play a positive role in its Internet version, but it should not just be a copy of the traditional Internet version, and should update the means, ways and contents of its service to meet the growing needs of the users for information.

Faced with the disorderly sea of information, the users have limited absorption capacity of the information. With the acceleration of information input within a certain scope, the users' absorption of and reaction to information will be speeded up accordingly, but when the rate of the information input exceeds a certain threshold value, the users' message response and the absorption rate will slow down or even stop, so the users will select and filter information according to their specific needs and values to got rid of the unnecessary information and to retain the valuable information. If it is useful, the information obtained will be absorbed, or else abandoned. Then the mentality is that when there is more useful information there are more pressing needs and the users in search for information will have more serious attitude and behave more actively. This shows that the users' needs of information depend on the value, which is also the driving force of searching information. In addition, some users who might put too much emphasis on some information that mistakenly exclude the valueless information and only choose valuable information, which leads to the greater bias of value behavior.

American scholar Thomas Man summarizes 'the principle of least effort' from the users accessing to literature information: "Most of the researchers and even some serious scholars are accustomed to use the easily obtainable information sources, even if the quality is not high. Meanwhile, they are easily satisfied with the easily obtainable information and unwilling to spend more efforts in pursuing higher quality information sources." Therefore, when they access to information, the customers always have the psychological tendency of minimizing effort to yield the maximum return. Such a trend makes the users choose the simple information cited from some easily and conveniently accessed sources. Thus, along with the formation and the continuous improvement of the network information service system, when designing network terminal we should take into full consideration the users' habit of obtaining information and make the efforts to offer "one-stop" service.

5. The defense psychology of the network information services users

When harmful, possibly harmful or disadvantageous stimulation appears, the users may defense instinctively, close the sensory channel and refuse any input. This is the defense psychology of the users. As a media, network's advantages are obvious: synchronous or immediate exchange, broad coverage, with massive storage capacity, strong interaction, coexistence of various media, which brings much convenience to the people and at the same time makes people have a psychological defense.

The main body of network information services is diversified at present. The users have too much to see when facing various types of domestic or overseas digital libraries, the Internet version of the traditional media at home and abroad, various commercial exploitation websites, and personal homepages and chat rooms. While receiving information, users may doubt whether the information disseminated is authoritative and credible, whether the information sources are reliable and whether information quality is good. With regards to the contents of information, network information is featured by its large volume, various types, informal style and different languages. Information is also exchanged without time and space limitation. The unprecedented increase of its complexity and diversity, coupled with the mixture of academic information, business information, government information and personal information often makes the users at a loss of massive information impact. With regards to network management, network development and the dynamic increase of information resources on the Internet are user-driven. However, due to lack of necessary filtration, quality control and management, information dissemination is free and arbitrary, and it is impossible for domestic laws to manage the foreign websites, thus the worries for the security and quality of information security and quality are unavoidably.

It can be said that there are substantial differences between the traditional information service and the online information service. In the traditional information service, there is definite object, fixed relationship, responding act and definite interpretation of the responding acts. Therefore such service is really reliable. But in network service, the object is not clear, the response is uncertain, and the answer may be interpreted in various ways, thus information may not be reliable. Moreover there is no need of self-control for the spread of the network. All these cause the users to have a defense psychology.

12.4.2 Behavior Psychology of Network Management

1. Online discussion

Imagine you are one of the mailing list subscribers of drugs sold online, and would like to know others' experience of glucose in the treatment of the pain on the back. After reading a number of irrelevant information, you mentioned in

your mail the information concerning certain brand names, purchasing channels, and market prices; and asked whether other people have used the product. The next day, it was publicly stated that such online marketing is absolutely unacceptable; some will lament that the new Internet users do not love to read Notes for Net citizens before surfing online. Still other people would give you a letter on his person, and talk about his experience of using glucose in the treatment of arthritis. In the end of the letter, they do not forget to remind you not to mention a specific brand name or else others would doubt that you are a drug dealer doing free advertising.

You actually violated the rule of online discussion by accidentally mentioning a specific brand but the three above-mentioned replies adopted different strategies and brought different psychological effects. The first person's attacking strategy was very easy to make you rebut. You would have thought it as unjustified accusation, so it was difficult to ensure that you fought back against him. Even you have received only one letter, you might still choose to leave this discussion group with regret thinking you have met somebody contemptible. To create a negative impression does not need a lot of experience and you would find life online sometimes really very dirty, insolent and arrogant. The second person used the mockery strategy to the new users, which is still a very direct criticism on you. The psychological implication is to stress his rich experience as a mail sender, which is a strategy at the price of the addressee.

The third person directly answered your question, with respect and sympathies. He was so clever by telling you what should be paid attention to in a private rather than public way. He was aware that public criticism is too insulting to a newcomer and avoided doing so. He guessed your identity in the best way. You are not a smart drug dealer; you just made a small mistake accidentally. Finally you made friends with him and you stayed in this group and ridiculed those people in the mail with his support. You even intended to give those people some herbs to eat, such as chamomile.

The ways people interact with each other online involve senseless online discussion losing the initial purpose. The three letters you have received contain elements of online discussion, because they emphasize the rules and practices of the interaction; some of them are desirable, but others simply do not fit this group. This phenomenon on the Internet is rarely seen in the real life, because the corresponding rules in the real life are relatively stable and easy to understand.

The tone and style of online forum is of important psychological impact. It can be seen clearly in the three above-mentioned letters that the different attitudes of people on online forums bring about different effects. In online discussions, we should be cautious particularly when attending open discussions to make comments, or the discussion will become acrimonious attacks on each other. Besides, since online communications are usually kept for consultation, we may give up the fixed bias through analysis of the communication patterns. For example, we may count the numbers of mails from males or females to make

clear whether it was males who ignored females or vice versa.

Conversely, online discussions can lead to disharmony, or even split among the people. The group is prone to polarization. Sometimes, you can hear such words: “Do not speak when your mouth is full!” or you can hear more aggressive words: “Buddies, I hate the way you speak. Shut up and get out!”

2. Synchronous space psychology

Though synchronous pace is not the only compulsory network environment, it did cause extensive use of the Internet. What is so fascinating to people? Therefore, let us first investigate into other fascinating activities, such as gambling. This is precisely the work point of B.F. Skinner.

Skinner discovers the complexity of strengthened therapy through e-mail. The principle is very simple: everyone is willing to repeat the action which has been praised by others. We are accustomed to connect the outcome of responses and are usually willing to do something which brings happiness to people. The detailed process can explain why the simultaneous Internet environment is so attractive. For example, time is vital to offer rewards. If the rewards are delayed for too long a period of time, they lose their effect, which may influence behavior.

The repetition of some praised actions for certain rewards may be an important element for being fascinated. Gambling games such as the slot machines are typical examples. In such a game people do not know how many poles should be drawn in the end so as to win prizes but they always hope that they will win the prize as soon as possible. It is the uncertainty that makes people continuously repeat this game.

Sometimes, if a certain act is repeated all the time without award, it would disappear, but sometimes even if there is no reward, acts will continue for a very long time.

Strengthened therapy is a basic psychological process impact on the behaviors, not limited to fascinated behavior. These characteristics may explain why the Internet is as attractive as the slot machines. The clanking sounds of the coins spitted out of the tiger’s mouth are the incentives to attract many people and in some attracting social environment, people’s attention to and recognition of you is a kind of reward.

After the article is sent to the simultaneous Internet, you can either receive reply simultaneity within a few seconds or simply not get it. Similarly, the process of the strengthened therapy makes more people lost in the online games and chat rooms. They are always immersed in the joy of victory.

12.5 Summary

Network Application psychology is a marginal discipline growing with the development of the computer network technology. This chapter briefly describes

the characteristics, application, current situation and prospects of the computer network technology.

Since its emergence in 1969 (the predecessor of the Internet), a profound information revolution which influenced the process of human history has swept the world. There is unprecedented vastness of information on the Internet, which is making an unprecedented pace setting the highest standards of human mental development and quickly infiltrating into every aspect of human life. With the current network becoming more popular and bringing numbers of practical issues, more and more traditional areas of study have begun to be expanded online, such as the marginal disciplines of network sociology, network politics, and network economics and so on. Psychology is not lagging behind. On the one hand, traditional psychology studies are expanded onto the network with the help of the network technology, thus achieve its renaissance. A case in point is the popularization of psychological measurement, psychological tests, and psychological counseling on the net. On the other hand, with the rapid development of Cyberspace, the virtual reality, there appears a series of problems issues such as Internet addiction so that network psychology begins to be considered as a part of the studies in the filed of psychology. How to apply computer network technology to discovering, studying and solving psychological problems has become an urgent new area—application psychology.

This chapter makes a reviewing evaluation on the current main topics of applied psychology at home and abroad. At the same time, in the Internet era, more convenient international exchange brings challenge for the Chinese psychology to catch up with the world level. This chapter also discusses the enlightenment of the development of the network application psychology to that of the Chinese psychology. We hope that readers have a preliminary understanding of application psychology, conduct the future study and practice with it.

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13 E-commerce Case Analysis

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Abstract Case Study Analysing is arguably the best way for students to understand and reinforce theoretical knowledge learnt previously. Through business real case analysis, Case analysis can make us deeply understand e-commerce. We could also collect the creative methods that most e-commerce enterprises adopted to solve the problems they faced, and take them as reference samples or paradigms in our own e-commerce system design. This chapter provides a few typical e-commerce cases abstracted from several industries to demonstrate the way of how to analyse e-commerce cases.

Key Words e-commerce, case study, competition, evaluation, comparison.

It is very important to analyze and summarize the case of e-commerce. Case study can make readers understand theories more deeply; they can turn knowledge to technology, so that theory study and practice can be integrated; they can also improve the readers' ability of using knowledge introduced in the former chapters so as to solve real problems.

In this chapter, we experience several successful cases, so that readers can share their enjoyment of success, discern the power of e-commerce as well as use the successful experience for reference and the creative ideas generated when solving e-commerce problems, so as to provide beneficial guidelines and help for later design of e-commerce and management of e-commerce enterprises, as well as design tips and reference cases for designing e-commerce system, so that design of e-commerce and management of enterprise can be very convenient.

The main content in this chapter includes e-commerce analysis and the case analysis and study of e-commerce in different vocations.

13.1 Methods of E-commerce Analysis

13.1.1 Methods of the Evaluation and Analysis of E-commerce Websites

With the rapid development of the Internet commercialization, lots of e-commerce websites arise, and the competition in market becomes more and more fierce. The website managers demand the popularities of their websites. They also worry the advantages and disadvantages of their websites, and find satisfying ways to improve their websites. The website investors must know the operation, strength and development potential of their websites so as to evaluate their websites and make proper decisions. The users need to know how to look for the most suitable website to acquire the best services and the highest value. In order to solve these problems, we must take proper criteria and approach to evaluate websites. Therefore, the strong social requirements of evaluating e-commerce speed up the development of website evaluation research and practice.

E-commerce website evaluation is the evaluation of the operation status and work efficiency of e-commerce websites based on certain approaches and contents. As the important force of e-commerce development and improvement, evaluation of e-commerce not only makes itself develop rapidly, but also impulses the improvement in the level and quality of e-commerce. It supervises and pushes the standardization and perfection of the e-commerce websites, thus stimulates the healthy development of the e-commerce website.

Through website evaluation website managers may find out the real effect of website operation and the users' degree of satisfaction in more details. They can also understand the status, advantages and disadvantages of their websites as the basis of website maintenance, updating, development and improvement. Taking part in the website evaluation contests has irreplaceable value for the websites to become more famous. Its value is shown the following aspects:

(1) Improving reputation. External, fair evaluation results may be reshipped by various media, generating good domino news effects; it has more obvious effects than the conventional methods.

(2) Attracting new users. The number of new users on the Internet may be doubled every half year. Many new users may not know about the existing website; therefore, the evaluation results may be their guidelines, and the new Internet users may be the first users of the famous websites.

(3) Improving retentiveness and faithfulness. Most excellent websites have similar characteristics: good customer services, valuable website contents and animate commercial patterns. Under the same conditions, customers are certainly more faithful to the famous websites. Excellent websites also means more commitments and customers' trust.

(4) Understanding the competition in certain industry. Through website comparison and ranking, the managers of the shopping websites can deeply understand the status of their competitors and the ranking of all indexes so as to be aware of their advantages and disadvantages for improvement.

(5) Impulsing the websites to attach importance to the satisfaction of their clients. Because e-commerce attaches importance to customer relationship and follows the principle of regarding the customer as the God, the evaluation standards incarnate the importance of customer services. Therefore, the websites evaluated are ranked through many factors on the basis of service quality. This approach can impulse the online merchants to improve their operation patterns to satisfy the majority of the customers, but not just involved in the price competition. The effects of websites evaluation on improving the reputation of the websites have already been recognized by many big websites, and website evaluation has become a common used approach to popularize websites.

The social requirement for e-commerce websites evaluation has generated a new e-commerce pattern: comparative e-commerce. As a main form of comparative e-commerce, websites evaluation becomes more and more important along with the development of e-commerce. It takes certain e-commerce websites as its object for analysis and evaluation and offers relative conclusions for the websites, their customers and the website investors according to the specific website evaluation approach and standard. As the neutral third parties, by providing information increment service—websites evaluation, ranking and analysis reports, the evaluation institutions and the websites offering evaluation get hold of the opportunity to grow quickly. For instance, the ranking of e-commerce websites by the two famous evaluation websites (gomez.com, bizrate.com) in America has become more and more influential. Therefore, as an e-commerce pattern, special evaluation websites appeared and developed quickly.

Therefore, the evaluation websites, as a contact channel between e-commerce websites and their customers, provide neutral and fair website information for their customers, and help the customers to select proper websites. In addition, evaluation websites can supervise and speed up the e-commerce websites to manage more normatively and perfectly. Their evaluation of the websites and the evaluation standard they take are the guidelines for the website managers, and can evaluate the e-commerce websites. With the popularization of e-commerce, evaluation websites become more and more important.

Evaluation of e-commerce can solve the information asymmetry problems between commercial websites and the customers to a certain extent. The customers can get credible evaluation information about the commercial websites according to the neutral evaluation results, so as to reduce the cost of searching information, select proper websites to stage commercial activities and to get best services more conveniently and quickly. For example, if consumers want to go shopping, they can get the evaluation results of websites, and compare different shops online from the aspects of product price, quality and the favorable measures of

the online shops. In this way, consumers can find the most proper websites according to their requirements, and buy the high quality goods with cheap price which they like most.

According to the practice of current e-commerce evaluation, e-commerce evaluation websites can be divided into many types. According to different standards, they can be divided into different types. According to different main bodies which take part in e-commerce evaluation, include customers, relative experts, website managers and technicians, e-commerce evaluation websites can be sorted as customer evaluation, expert evaluation and website evaluation. According to different characters of the evaluation websites, they can be sorted as commercial website evaluation and non-commercial website evaluation. According to different methods of website evaluation, they can be sorted as website flux evaluation, expert evaluation, questionnaire evaluation and integrative evaluation.

According to the different working range of websites evaluation, we can classify them into integrative website evaluation and special website evaluation. In addition, special website evaluation can be further divided into the website evaluation of different fields since different fields have their own characteristics and the evaluating standards are different.

According to different constitutors of website evaluation activities, we can classify them into official (unofficial) occupational evaluation institutions, specialized commercial evaluation websites, various consultation and investigation corporations and relative media and folk websites. Various e-commerce website evaluation institutions evaluate the e-commerce websites with their particular means, their goals and service objects being different.

(1) Evaluation institutions organized by special fields. In China evaluating institution organized by special fields is also called official evaluating institution, such as CNNIC. This centre is a nonprofit management and service institution founded in June 3rd, 1997. Since 1997, CNNIC has organized statistical investigation of the development of the Internet in China two times per year, and issued relative investigation reports. CNNIC carries out its investigation mainly in the form of online questionnaire and attaches “The Top 10 Websites” of every field generated by customer investigation to the end of investigation report.

American Consumer Union (CU) also evaluates e-commerce websites fruitfully. CU is a dependent, nonprofit test and information organization. Since 1936, the goal of CU is to test products, publish testing report and to protect consumers. The nonprofit characteristic of CU is beneficial to build up its fair impression among public. At present, the websites it manages mainly evaluates the following 9 types of websites: garments and ornaments, apparatus, automobiles, books and music, catalogues, electronic goods, toys, and family ornaments and furniture.

(2) Specialized commercial evaluation websites. Some famous commercial evaluation websites include Gomez and Bizrate in America.

The website www.bizrate.com was founded in 1996, and was said to be the first online shopping website. It collects data of websites being evaluated through

"online evaluation", that is, all the data of BizRate are collected from the online investigation of the real customers. By collecting feedbacks directly from millions of online shopping consumers, it has evaluated about 4,000 online shops. The desired result is considered to be the standard of customers' satisfaction.

Gomez is an institution supplying quality evaluations based on Internet service for e-commerce customers and corporations. That is, after colligating all the experts' opinions, through the general, extensive and objective evaluations from the Internet, highly qualified evaluations in communities and online comments from corporations, Gomez supplies services such as customers' experience evaluation, e-commerce benchmark test and purchase guidance to e-commercial customers and e-commercial firms. The services aim to help corporations establish successful online trades and show the users how to make an online trade. The goal of Gomez is to be the No.1 of its field in supplying e-commercial judgment supports and the evaluation of online users' experience.

The comparison shopping websites in China, such as Ego (www.ego88.com), also belong to this kind. The only difference is, because of their simple function, these websites mainly focus on the price comparison of commodities.

(3) Various counseling and investigating corporations and relative media. Forrester Research (www.Forrester.com), a famous research counseling corporation, entered the EC website evaluation area, and made remarkable contributions through its hardwork when the tide of EC came. Forrester combined online survey of the customers, statistics of websites' presentation and impartial analysis of experts to evaluate an EC website, which is named Forrester Power Rankings. In this way, Forrest tried to support the customers with general and objective judgment, help them make better online shopping decisions and to give a fair evaluation of the efforts in the management of the EC corporations.

Several domestic institutions and media have developed activities to evaluate EC websites continually, such as CCID (www.ccid.com), CTC Online Competition of China and Computer World of China. Their evaluations have made a certain influence domestically.

(4) Unofficial Evaluation Website. These websites refer to the domestic evaluation websites which are both unofficial and unprofitable. Different from the goal of CNNIC's Internet report (which aims to supply policy reference to the government and other relative offices), these unofficial evaluation websites are to recommend some long-lasting and excellent websites worthy of visiting. As some influential websites are known to every netizen, the objects being valued are mainly private websites, especially some good but unknown ones. Some namable domestic unofficial evaluation websites include Yesite (http://pick2net.yesite.com), Picknet1 (http://www.picknet1.rg) and so on. Strictly speaking, these domestic websites are still the rudimental forms of comparative e-commerce. There are two reasons. Firstly, the evaluated objects are mainly private websites rather than EC websites. Secondly, their evaluation standards mostly cover technological elements, while customers service has not been fully concerned.

Many ways have been adopted to evaluate EC websites. Judging from the ways to get evaluation statistics, four methods are widely used at present:

(1) Calculating the flux index of websites. The calculation of flux indexes refers to the counting and analysis of the websites' fluxes by using some particular software. World famous counseling and investigation institutions, such as MediaMetrix co. (www.mediametrix.com), ACNielsen Research Institution of Media (www.netratings.com), use the index of independent users' visits to identify the website fluxes and publish the ranking of the websites regularly. The influential domestic websites in calculating the visiting fluxes，such as a third partner web flux registration system of CNNIC(http://www.cnnic.net.cn) and the NetEase List of Best Sites in Chinese, all rank websites according to web flux indexes. The list is usually made weekly, monthly, or even daily. The definition of independent user in general is that during one specific calculating period (one month or a week), no matter how many times he visits a website will be viewed as only one user for the website.

However, the definitions of web flux index at home and abroad are not the same. There are even diversified definitions domestically, which restricts the authority and consistence of these websites to some degree. And, the most important thing is that foreign consultation institutions monitor the process, while domestic ones rely on the evaluated websites adding their codes to them. Whether being involved in ranking or publishing the ranking is of the evaluated websites' own accord. Thus the realness and comprehensiveness of the ranking for the website flux cannot be guaranteed. Regardless of this, being ranked in the list is still a good way to make a website more well-known.

(2) Experts' Evaluation. The evaluation of the experts is a means of website evaluation using prescribed procedure to investigate the experts so that they can make a judgment and evaluation after comprehensive analysis according to their professional knowledge and experience.

For example, CTC China Compete Online held a vote for "China's Excellent Websites in 1999" in October 1999, which divided websites into 10 classes, such as comprehensive and professional websites, government and organization websites, computer and network websites and so on. The primary election was held after 20 websites having been selected as candidate websites by the election committee. Then people got the chance to vote online and to make comments. Finally the election committee made the result after considering all the elements of which judgments from experts were mainly concerned.

The advantage of experts' evaluation is that it combines all the thoughts, and it can give a comprehensive evaluation to every website. However, the shortcoming is obvious too. For example, the number of experts is limited, which means it is not so well representative. And unavoidably some experts may have their own preferences. Also the result may be affected by some authorities. Despite all these, the justness may not be well protected if some experts try to please others or avoid impolite behaviors out of their uneasiness.

(3) Questionnaire. Questionnaire is a common way of investigation, which usually takes two forms, sample investigation and online investigation. All the former evaluations of the top10 websites in China made by CNNIC were based on online tests. The main defect is the possibility of cheat behaviors, which takes a lot of labor to clear out the useless questionnaires.

However, since the reliability of sample investigation depends on a lot of elements, such as the design of questions, ways to get samples, number of samples, and distribution of samples, system error and investigation fee, the consequence of questionnaire can only partially reflect websites' "image" in people's mind.

To set up a scientific standard of evaluation and to keep a fair image of oneself are of great importance to all the evaluated websites. But whether the websites are evaluated by online investigation or by experts' comments, personal affection cannot be eliminated. Because of the differences in people's experience and preferences, the judgments to certain standard vary. So, neither quantitative analysis nor qualitative analysis is perfect.

(4) Comprehensive evaluation method. Due to the limitation of all the adopted methods mentioned above, e-commerce websites evaluation needs to be implemented in a comprehensive way, which should combine dynamic monitor, market investigation and expert evaluation as whole. To make it, we need a scientific way of analysis and evaluation, an integrated, just and objective system of performance appraisal, and also enough scientific and reasonable samples with fixed number to be the foundation.

When using this method, we should first establish a weighted system of comprehensive evaluation indicator; then set up a database of monitoring and investigation, whose data can be collected by technology measurement, expert investigation and customer investigation. After these steps we can use qualitative, quantitative, compared analytic and mold analytic ways to mine and analyze the related database and resources. Some papers have made a comprehensive evaluation of integrated e-commerce websites for securities (mainly the EC websites which are not security brokers and which offer ASP platform service and ICP data service) in technical index, functional module and commercial mode. They tested the technical index of all these websites, compared all their functional modules, described the fundamental strategic competence of their commercial modules and made a compared evaluation of an analysis between advantage and disadvantage.

As what we have talked before, e-commercial websites have a vast way of evaluation. Their evaluation standards differ as a result of the differences between the varied goals they set. Whereas, visiting number of the websites is the common evaluation standard.

Gomez and BizRate set the content and standard of evaluation mainly in terms of the customers' needs and satisfactions. Gomez set up the five A-class standards: easiness for use, user confidence, website resources, service of customer relation and gross cost, Seeing details in Table 13.1.

Table 13.1 Evaluation Standards

Evaluation Standards	Explanations of Standards
General Evaluation	The evaluation of websites' service, web design and layout.
Easiness for use	Webpage is the combination of identical form and straight appearance. The layout should be tight and integrated with its content and function. Also the page should supply useful examples and extensive online helps.
User Confidence	Websites should be highly dependable, have customer service institution which is knowledgeable and easy to contact, and offer guarantee of quality of security.
Service of Customer Relation	Companies use personalized service to set up electronic service of customer relationship, allow customers to propose service requests and increase customers' loyalty and sense of collectivism by fellowship activities and extra allowance.
Website Resources	Companies should not only supply information of various goods and service online, but also give a deep all round service by means of email account, exchange and service of searching for tools and information.
Total Cost	The total cost company spent to supply packaged customer service, includes material costs, extra costs for transporting and disposing, the smallest difference between income and expense and interest.

The evaluation standard made by BizRate has 10 items: revisiting ratio, convenience to order, choice for products, product information, product price, website appearance and behavior, goods distribution and disposal, punctual delivery, consistency of product, customer support and track after delivering.

The evaluation content of Consumer Reports Online (www.Consumersunion.org), the website of Customer Union (CU), contains the following aspects:

Website flows, sale, website policy (security, individual privacy, loading and transporting, return of goods, customer service), convenience for use (design, navigation, ordering and canceling, and advertisement) and website content (depth of classification, product information, and individual personality). Then experts make a list for e-commerce websites according to the comprehensive statistics of all these indexes.

The evaluation indexes of CNNIC include compatibility of web browser, emergence rate on search engine, web visiting rate, efficiency rate of links, linked rate, rate of spelling mistakes and website design.

As has been stated above, the evaluation contents of e-commerce websites differ because their goals vary. Some consider more about the technical indexes, while others pay more attention to info-service. Besides the two, a few rely on the satisfaction degree of customers. To the commercial e-commerce websites, we think at least six aspects should be considered in evaluation:

① Technical index, including the operation speed of website, steadiness and security of websites, and efficiency of links.

② Interface index, including visual effect as a whole, art design, page layout, website structure and classification depth, and easiness to be used.

③ Information index, including the quantity, quality and sort of information, information renewal frequency and individual info-service.

④ Function index, including the maturity of function, effectiveness of realizing function, characteristic products, and characteristic function and service.

⑤ Customer index, including choices available for supply charge and ways of distribution, punctual delivery, level and quality of customer backup, personal order capacity, interaction between websites and customers and individual privacy protection.

⑥ Operation achievement index, including website flow (Clicking rate), amount of transaction, profit rate of cost and even stock price.

As stated above, the needs for e-commerce evaluation promote the growth of many evaluation institutions, and also promote the development of evaluation researches. Generally speaking, the overseas research and practice of e-commerce website evaluation is much more mature than domestic ones.

First of all, with regard to the evaluation contents, overseas institutions put more concern on the function and operation of websites and the level and quality of customer services; while domestic evaluation still mainly covers technical performances of websites. For one thing, it reflects the disparity of domestic e-commerce development; for another thing, it also shows that the importance and value of customers have not been paid enough attention to domestically.

Secondly, as to the evaluation approaches, although website flow, expert evaluation, investigation are used both in the website evaluation at home and abroad, the samples of investigation carried domestically is not rich in number because we do not have so many net users who really get involved in e-commerce. Besides, weighted index evaluation, module evaluation and dynamic evaluation are seldom used in the analysis and process of data, thus decreases the exactness of evaluation.

What's more, although domestic websites Ego (www.ego88.com) and CNNIC have some influences in website evaluation, they are still short of evaluation methods and contents. Up till now, no trademark evaluation website has been formed yet, which restricts the exertion of website evaluation.

For all these reasons, domestic e-commerce websites evaluation should enhance the application of theoretical research and practice. Firstly they should improve the research on evaluation principles, contents and methods. For one thing, diversified evaluation contents and index systems should be established in different fields; for another thing, scientific data-processing evaluation, which has more indexes, such as weighted evaluation, module evaluation and dynamic evaluation, should be used more often and more positively to make the consequence more reasonable. Secondly, evaluation websites as neutral institutions should be highly developed, and will serve as a market monitoring approach to perfect and regulate e-commerce market. As it shows, facing the tide of e-commerce development, our domestic e-commerce evaluation undoubtedly has a great potential.

13.1.2 Method of E-commerce Case analysis

1. PEST analysis (general environment analysis)

PEST analysis, also called general environment analysis, is made from the initials of four words: politics, economy, society and technology.

The matrix method which divides the coordinate into four quadrants is usually adopted in PEST analysis. If we take politics and economy as the coordinate, it should develop when both the political and economic environments are good. If neither of them is good, there is no means to develop. While one is good but the an other is not good, proper consideration should be taken to make a decision. PEST analysis is usually used in exterior environment analysis of corporations.

2. Competition factor analysis

If one corporation wants to enter into another new field or an old one tries to develop a new product, competition factors should be analyzed.

As shown in Fig. 13.1, there are mainly four competition factors:

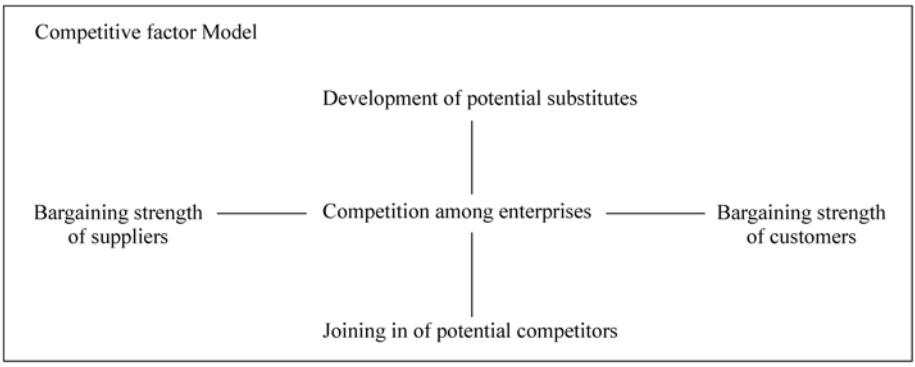

Figure 13.1 Competition factor analyses

(1) Development of substitutes: for example, the output of video tape recorders used to be great, but once a potential substitute VCD appeared, the sale of video tape recorders decreased soon. The emergence of TV also gave a hard blow to film industry. Whatever product it is, it will be substituted one day. The old one gets affected while its substitute is in a predominant state.

(2) Joining in of potential competitors: if substitute exists, there must be potential competitors at the same time.

(3) Bargaining strength of suppliers: the upstream of products is the suppliers who always want to increase their profits. In fact they are a source of competitive force, and a potential threat.

(4) Bargaining strength of customers: Downstream clients try their best to cut your price. If you sell one desk for ¥300, they always want it to be 280 or 250. In this regard, customer is a competition factor.

3. BCG Matrix and Value Chain Analysis

BCG matrix makes a matrix from the rate of sale increase and relative market share, and it is analyzed through four quadrants. If an enterprise produces various kinds of products, a discussion should be held to decide which one should be continually developed and which one not.

Suppose the *x*-axis represents the comparative market share and the *y*-axis is the rate of sale increase. If a certain type of product has a big comparative market share and a large number of clients while its sale still increases, it should be developed. If the market share is small, it should no longer be produced as it's more and more difficult to be sold. If the share is large while the increase is slow or the increase is fast while market share is small, the product should be left as it is or developed.

For example, the sale increase goes up quickly while its market share is small; the marketing channel should be extended by using some sale methods. If the market share is large while sale increase is slow, we should also pay attention to the marketing methods.

The value chain analysis of products analyzes every link of products from research, production, sale to after-sale service, to find out which link is not done well and which one causes extra profits.

4. SWOT Analysis

SWOT analysis is one of the most popular ways for strategic management analysis, which is more important than all the methods we have talked above. SWOT comes from the initials of four words: superiority, weakness, opportunity and threat. It is the most commonly used and most effective way.

While analyzing enterprise's inner and exterior environment, we can divide it into two parts, which are also the first two parts of SWOT analysis: one is the superiority an enterprise owns, the other is weakness. When we talk about its exterior environment, it can also be divided into two parts, which is the latter two parts of SWOT analysis: one is the opportunity we have, the other one is the threat outside.

SWOT Matrix Analysis (Fig. 13.2):

(1) Superiority—Opportunity strategy is also called superiority—opportunity matrix (or SO matrix)

SWOT matrix analyzes the superiorities and opportunities of enterprises. The inner superiority should be exerted while exterior opportunities should be made use of. If both are available to a company, it will surely develop. If there is neither opportunity nor superiority, the company will not develop. If only one of them is available, it should set the stage for the development. SO matrix tells

how to exert the inner superiority of a company while taking advantage of its opportunities.

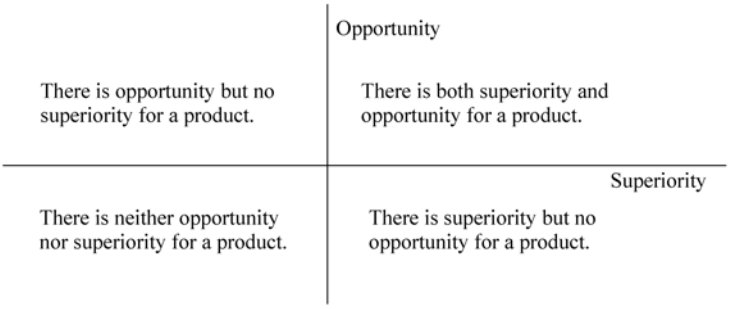

Figure 13.2 SWOT Matrix Analyses

(2) Weakness—Opportunity strategy, which is also called Weakness and Opportunity matrix—WO matrix

Under the circumstance when there is neither opportunity nor superiority, there is no way for the development of a product. But if there is any opportunity, do utilize the exterior opportunities to set off the inner weakness.

(3) Superiority—Threat Strategy, which is also called superiority and threat matrix—ST matrix

Make use of the superiority of the enterprise to avoid or ease exterior threat.

(4) Weakness—Threat Strategy, which is also called weakness and threat matrix—WT matrix

Decrease inner weakness while avoiding exterior threat.

5. Three ways to analyze competitiveness

The so-called three ways to analyze competitiveness refer to three strategies enterprises take in competition: differentiation strategy, concentration strategy and low-cost strategy.

Differentiation strategy means to achieve superiority in competition by supplying unique products and services to meet customers' special needs. The cause of this strategy relies on enterprise's characteristic product and service instead of its cost. However, this does not mean that cost can be omitted. The point is that cost is not the emphasized strategic goal. By using this strategy, an enterprise can well protect its five competitive forces of its field (which will be discussed later), and gain more profits than average.

If the customers in the market are more sensitive about price, to be supplier in the field with the lowest cost can be a very powerful means of competition. The strategic goal of low-cost-oriented supplier is to gain long-lasting cost superiority rather than extremely lower cost. While gaining the leadership in this aspect, enterprise managers must consider the most important characteristics and services regarded by the customers. If one product is too simple without any extra

characteristic, its competitiveness will be decreased rather than improved. What's more, whether the competitors can copy or keep up with the way you gain the cost superiority is also important. The value of cost superiority depends on whether it is long-lasting. If the competitors realize that it is not difficult or it does not cost a lot to copy the way the leader gains the cost superiority, this superiority will never last long. And there is no valuable superiority.

Concentration strategy means focusing on a specific market as the goal, and supplying specific products or service for a special area or customer group, which is quite different from the other two strategies. Cost superiority strategy and differentiation strategy face the whole field and act in it. However, concentration strategy chooses a specific goal to carry out intensive production which calls for more efficient services than the competitors'. Once the target market has been selected, enterprise can make its concentration strategy by differentiating products or leading in cost. That is to say, enterprise using concentration strategy is basically a special kind of differentiation or low-cost enterprise. For its small size, this kind of enterprise cannot carry on differentiation and low-cost strategies at the same time. So if it wants to lead in obtaining low cost, it can produce some specific products or complicated ones which are always too hard to be standardization and not easy to form the efficiency of large scale economy in production, so it is not easy for such products to gain the priority with the experience curve. If the enterprises engaged in concentration strategy want to achieve differentiation in its products, they can use all the differentiation approaches to gain their expected aims. Being different from the enterprises taking the differentiation strategy, they only compete with these enterprises in a special target market instead of other sub-markets. In this regard, concentration enterprises can know their market and customers well and supply more sophisticated products and services.

6. Model analysis of five forces

In some sense five forces model analysis belongs to microcosmic analysis in exterior environment analysis. This model began to exert its influence since it was proposed by Michael Porter in the early 1980s. Customers' competitive environment can be efficiently analyzed by using the way to analyze the competitive strategy. Potter's 'five forces' analysis is a static profile scan to an industry's profitability and attractiveness, which explains the average profit opportunities of the enterprises in this industry. So it is a measurement index of a whole industry's situation, not an index of a single enterprise. Usually this method can be used in analyzing the ability of making profit by establishing a new enterprise in certain industry. The main contribution Michael Potter has made to the management theory is to have set up a bridge between industrial economics and management. He brought forward the model of industrial structure analysis in his classical works *Strategies of Competition*, which was then called five forces model. He believed that the profitability of an enterprise is determined by five forces that

are the present competitive situation, suppliers' bargaining strength, customers' bargaining strength, threats from substitutes or substitute services and threat from the new comers of an industry. And the core strategy of an enterprise should lie in the choice of a right industry and an attractive position for competition.

Strategy analysis has many ways to be realized. The most usual ones are PEST analysis, competitive factor analysis, value chain analysis and BCG matrix analysis. Of all these methods, SWOT analysis is the most important one. One thing needs to be emphasized is that information should be healthy, unpolluted and real. Know both the enemy and yourself, and you can fight a hundred battles with no danger of defeat. While carrying out strategy analysis, it is very important to seek truth from facts because it is important not to exaggerate one's superiority and to avoid the weakness.

13.2 Case Study

13.2.1 Case Study of China's Agricultural Products E-commerce

China is a large agricultural country with plenty agricultural products resources, which diversified in variety and widely distributed. From the market point of view, the first type of products are the fruit, vegetables, meat, eggs with high added value, which can be seen as general food products; And another type is closely related to national economic security and the people's survival, such as food and fuel. China's entering the WTO integrates the socialist market economy of China with the global market environment. The domestic agricultural product market (especially foodstuff) will gradually come into line with the international market, which will make more efficient use of resources in agriculture and resources of related industries, and bring about the steady and rapid development of the agriculture and other markets in relation to agriculture. Information technology and e-commerce are the inevitable means to improve the operating efficiency of enterprises and to increase market competitiveness in the circulation of agricultural products and globalization of agricultural enterprises.

The development of e-commerce can be roughly divided into three levels.

(1) E-commerce information, i.e. advertising online or providing business information on the Internet. All the e-commerce business activities using information technology can be viewed as the broad sense of e-commerce. This is a wide range of low-level e-commerce.

(2) Online Coordination. With definite buyers and sellers, its process is actually the expansion of e-commerce. The result is to sign contract online, which would involve certification and the legal validity of the contract.

(3) Electronic transactions, which is the highest level of e-commerce. Its core includes electronic payment and electronic clearing, realizing the settlement of

goods distribution and capital flow step by step.

Unlike the direct online transmission transactions for intangible goods such as software and information products, the object for e-commerce for the traditional agricultural goods is often visible; there must be corresponding logistics and distribution system for online transactions. Due to the perishable nature of most agricultural goods and the sensitiveness of the agricultural product prices to the changes in supply and demand, they are usually transacted in the form of online auction.

The implementation of e-commerce in any industry cannot be separated from the choice and construction of its business model. E-commerce in the agricultural industry is no exception. China's agricultural development and practical application of e-commerce models feasible at the present stage is more forward-looking theoretical study and practical exploration.

General e-commerce transactions can be broadly divided into four phases: preparation before the transaction, transaction negotiations and the signing of contracts, transaction processing procedures, the execution of the contract and claim. Generally speaking, the application of e-commerce in China's agricultural product is in the initial stage of multi-level development. The flow of information in business activities has been carried out more and more electronically, while the electronic application in logistics and funds flow is still in the initial development stage.

The major existing models of e-commerce business include electronic auction, online trade matching and online purchase. Based on the representative e-commerce cases of agricultural products, such as the commodity futures exchange house, the China Rural Network, XinHua GuoXin Information Services Company Limited of Beijing and so on, this text tries to give the readers a broad understanding of the status of e-commerce for China's agricultural products.

The practices of these e-commerce companies in the agricultural industry include both the futures market of electronic commerce (e.g. corn, soybean and soybean meal in DaLian Commodity Exchange; wheat and cotton in ZhengZhou Commodity Exchange) and the spot market of electronic commerce (Chinese Rural Network). There are both e-commerce companies which provide e-commerce platform (e.g. Alibaba, XinHua GuoXin Information Services Company Limited of Beijing) and Chinese Rural Network which has combined the virtual market and the spot market. There are both Alibaba which provides a single form of e-commerce transactions, and XinHua GuoXin Information Services CO. LTD. which provides a wide range of e-commerce. There are both B2B in the form of companies to companies and the one in the form of one company to companies. There are e-commerce transactions for fresh agricultural products as well as for grain and cash crops.

(1) E-commerce of XinHua GuoXin Information Services CO. LTD., Beijing. It is the broadest sense of e-commerce, mainly to get involved in the foodstuff industry. It established not only China Cereals, Oils and Foodstuffs Information

Net (www.cof.net.cn, called "Chinese Food Network") which provides online information, but also China Grain Trade (www.cctn.net.cn) which offers online e-commerce service, as well as I-Grain which provides a community for companies dealing in food and agriculture to display themselves and communication with one another. In July 1996 XinHua GuoXin launched the first commercial information network of China food industry, China Cereals, Oils and Foodstuffs (www.cof.net.cn). It provides online information and consultation for food. This is a widely used mode of operation for the domestic agricultural and foodstuff websites. The agricultural department, food department and business department of government also provide a lot of information-based services, but from the business point of view, companies purely providing information mainly include Chinese Food Network, the China Business Network, and China's grain-business network. In November 1997 the first B2B online trading network in this industry, China Grain Trade Network (www.cctn.net.cn), was launched. China Grain Trade Network considers grain trade as its central business, views suppliers and stockers as their clients, makes the Internet their communication platforms, and uses membership-based system and network operations. It brings together various information about supply and demand of agricultural products from overall China and even the world, realizes its gain, conclude transactions of oil and related agricultural produce with high efficiency, low cost and great benefits through both online and offline approaches. It carries on one of the most meaningful exploration in the e-commerce practice of China's agricultural industry. As to the trading modes, it currently covers modes of e-commerce transactions: automatic online trade conclusion, electronic auction, online purchase and authorized purchase.

(2) E-commerce of Chinese Rural Network. Chinese Rural Network was founded in 1997 by increasing its investment and enlarging its shares on the basis of Chinese Produce Information Network. It was co-founded by Information Center of Agriculture Department, Shenzhen Agricultural Produces CO. LTD., Shenzhen ShenBao Industrial CO. LTD. and Techedge Intelligent System (Shenzhen) Co. Ltd. The four shareholders combined their complementary strengths, integrated the traditional enterprises with network economy and accumulated business together with experience and resources.

(3) Agriculture commodity exchange house. In the 1990s, along with the further development of reform and opening up to the outside world in China, a higher form of market—futures market started operating. At present, the dominating futures market—Zhengzhou Commodity Exchange House and Dalian Commodity Exchange House have already begun their transformations to electronic transactions, which is a very important B2B (business to business) e-marketplace model, which is worth to be seriously studied. However, we will not make in-depth analysis for such electronic business models since it is influenced by the national policies. But practically speaking, price detecting function possessed by futures business has a great influence on domestic and overseas products markets. The

vigorous popularization and application of e-commerce for the produce traded in the futures exchange house are of great significance for the establishment of China's produce market system.

Prospects for the e-commerce in agricultural industry in China.

(1) Favorable external macroscopic environment. It consists of the national attention to the "three rural issues", the attention and support of the national ministries for information technology and e-commerce, the emphasis and active support policies from the Information Office for the Wholesale Market of Agricultural Produce which is attached to the Nation Development and Reform Committee and the Ministry of Agriculture, and external force of economic globalization.

(2) The demand-driven of self-innovation in agricultural market

Production is the foundation for the industrial development, but market and circulation are the key to industrial development. Poor circulation of agricultural products has become the obstacle impeding the healthy development of agriculture and the rural economy, and it has also become one of the important factors affecting the increase in peasants' income and rural stability. From the aspect of circulation, the difficulties in selling produce and the structural, seasonal and regional surplus are for two reasons. First, the information did not arrive in time and people blindly followed suit. The underdeveloped market information formation mechanism and the dissemination of information transition cause a lack of market information. Secondly, there is only a single means of transactions and trading market management is not standardized. Now the traditional method is one-to-one spot transactions; modern bulk agricultural markets are not universal; and there are even less futures transaction and forward contracts.

The application of Internet technology has injected new vigor and vitality to the circulation of agricultural products in China. From the traditional hand-to-hand mode of agricultural product transaction to the integration of all kinds of resources, and the use of advanced and convenient technology to set up application platform for agricultural information, the implementation of online transactions of agricultural products has greatly improved the agricultural value chain and the competitiveness of agriculture. However, the e-commerce for agricultural products is not a simple alternative of traditional way of circulation; it is a revolutionary transformation of the traditional agricultural economy. First, in the process of agricultural products going from production to the market, the circulation speed is restricted by the farm produce's characteristics of being uneasy to be standardized. The creation of Internet market requires the standardization of agricultural products, which will inevitably lead to the upgrading of agricultural product brands and increasing core competitiveness. Secondly, online transactions are more open, fair and transparent, in which the prices for agricultural products truly reflect the relationship between supply and demand in the market. So they provide an explicit index for the government departments at all levels and the broad masses of peasants to make scientific arrangements for production and

marketing. Thirdly, the online trading platform is an extension of the original traditional agricultural markets. It results in the diversified main body of the transactions, and also provides broader business opportunities for the enterprises.

In the process of building e-commerce platform for agricultural business and doing business online, a series of practical problems in the circulation of agricultural products were resolved through the continual practices and pragmatic explorations of domestic and foreign companies for the past few years, which accumulated some experiences in implementing agricultural e-commerce in China. First, they guide the enterprises to re-integrate resources and business processes to change the traditional way of doing business, and form a highly efficient industrial chain. At present, China is facing rapid development of the circulation of agricultural products at home and abroad, and the enterprises are faced with competitive products and services, which will no longer be a simple competition, but competition in the business model and the industrial chain. Therefore, it is necessary to re-evaluate and inherit the original business processes and integrate industrial chain. Secondly, the enterprises may obtain the value-added part of the value chain through electronic commerce, thereby realizing the reality of its value. The application of e-commerce technology plays an important role in the formation of the new model of business operation in enterprises. It is not only the computerization of the traditional business. From a development perspective, the new model will bring the companies new values, including the updating of information, improvement in management, smooth dissemination of information, improvement in efficiency, reduction in costs, increase in benefits, widening of marketing channels, coordination of cooperation, promotion of brand name, unity of standards, improvement of services and finally enhancement of competitiveness. This is also the goal of the implementation of e-commerce strategies. Thirdly, we should have a stable mentality and gradually form a mode of making profits. Whether it is an e-commerce operator, or a traditional agricultural business that wants to develop e-commerce, business is business. We must make profits. Only profits can guarantee the survival and development of the enterprises.

In short, China's e-commerce development is a gradual process, and it is impossible to replace all the traditional business modes. The exploration and development of e-commerce in agricultural products is no exception. The true value of e-commerce is reflected in the process of integration and optimization of the supply chain, enhancing service quality and reducing operating costs. Therefore, it is necessary for e-commerce operators to take a step-by-step development strategy.

13.2.2 Case Analysis of E-commerce Supply Chain Management

Supply chain management is an effective way for enterprises to adapt to the global competition after entering The 21st century. As a new management model,

it integrates and coordinates resources of all the nodes from the aspect of the whole supply chain, and emphasizes strategic partnership coordination, integration of information resources, rapid reaction to market and creation of value for users. However, it is difficult for the enterprises and their partners to share the real-time information with the traditional supply chain based on paper and fax. Although some manufacturers have already been using MRPII, ERP, CRM and SCM systems presently, these systems are still often limited to internal enterprises, and cooperative partnership between the online electronic connection (Electronic Linkage) and the joints between the enterprise and customer are weak. They formed a number of isolated information island on the supply chain and could not fully reflect and support the strategic advantages and systemic features of the supply chain management.

E-commerce is an effective way for future enterprises to improve their international competitiveness and to expand market. At the same time, it has become a new challenge to the traditional methods of supply chain management theory. The combination of e-commerce and supply chain management formed a new hot topic of chain management—e-commerce supply chain management (e-supply chain management, e-SCM). The core of e-SCM is to manage information efficiently and to help enterprises create a smooth information flow among customers, suppliers and internal enterprises.

At present, the study of supply chain management and e-commerce integration attracted the attention of scholars at home and abroad. Related topics have been raised in some magazines and academic conferences. These studies can be broadly divided into two categories: The first category is the use of electronic commerce to integrate various heterogeneous systems on the supply chain together to improve business process efficiency and lower total cost of the supply chain. Some typical examples are the integration, adapter and standard of ERP and CRM, EDI strategic application and its influence on partnership business relations and balance of power, the research on the adopted model of e-commerce technology. This category focused on the application and management of information technology. The other one is to study the features and methods of the supply chain management under the environment of e-commerce, such as distribution process redesign, reduction of middle layer in circulation, avoiding price differences, reorganization of the supply chain, and e-strategic study of supply chain. They all focused on the innovation of management model. E-commerce supply chain management is quite extensive now in foreign enterprises. Many large companies already have their own e-commerce supply chain management systems, such as Cisco, Dell, GM, Ford and other companies; some other companies provide professional e-commerce supply chain solutions, such as i2, Manugistics, and Agile Software.

The supply chain management mode requires a breakthrough to the traditional areas and obstacles of procurement, production, distribution and service. It views the various business operations inside the enterprises and between the nodes

enterprises in the supply chain as a whole. Through effective coordination of the supply chain information flow, logistics, and capital flow, it organically integrates the internal and external supply chain to build integrated supply chain management system, which is aimed to meet the requirements of high-quality, high flexibility and low costs for the production and management of the enterprises from new competitive environment.

Applications of e-commerce promote the development of supply chain, and also make up the inadequacies of the traditional supply chain. From the infrastructure point of view, the traditional supply chain management is generally based on private dedicated network, which requires a large capital investment. Only large enterprises can afford to set up their own supply chains, and their chains lack flexibility. However, e-commerce enables the supply chain to share the global network, so that small and medium sized enterprises are able to join the globalization of the supply chain at a lower cost.

From the communication point of view, the adoption of advanced e-commerce technologies (such as XML, OBI, etc.) and network platform make it possible to establish various flexible electronic links between the various organizations, such as internal organization system (Inter-organization Systems, IOS), corporation websites, Extranet and Electronic Market, so as to improve the means of communication between business partners. Thus all business enterprises in the supply chain can link their isolated information islands together to achieve the integration and sharing of business and information, and to make some of the advanced supply chain management available.

Enterprise supply chain management is an open, dynamic system, whose main factors can be divided into two broad categories: (1) Regional factors, which contain the three elements of procurement / supply, production / planning, and demand / distributor. (2) Flow factors, which include information flow, capital flow and logistics. According to regional and flow features of the six basic elements of the supply chain management system, a matrix analysis model of supply chain management system can be formed.

Present situation of supply chain management in Shanghai bell corporation

Shanghai Bell is a modernized Sino-foreign joint venture and a state-holding enterprise in the industry of communication and information, with a total registered capital of USD 120.5 million and the 3,600 existing staff. Since the 1990s, the output and turnover of the leading products have always been in the top of the industry. The company's product mix comprises two main parts: (1) Traditional products: a series of program-controlled switchboards, the S12 Series. (2) New products: mobile, data, access and terminal products in contrast to S12 products. The output ration of these two parts is 8:2.

The supply chain establishment of Shanghai Bell is passable with good internal information infrastructure, ERP systems, and relatively clarified procedures and

responsibilities. But the integration between Shanghai Bell and resources from the external supply chain is not satisfactory. To a certain extent, it is still a traditional mode of operation and management, and has not really implemented its supply chain management to the entire system. Since the beginning of 1999, the global market demand for IT products has been growing wildly, but the supply of elementary components and spare parts could not keep pace with the demand. As many IT firms were competitive for material resources at the same time, the delay in delivery of equipment arose. As Shanghai Bell did not do well in quick reaction, flexible adjustment and responding between the internal and external system, some of the materials were not matched as sets or even kept in stock for a long time, and few contracts were fulfilled. For example, in the first half of 2000 the rate of contract execution was below 70%, for some products, such as ISDN terminal product, the rate is no more than 50%.

The focuses of Shanghai Bell e-commerce supply chain management strategies include e-management of supper relationship, e-prediction of market demands, e-decision and e-control of outsourcing, and e-strategy of inventory management. The existing supplier relationship management model of Shanghai Bell is a major obstacle to the development of a good supply chain management; therefore it needs to make adjustments in the following areas:

① Criteria for supplier selection: First, it's necessary to define the relationship between its products and the candidate suppliers based on the company-supplier relationship management model. For example: Shanghai Beiling provides Shanghai Bell S12 ASIC for communications, and every year 80% of its products are sold to Shanghai Bell. According to the company-supplier relationship management model, Bell and Beiling are au pair strategic partners. Secondly, we must have a clear understanding of the requirements for information standards for the suppliers and standards for the communication of information between them, and particular attention must be paid to information technology facilities and platform for suppliers of key material resources. Fluctuations in the supply of critical material resources will have a great impact on the supply chain; therefore, the selection criteria of traditional suppliers plus the standard classification of information are the basis of supplier relationship management.

② Means of selection and scope of suppliers: As an IT company, there is a tendency of globalization for the suppliers of Shanghai Bell, so the supplier should be chosen and evaluated through e-commerce all over the world. For example, suppliers may be chosen through online bid. On the one hand, this can breakthrough the limitations of existing information; on the other hand, it can realize fair competition, and enterprises can enjoy lower prices and good services. At the same time online bidding is comparably cheaper and faster and can be frequently used. In this way a dynamic alliance form of supply chain management is formed between enterprises and suppliers.

At present, the core competitive advantage of the IT companies is no more than technologies and services. It could be really difficult if one wants to gain an

edge all by its basic production in the face of fierce competition within the IT industry. So the future development direction of Shanghai Bell is to provide comprehensive information, communications solutions, and excellent customer service. The increase in the amount of outsourcing business in the future will inevitably increase the difficulty and complexity of management and coordination. So e-commerce technology should be adopted to manage and coordinate outsourcing business.

① The selection of outsourcing firms: Apart from the original production, quality, delivery and other conditions, selection criteria about its production management system and information infrastructure are added to ensure the future execution of e-commerce operation and monitoring. Take the 35th radio factory, Shanghai as an example. It has always been Bell's outsourcing firm, but its information infrastructure is relatively weak. Once there is a significant increase in the outsourcing tasks, or frequent changes in the information about market demand, the efficiency of the supply chain will be badly affected because of its poor information infrastructure and slow response to information.

② The immediate response to the outsourcing of production: In Shanghai Bell there are Intranet and ERP systems. Outsourcing firms can use the Internet or green Remote Access to get connected with functional extension of the production planning module of ERP Management System, so as to achieve simultaneous production with Shanghai Bell in response to market and demand changes.

In the past two years, on the one hand, there is a serious world wide lack of electronic components; on the other hand, the original Shanghai Bell poor inventory management system lacked the capacity to avoid risks. The result is that the problem of stock has become a focus in Shanghai Bell in the past two years. There are various models of inventory management for the supply chain management. According to the Shanghai Bell production model and types of inventory management, the following inventory management models can be adopted:

① Materials and semi-finished goods inventory: In Shanghai Bell, inventory management of materials and semi-finished products basically corresponds to the 'make to order' production mode. The main products are large switching equipments. The uncertainty of market demand forced the enterprises to keep safety inventory for certain materials or semi-finished products, so that they could solve the problems of inventory management for materials and semi-finished goods. In the recent two years Shanghai Bell had to face such confusion. On the one hand, it controls and manages the amount of inventory for materials according to historical data and market forecasts; on the other hand, there appeared a continuing shortage of material. Such risk of stocks may also reach another extremity of badly outnumbered materials inventory. A joint inventory management strategy can be considered on the crucial material resources. Through consultations between suppliers and Shanghai Bell, the joint management of inventory was executed. In this way they could consider the market demand to

minimize the impact of uncertainty in it and they could also consider the productivity of suppliers' to help the suppliers timely respond to the market demand and adjust the output. With the support of the e-commerce, the two sides are able to form a healthy inventory management model that shares information, resources and risks.

② Finished product inventory management: In the recent years, the finished product inventory management of Shanghai Bell has no serious problem; on one hand, this situation is decided by the company's product structure. More than 90% products of the company are produced in accordance with the orders and basically there is no inventory of finished products. On the other hand, the terminal products are quasi-civilian products manufactured in the way of 'make to order', which means not long after materials are stored, they are made into terminal products to serve the market needs. Due to the recent strong demand in ISDN terminal market, it still has no inventory backlog risks. However, there exists great pressure of lack of stock due to the fluctuations of market demands. Relatively speaking, the distribution channels of Shanghai Bell's terminals, and information IT systems and infrastructure facilities of distributors are strong enough to effectively support inventory management while the power of enterprises, and the capacity for storage and delivery is quite strong. VMI (Vendor Managed Inventory) model can be used to achieve inventory management of the terminal product. In 2000 the Terminal Department of Shanghai Bell was trying to use the overall framework agreement, implementation in batches, dynamic compensation and instant exchange of relevant information, which, in essence, has embodied the VMI inventory management.

To develop into a world-class telecommunications infrastructure supplier, Shanghai Bell will inevitably face the globalized market, customers and competition and make corresponding changes in accordance with market research, demand forecasting and response.

① E market research and demand forecasts: Shanghai Bell's inventory risks come from two aspects: one is the inventory management model and the other is the market forecast errors which is also the fundamental factor causing inventory risk. Strengthening market research and reducing demand forecast error are the imperative tasks of the company. The application of e-commerce can raise the level of market forecast from the scope of the study, sources of information, feedback time and costs. Shanghai Bell can establish a specialized demand forecast network together with all its branches and distributors on its original Intranet basement so as to make a real-time, dynamic tracking of trends in demand, collect market data, and provide the latest market forecast. In these ways, Shanghai Bell's supply chain system can really be operated according to the market conditions.

② E market and customer response: Recently, internal business ERP system and electronic connection with branches and professional distributors can be established through the extension of the backbone network or Internet, while

examination of the sales of the product or service contract can be handed over to its various branches, so that the market demand can be included in ERP operations as soon as the contracts are confirmed, and ERP system of an enterprise can timely respond when the contracts are changed and make adjustments related to the whole supply chain changes. Now, the major branches of Shanghai Bell post their contracts for the confirmation of the head office, and then the relative information enters the ERP operation, of which the average cycle is 7 – 10 days, while the existing contract fulfilling cycle is mainly concentrated in 20 to 30 days, with the average production cycle of 10 – 15 days, the transport cycle of 3 – 5 days. From the medium-to-long term point of view, the gradual development of Shanghai Bell's B2B e-commerce, the establishment of online product catalogs and solutions, online customization and ordering and online technical support and services enable the target customers of Shanghai Bell to respond to Shanghai Bell more directly, conveniently and timely.

Through the application of e-commerce, the isolated business islands outside the supply chain can be linked up effectively, to achieve integration of business and sharing of information. Meanwhile, the application of EC has changed the stability and affected scope of the supply chain. It has also changed the traditional way of the gradual transmission of information in the supply chain to provide a basement for creating a more dynamic and extensive supply network (Supply Web) which enables many enterprises to join in the supply chain alliance with low cost. Shanghai Bell's e-commerce supply chain management practice shows that the implementation of the strategy cannot only improve the operating efficiency of the supply chain and enhance customer satisfaction. Moreover, it can make an innovation of the supply chain management models and approaches, and makes the supply chain more flexible.

13.2.3 Case Analysis of E-commerce in Commodities Circulation Areas

Commodities circulation refers to the transmission of the products after been made from production area to consumption area (including the consumption of products of subsistence and products of production) through commodity trading with currency as the media. It is the aggregation of all commodity exchange relationships. For the circulation industry, e-commerce is essentially a circulation process, which includes the circulation between enterprises (groups) and consumers (individuals), and the circulation of business-to-business, business-to-consumer (individual).

1. Individual (consumers)

The individual of e-commerce refers to the individual (consumers) or group (enterprises) using e-commerce to make business consumptions. In the current

business forms, each ordinary consumer can be seen as the individual consumer under e-commerce model. The difference is that in the original business model the individual consumer goes to shops to buy things while in the e-commerce model, he buys things through electronic means (computer terminal).

To some extent, the number of consumers (individuals) determines the degree of prosperity of the applications and development of e-commerce in the circulation industry. The more the number of individual is, the more advanced e-commerce is and the greater capacity it has. The smaller the number of individual is, the less developed the e-commerce becomes. The circulation industry based on it would not develop well. This phenomenon has been proved to be correct in the development process of the domestic and overseas e-commerce practice. In the United States, the online transaction is of considerable size because of their large number of Internet users; in China, there are few large profitable online shops because the Internet users are few in number.

2. Enterprise (Group)

Enterprises are groups involved in commodities circulations and consumptions and they generally do wholesale and retail business. The purpose of the development of e-commerce is to provide fast wholesale and retail marketing to enterprises, and to finish through e-commerce a series of work of e-purchasing, e-shopping, e-payment and e-transmission. By conducting e-commerce, enterprises can make use of the advertisements for the international market, convenient electronic means, and communication capacity to maximize the economic profits with the most direct means of circulation, the least circulation and inventory, and the most rapid circulation rate and the fewest circulation links.

As early as in 1994, China has begun its research and development on electronic purchasing system. Many similar e-commerce models were enterprise-oriented, and provided specialized network as a communications tool for the enterprises to do transactions. Due to the high cost and complicated operations of the specialized network, the effect of these research and development was not so apparent. Today, with the development of e-commerce using the Internet, commodity exchange has been extended to the public computer network, and which led to a new upsurge of e-commerce. Hence it brought the birth of a virtual market.

E-commerce has brought a vast market for the enterprises. In this market they can use the Internet to disseminate information about the commodities to the places around the world. In this market, goods can be ordered speedily and conveniently through electronic means, which speeds up the production cycle. In this market the commodity circulation links can be reduced, goods can be sold directly to the consumers and the cost of transactions can be cut down.

With the rapid development of retail business today, the model of wholesale business has been weakened. In fact wholesale business can be conducted in e-commerce environment to make good profits.

Wal-Mart is the most successful international chain shopping center, and its electronic distribution center supports the supply and distribution of thousands of its branches. This center can automatically make electronic delivery for more than 1,000 manufacturers and suppliers. “Bulk” operations and reduced costs naturally form a “zero inventory” mode of operation, thus manufacturers, suppliers, and retailers can all benefit from it. A virtuous chain has be formed automatically and is growing bigger and bigger like a rolling snowball.

In China, the development of e-commerce has also provided an opportunity for chain organizations. Commercial enterprises can compose chain circles of e-commerce in a variety of ways, such as merging or acquiring, in order to develop the business of scale and enhance their overall competitiveness.

In the macro environment for the development of e-commerce, domestic enterprises can only enhance their competitiveness by participating in world economic activities. When the development of e-commerce reaches a certain extent, the role of e-commerce may change again and both wholesalers and retailers can do business online. Thus sellers selling directly online and individual consumers shopping directly online will become the main form of business operations.

Enterprises engaged in the retail business by using e-commerce technology, are called e-retailing enterprises, also known as electronic shops. Superficially speaking, electronic shops are virtual stores built in the world of network. Being different from shopping in the traditional supermarkets or department stores, online shop customers will not need to go out, but purchase at home through the computer network links. Store owners do not have to send the heavy goods into shops waiting for you to come, instead of that, the information and images of commodities can be presented to consumers’ computer screen by recorded multimedia through world information network, waiting for consumers to purchase.

People have already been accustomed to driving a car or riding a bicycle to go shopping; however, online shop still have unimaginable impact. As a convenient way of browsing, the Internet enables people to see specific models, specifications and prices of a product without stepping out of their homes; it can also allow people to see the real pictures and get the introduction of the performance of the goods online, which makes it as real as in a shopping mall. It can also be a way to reduce the congestion and tiredness caused by shopping. The most attractive thing is that this method can also achieve results which cannot be realized by shopping in person. For example: for a suit consumer, if he cannot find the proper color, style or size for a certain brand of suit he prefers, he needs not turn to another brand. The only thing he needs to do is to send an email with the information of his favorite color, style and sizes to the manufacturers. Thus his requirements can be met in a very short period of time. Particularly for those car-loving people, they can ask the car manufacturers to assemble a car which has not been assembled before to meet their unique driving habits. Such sales methods have already been in practice in some fairly large foreign automobile

companies such as Chrysler Corporation, the United States.

Commercially speaking, any transaction in the online shop should include four stages: trading (business flow), distribution (logistics, or commodities flow), payment (capital flow), transmission and value-added information (information flow).

As same as the traditional retail business, the online retailing stores can also provide the retailers an important competitive edge. First, it allows operators to provide differentiated products so different from the existing or potential competitors. Secondly, if the competitors provide the same or similar alternatives, it can help operators retain their customers. However, the online organization of commodity supply is different form existing channels. Online retailers need to have new marketing skills, particularly the skill to organize products. To make better use of the interaction of network channels and multimedia technologies features, screening must be learned to select suitable products. At present, the commodities which may be sold well online have the following characteristics:

(1) The commodities that have unique features.

(2) The commodities that the performance and prices of the commodities need to be compared, but the trial use before purchasing is not so important. Examples are standardized products with mature technology like computers and household appliances.

(3) The commodities that the consumer need to purchase conveniently and frequently.

(4) The commodities that can use voice, video and animation to display and sell, such as books, music, CDs and automobiles.

(5) Products can be electronically transmitted on network, such as downloadable software and electronic publications.

Comparatively speaking, present online sales of clothing are in a tight corner. One reason is that there are more men online and on the other hand, the pictures of the clothes on the Internet are often not clear enough, which makes clothing sales falling short of expectations. This shows that we should rely on our practical experience to tell whether certain commodities can be or cannot be sold on the Internet. Skills related includes continual adjustment of product structure to meet the needs of consumers, development of attractive prices and seizing the opportunity after the sale, e.g. when a client has purchased online in an interactive way, he will be awarded with a small gift, a catalogue and so on.

The vitality of e-stores lies in their ability to overcome the drawbacks of traditional transfer mechanism. The traditional commodity circulation is an “indirect” transfer mechanism. Under such mechanism, most commodities are required to go through the wholesalers. Sometimes they will even be dealt with by several wholesalers before reaching the retailers. At present in China, usually a wholesaler only holds several or tens of types of commodities; even the largest wholesaler holds only several hundred or several thousand kinds of goods, while a medium-sized retail enterprise owns tens of thousands of types of commodities.

So when a retail business wants to get the commodity it needs, it has to deal with several or even dozens of wholesalers. Usually a larger retail shopping mall has more than 2,000 wholesalers. This kind of mechanism not only increases the number of unnecessary sectors for commodities circulation, but also increases the circulation costs, storage costs and transportation costs of the corresponding parts. Once these costs coupled with the profits various wholesalers will extract for themselves, a huge difference will be formed between the ex-factory price and the retail price of goods, which is something that no consumer is willing to accept.

Facing such situation, some comparatively strong brand-name enterprises, such as Haier, Changhong, and Xinfei send their commodities directly to the shopping center. This direct transfer means has been widely welcomed by the vast number of consumers as soon as it emerged, and the prices of some commodities went through a significant decline. However, this mode does not give manufacturers greater benefits, because their sales staffs often have to visit different places. If they have to face every retail enterprise, they should not only equip themselves with the "massive" sales stuffs, but also increase the market expense to an intolerable extent and the purpose of lowering prices will not be achieved.

The emergence of electronic stores brings the most direct circulation channels to any kind of goods. The manufacturers cannot only send their products directly to customers, but also get from customers the information with the most characteristic demand and finally achieve the objective of "caring service". In the modern China where commodity circulation has not been developed maturely, e-stores will not only save storefront rents, decoration costs, utilities and manpower costs, but also achieve the objective of non-inventory management and reduce the funding pressure, which are very attractive to all kinds of enterprises in China. In addition, the electronic stores can open all day long, which will contribute to a special managing effect only for China, the country owning the world's largest population.

Retail business system is a system to complete the redistribution of products and services people need in a certain time and space channel. The basic elements of it are the manufacturers, wholesalers, retailers, consumers and the sales channels. A completion of commodity or service transactions is the result of interaction among many elements. When there are changes in the basic elements and the relationships among them, the system itself will undergo profound changes, especially the changes in the basic structure. The computer network represented by the Internet and featured by network connection breakthrough the traditional concept of space and time, and widen the link channels for extensive network. It enormously reduced the cost of the storing, transmitting and using of information and established a brand new products and services redistribution system. It enables the manufacturers, retailers and consumers to have enough interaction without the limitation of time and space. Thus, the retail business on the Internet will definitely grow in a new way.

The inevitable existence of the retail business system on the Internet lies firstly in its own features. Internet is not formed after the global systematic planning. Its size today is mainly owing to the original designing features of being open, sharing information, cheap cost and interaction.

(1) Openness: The Internet is open, free linked, and has no time and space limitation and no concept of geographical distance. Anyone can join in at any time as long as they abide by the agreements. Meanwhile, on the Internet anyone can enjoy the freedom of creation and all the information flow are unrestricted. No highest authorities exist in the network, and there is no control. Network operation is coordinated by the users, all of whom are au pair. The open feature of the Internet enables the Internet users to use it uncontrollably.

(2) Content sharing: Users can randomly access to the network websites (homepages) of others or call at the electronic billboard to find the information they need. Some websites are connected with the commonly shared database, thus more information is available, while the original intention of the content providers is to make users keep access to their latest research findings, the introduction of the new products and the instruction to use them or just some of their experience, they hope users to agree with their views and share their happiness.

(3) Low prices: While the exchange of academic information has been the beginning of the exchanges on the Internet, people have already become accustomed to free access to it. After the commercialization of the network, Internet service providers (ISP) commonly use low-cost marketing strategy to greatly reduce the communication and network expenses (which should be paid by the users), and increases the attractiveness of the network. Currently, most of the information on the Internet is free, and Internet services providers give out free Internet access differed in the length of time. The people who are willing to watch advertisements online will be presented a period of free access to the Internet which equals to several dollars in value and can be accumulated to a handsome amount.

(4) Interaction: The interaction of network is realized through two aspects. One is a real-time man-machine dialogue through web pages, on which the designer arranges the possible information of the users' concerns in a certain logical order by designing the visit routes and hyper-text links beforehand. Users can jump to the content they are interested in or other pages to get the information they need to know by choosing a specific icon. Meanwhile Gateway (Common Gateway Interface) can also be designed to collect users' data automatically. The second aspect is the asynchronous man-machine dialogue through electronic bulletin boards or e-mail. This is because the fast transmission of information on the Internet. This enables the users to obtain the accurate feedback which is different from making a phone call, where nobody answers the call or the person answering the phone is not the one you want to speak to.

The above-mentioned basic characteristics of the Internet have a big impact on its own commercialization and online retail business systems development. Its

overall effects lie in two points. Firstly the Internet can be taken as a new multimedia interactive media; secondly it can be used as a cheap and efficient trading channel. We should make full use of the Internet which can accommodate the multimedia data such as voice, video, animation etc., to store and release the appearance, quality and internal structures of a product or service in an all-round way, so that the personal visit associated with traditional retail stores can be partially replaced. On the other hand, since the Internet has supplied interactive channels of communication for almost anytime, the contract trading process becomes as easy as to buy something in the traditional store after interacting with the salesperson. This enables the Internet to become a new sales channel. If the former makes it possible to open up a retail online shop, the latter makes the online sale into reality.

The fact that the Internet retail industry has been initially developed actually declares the unique advantages it has compared to the traditional retail business. These advantages include:

(1) Advantage of new time and space. The traditional retail business is a type of retail shop selling conducted in fixed places and at fixed time. With the changes of people's demand and work schedules, the traditional retail businesses break the space barriers by setting up chain shops, and satisfy the consumers' time requirement in a selling chain. However, the Internet retail business is based on online shops characterized by information database and the extension of retail space expanses together with the extension of the network. With no geographical barriers, the time of shopping is decided by consumers themselves. Therefore, the Internet retail business has a new advantage of time and space for shopping compared with the traditional retail business. This advantage can meet the users' needs to a greater extent, so in fact there is no boundary and no difference between day and night when people are shopping on the Internet.

(2) Advantage of displaying products or services in a full round. For the common household goods, online retail has no advantage compared with the traditional retail business. However, for some other durable goods and industrial products, the retail network is able to use the online multimedia performance to display the appearance, performance and quality of the products or services and the key internal structure deciding their function, which will help consumers to know the products or services before they buy them. In the traditional retail shops, although products can be actually displayed to a customer, the ordinary customers usually have a superficial understanding for the goods. It is hard for customers to know inherent value of quality, which means they tend to be confused by the appearance, packaging and other factors of the commodities. Theoretically speaking, the rational purchase of consumers will not only improve their own consuming effectiveness, but also save some social resources.

(3) Advantage of improving customer relations and deepening user understanding. The interactive communication of the Internet enables people to express their thoughts without any outside interference, so it is easier for consumers to show

their evaluations of products or services they have brought, which enables the online retailers to have a more thorough understanding of the users' inherent demand.

(4) Advantage of reducing the cost of circulation and transaction. Compared with the traditional retail business, the using of the Internet as a marketing channel avoids the excessive intermediate links and speed up the speed of information flow. Thus, the online suppliers of the commodities can provide the consumers with goods at more favorable prices. In fact, when investments of other retailers become more and more expensive, the investments of e-commerce—computer, database and telecommunications equipment—has become increasingly cheap.

In e-retail stores in the online retail business system, the suppliers and consumers of commodities, shopping service providers and shopping service distributors all play certain roles which are quite different from the roles played by the manufacturers, wholesalers, retailers and consumers in a traditional system.

The basic structure form of the Internet retail business systems is similar to that of traditional retail system. The envisaged basic form of online retail business structure is online market and online consumers.

The Internet market is a shopping mall formed by one or several large shopping and information service websites. When the websites have accumulated numerous products and services of everyday needs, a large number of people will visit them, which will stimulate more enterprises to sell several types of goods in the corresponding websites. So the number of pages on these websites keeps increasing. As more and more services and products are included, they attract much more attention from people, and the number of visitors will go up without doubt. The Internet market includes shops, shopping malls and commercial streets.

(1) Online shopping mall. The Internet Shopping Mall (Internet Hall) is similar to the traditional retail shopping center (Shopping Hall). The difference is that the traditional commercial buildings cannot accommodate many shops while online shopping centers can accommodate thousands of retail shops. A typical example is the "Internet Shopping Mall (Internet Hall)"of the United States opened in 1994, which has 130 stores and is very rich in products catalog now. The Internet shopping malls are usually set up by shopping services providers who build distribution networks too.

(2) Online individual shops. Online retail shops are quite similar to the traditional business of individual shops, but they provide the information instead of the real goods or services. To achieve the same market as the traditional shops, online stores only needs a small room, a computer, a set of networking equipment and some software. Good location is not as important for setting up shops or developing trading channels on the Internet as it is for setting up tradition channels. And it's unnecessary to pay exorbitant rents or invest a great amount in fixed assets. But setting up a spot in online shopping mall or the downtown area is important, or else very few people can find the location of the shop.

(3) Internet shopping streets. Being similar to traditional commercial streets,

online retail business is composed of many individual shops or shopping malls. Judged from the actual operation online, Internet shopping malls and shopping centers do not have so much distinction or obvious benefits. According to the report of Financial Times (Britain) on June 11, 1997, International Business Machines Corporation (IBM) of America closed the "World Street"—a retail shopping streets supported by the Internet in July 1997 due to its inadequate customers and huge losses, because of their own business operation and the restrictions of the level of Internet development.

Individual customers refer to the individual users wandering on the Internet, or independent Internet users. When they visit the online downtown areas or a variety of online shops and shopping centers, they become the customers of online retail business. Individual customers are scattered and random and their amount depends on the number of network users.

The virtual societies are actually online customer groups usually built in the outlets and online stores. The Internet users who share identical views and common interests gather together to exchange information or procure goods one week after another. They formed a circle called the virtual societies. The virtual societies can be a good shopping guide to the newcomers. Meantime, they themselves are basic customer bases. So the existence of virtual associations has a great impact and push on the sales of online stores.

While IBM preparing to close the online "world street" it launched, there has never been a moment's pause in the development of the Internet. Federal Telecommunications Commission of the USA has made the decision to popularize the digital television in nine years, which will create a huge market for USD 150 billion. The computer industry tries to lead this innovation to the integration of computer, television and the Internet. It can be predicted that relying on digital television, general information users can easily obtain the necessary information and shopping service online. Once the Internet is popular in the ordinary families, the development of household online shopping will be greatly promoted. Online shopping has created tremendous potential business opportunities for the retailers, who may use the following two methods to improve the rate of their investment returns.

(1) Increase gross sales. That is to increase gross sales through purchase of existing customers or through attracting more new customers. For example, the retailers in the original traditional retail business system can access new customer groups through national and global network. Because of the use of more convenient means in commodity information searching and more entertaining ways of promotions, the old customers will buy more commodities; thereby the market share is expanded.

(2) Reduce the selling costs. The costs of transaction will be cut down by using the low-cost Internet e-commerce approach instead of replacing the traditional retail sales channels. Online sales will be a really inexpensive way of selling commodities. In particular, those retailers who spent a lot in advertising and

marketing, sales personnel, storefront operation and delivery rate will discover that online sales can access to the same group of users more effectively, and not so large amount of investment should be paid in the fixed assets as shop selling.

In fact, with a large number of families accessing to online shopping, greater investment return will be provided to managers in the system of online retail business. Online retailers will not take the disastrous error of IBM's "world street".

The e-retail systems, e-retail server and the process of e-retailing are the core content of e-commerce technology. It is of great practical significance to have an extensive and deep study of the e-commerce shopping process, the application software and modernized e-payment instruments. To develop e-commerce, study on safety, security, authentication and other high-tech of e-commerce should be carried on. In particular, we should mobilize all sectors and all kinds of business to actively participate in e-commerce, including the bank and financial industry, customs, tax bureau, commodity inspection, insurance, import and export companies, transport packaging companies and so on. The large number of consumers should change their concepts to engage in electronic shopping.

As the Internet is becoming increasingly popular, to make use of the Internet which has no boundary and region limitation to sell goods or services has become the new choice of commodities trading. A series of enthusiastic international discussion on how to use the Internet to create business opportunities proves that the electronic stores have been or will soon become a new fashion. The advantages of such transactions have being gradually understood. And these concepts are being transmitted to all corners of the world with an unimaginable accelerating speed, and China is no exception.

In China, with the improvement of technology and the gradual deepening of people's consciousness, a good trend of vigorous development for electronic shops has appeared. From government to citizens, it is generally believed that the Information Age has arrived. As an important form of the Information Age, electronic shop replaces the old business model and becomes the new favorite of the times.

(1) The inherent advantages of electronic stores, such as its wide range (without time limits), low-cost (zero inventory, no storefront, no salespersons, and no transmission of intermediate links), and simple management are gradually known to the enterprises, including the manufactures and commercial enterprises.

(2) The competition in traditional business is excessively fierce. At a time when more and more shops have been closed, e-stores as a brand new concept is attracting more and more investors. Many large and medium-sized enterprises have set up their own business networks already, and a considerable portion of them have been connected with the banks on the Internet. Some small and medium-sized enterprises, particularly many rural township enterprises, have begun to set up their own websites. By the adoption of the Internet technology, there has been considerable progress in China' s commercial automation. These have all made a sound foundation for the further development of e-stores.

(3) In order to catch up with the global trend and promote the faster development of the national economy, the government of China is taking some preferential policies to actively foster the development of e-commerce. The top leaders of China have declared their support for the development of e-commerce and tried to create a favorable external environment for it. The Ministry of Information Industry reduced the cost of Internet access on March 1, 1999, which has greatly aroused the enthusiasm of ordinary users.

However, it must be clearly understood that although the advantages of the network has been aware of, there are still some steps for popularizing the electronic stores. At present, the development of China's electronic shops is constrained by the following factors:

(1) Reliability of the product quality of e-stores. In today's market of China, people often wonder whether they are cheated by buying fake goods even after seeing and touching the goods in person. It is believed that it is a ridiculous way to buy things just according to the photographs or introductions. Therefore, to develop the electronic store market we must further regulate the commodity circulation market, step up efforts to crack down on fake, counterfeit, and inferior goods, and ensure the quality of commodity trading.

(2) Changes in people's concept of shopping. At present, the majority of family in China regards shopping as a form of entertainment. People enjoy more from mutual communication and relaxation in addition to pure shopping. So the urgent task to develop e-commerce is to find a substitute which can provide the same entertainment.

(3) Propaganda. Most Chinese businessmen have not step out of the traditional business model, and some have never heard of electronic shops, not to mention the investment for online shops.

(4) Absence of a more complete set of laws and policies for electronic stores in China. That is why so many people are afraid of selling online.

(5) Technical problems of Internet itself affecting the development of electronic stores. The problems include the security of transactions, the credibility of the transaction, delivery of loans and confidentiality. Although some solutions have been made internationally, such as the public key infrastructure, the traders' worry cannot be fully dispelled with the delay of propaganda. All the above-mentioned problems, which are also the difficulties involved in the development of electronic shops in China, need to be addressed and resolved for the further development of e-stores.

3. Case of online shopping

The emergence of electronic stores in China catches a great attention of governments at all levels. After years of planning, the State Economic and Trade Commission launched the China Commodity Trading Center, a complete e-store center, in September 1997, which constructed a modern commodity trading network by use of the Internet technology. In addition to searching commodity

information and completing the settlement of capital through the computer terminals, the authenticity of transactions and the regional characteristic of production have been considered. The center has set up a display center of commodities to show all kinds of physical commodity samples. Sub-centers have been set up in 337 cities of China to manage the access of the enterprises into the network and the delivery of goods.

Commodities Trading Center links production enterprises, retail businesses and consumers together with four main bodies.

(1) A central network of various databases providing a convenient channel for inquiry between manufacturers and retail businesses.

(2) A large display center which enables all the retail enterprises to see the real samples of commodities.

(3) A set of strict and simple rules for commodity trading for all the transactions to follow.

(4) An authoritative management body of commodities transactions to be responsible for the making up of rules, the maintenance of databases and the process of transaction.

The application of such transfer mechanism makes it possible for producers and retailers all over the country to negotiate business only in one place, which will not only saves the time and the costs of run around different places, but also achieves the purpose of comparing the products from different shops. The retailers will not miss the goods they're interested in, while the manufactures can find their vices and shortcomings by comparing different goods. This direct transfer mechanism of goods takes full advantage of the convenient access, resource sharing, rapid information transmission and convenient information inquiry of the Internet. Furthermore, through the Internet, connections can be made with foreign commodity trading centers, which will help to form a global commodity exhibition and trading center for the global commodity exchange.

At the same time of the opening of the China Commodities Trading Center, the National Planning Commission has opened the commodity trading net of Business friends, which is also a significant electronic store system with the same size as China Commodity Trading Center. Although these two networks have not got enough attention from domestic enterprises, they fully embody Chinese government's foresight in the development of electronic stores and rectification of the circulation market.

Independent electronic stores are also springing up everywhere. Let's take online bookstores as an example. China's online bookstores began to appear in 1996. The earliest online bookstores are the WanSheng bookstore and the Fengrusong bookstore in Beijing. And then HangZhou XinHua Bookstore and Xinhua bookstores at East Nanjing Road, Shanghai, began to run online bookstores. Publishing companies and ISP service companies came after them. The China National Publishing Industry Trading Corporation and the United States Congress cooperated with each other for the founding of an online bookstore,

"China's Modern Bookshop" in May 1997. Oriental Netscape set up the Oriental Netscape Online Bookstore in June 1997. Opened in 1999, Dang Dang Online Bookstore (http://www.dangdang.com/) has become a very influential bookshop now. These bookstores provide a lot of publication information and introduce new books and the best-selling books timely, together with a picture of the cover of books, an introduction of the contents, the authors, the number of pages and the prices. Readers can search through various ways to find the books they need. Most online bookstores offer 7% – 9% discount and free mailing service. Readers only need to fill in the form provided on the home page, or send an e-mail to specify the books they want to purchase and pay by credit cards or through post office remittances. Their favorite books will arrive a few days later.

Technically speaking, electronic stores combine the feature of the extensive range of the Internet with the traditional information technology. It is dynamic and interactive, and its scope is very broad, ranging from the enterprise network and the commonly shared external network to the common Internet. It makes use of the characteristics of the Internet to connect the customers, vendors, suppliers and employees together in an unprecedented way. In short, electronic stores link up valuable information with persons who need it.

13.2.4 Case Study of E-commerce in the Financial Industry

E-commerce needs financial services to supply infrastructure. E-finance is a product of financial innovation under the conditions of electronic commerce. As digital era is just around the corner, the financial services driven by e-currency online are growing rapidly. It was estimated that by 2006, electronic financial services would account for 70% – 80% of the traditional business. The e-finance businesses of the United States grow fast and the European countries are also developing online business vigorously. Almost all the Asian countries lagged behind except Singapore, and Taiwan and Hong Kong of China which are the regions with the advanced development of e-finance. For quite a long period of time, the traditional financial services and new e-finance business will coexist with each other. The following are several types of companies in the competition of electronic financial services:

① Credit card companies like VISA and MasterCard.

② Network service companies like Prodigy and AOL.

③ Large banks like Chase Manhattan and Commercial Bank of America (BOA).

④ Financial software companies like Check Free, Intuit and Microsoft.

⑤ Some companies keen on the new electronic cash, such as the Cyber cash. First Virtua1, Digicash and so on. Microsoft' s "Money" is the development of the personal computer software for family banking online, which shows the determination of Microsoft to develop e-commerce.

With the support of electronic finance, the development of international finance

and financial globalization is irresistible and financial services and the relative functions are being diversified day by day, which promotes the in-depth development of financial innovation.

In the promotion of international financial market integration, financial innovation and technological revolution, geographical and time constraints are broken through in the rapid development of e-commerce. A comprehensive reforming situation has appeared in the global financial industry to satisfy the needs of the new era of socio-economic development. Bank customers are the lifeblood of the banks, and the financial reform starts first on the reformation of the client management systems. The world commercial banks have implemented for a long time the service and competition system aimed at improving profitability. With the intensification of the competition among banks and the increase of financial risks, great changes have taken place in financial management and services, namely the network customer management system for the purpose of enlarging market shares. Such a people-oriented and market-oriented system takes marketing as the basic idea guiding the financial operations, requires all the customers-related financial service activities to be coordinated by marketing factors, and enables the marketing concepts to merge into all aspects of financial operations. The rapid changes in modern technology provide the foundation for the financial reformation. In particular, the development of the Internet in the 1990s requires the financial services to be timely, convenient, safe, multifunctional and globally integrated, thereby forming a financial foundation for the global e-commerce.

With the rapid development of technological revolution, the finance industry steps into a new electronic era. This wave of finance provides the customer electronic financial services around the world. For the financial institutions, the customers are the most important asset. To survive in the information age, we must provide them with quality services for much more customers, particularly automatic services which include automatic printer of the statement of account, automatic teller machines, automatic terminal services, and so on. Customers enjoy the functions of cash depositing, drawing and transfer, and account inquiry in a “non-bank” realm. The use of communication facilities like cable and electric cable enables convenient links between banks. Customers’ demand for financial services drives the modernization of the means of financial services. The people in the financial industry commit themselves to the use of new technologies and improve the connections between the banks and their customers as well as between finance and banking.

The development of financial derivative businesses provides the world commercial banks with new profit growth. In the recent years, owing to the strengthening of financial supervision the tabulated banking business are subjected to greater restrictions. Derived from the cash market products like interest rates, exchange rates, stocks and foreign exchanges, the financial commodity transactions like futures and options are gradually favored by the commercial banks for their

leverage and flexibility. Financial derivative business has replaced the traditional lending business to become a new profit growth point for the commercial banks, which also causes the changes in the client management structure.

There are more and more banks being merged by other banks. Over the past few years, the merger of financial institutions causes the new banking giants to emerge naturally. Merger of financial institutions will prompt the reformation of the customer management system. The two elements in the competition are funds and customers which complement each other. The more funds a bank owns, the more trust it wins from the customers and the smoother customer network becomes. The timelier the funds are transfer, the higher profits the bank makes.

The need for the expansion of the financial service field requires the practice of e-commerce in this field. The e-commerce pushes the implementation of financial business through the Internet and people require that all financial business should be handled by computer. Therefore, the financial services expand from the traditional savings and payment to the management of properties, investment, insurance, and information consultation. Multifunctional banks are required to provide convenient and timely financial services of various types.

Technological development and updating of concepts.

(1) New ideas of "digital economy"

In the international financial markets, the thoughts of the information and communication modernization and market liberalization represented by the Internet are merged into new ideas of "digital economy". The Internet links the computers all over the world in the financial markets and all the information, transactions and fund transfer can be transmitted through the open global network. The rapid growth of customers requires the banks to manage with digital and network technology. The financial information in digital form can be processed in the shortest period with the lowest price through the Internet, which is a specific form of the digital economy.

(2) The leading trend in the reform of the world commercial bank management—the establishment of "people-centered" concept

The study of the behavioral sciences has gradually formed a trend in the world, which has directly led to profound changes in the management of enterprises in the world. Business people have recognized that people are the main body of management, and the reflection of this concept in the field of commercial banks is the shift from the material-centered management to the human-centered management. The competition among the banks is essentially the competition of highly qualified personnel. With high quality management personnel the banks will be able to gain the trust of their clients. With the high quality bank managers, there will be large customer base.

(3) The basic tone of the world commercial banks' management reformation—to improve service quality and find out the things that customers value. Customers judge the service quality by the relationship between perceived quality and expected quality. People's attitudes should be changed first in order to

improve the service quality so that the value of the services in customers' mind is higher than the actual costs of the services, thus causing a multiplied effect:

① Train "exclusive customers." Bank clerks need to establish an idea of offering specialized services for customers with special needs so that those customers are only willing to cooperate with this single bank.

② QSCV inspection. It is a consensus of people to judge the quality of service through the regular inspection of the quality of bank staff (Quality), services (Service), cleanness (Cleanness) and value (Value). Citibank also pays attention to the measurement of ART, which includes accuracy, responsiveness and timeliness.

③ Create reliable service team (Term group) to satisfy the customers by meeting their requirements in the first service.

If a bank does not have a good manager to control market, it will lose the market and be eliminated by others. Experts attach great attention to the importance of the analysis of market shares, market concentration, market characteristics and the measurement of the market potential. Banks must take full advantage of the electronic technology, overcome the geographical and time limitations, and become the basis for e-commerce in the new era in order to continuously expand their market shares and enhance their competitive edge.

The development of e-commerce provides brand new service areas and approaches for the financial industry. Financial services would also meet the requirements of e-commerce and provide the necessary information support. The world financial service system will be formed with the integration of China's financial industry with the rest of the world economy. It brings lots of opportunities for financial institutions, especially for the small and medium-sized banks and financial service institutions. The contents and forms of the financial services should be mutually adjusted to meet people's requirements for interactively conducting financial activities without the limitation of time and place in an era with the great development of domestic banking and corporate banking. Specifically, financial activities driven by e-commerce are as follows:

① Financial services: Internet banking, online payment, personal financial management, accounting management.

② Insurance: Insurance agent services, online quotations, and claim management.

③ Finance and investment industry: Online security trading and entrusted investment, online investment and property management.

④ Information services: Releasing and accounting financial information, consultation, assessment and feasibility study management.

The payment of capitals is an important part of the transaction for other traditional transactions and the emerging e-commerce. The difference lies in the fact that e-commerce payment is stressed on the use of e-commerce in the e-payment process and the e-payment means. Therefore, the banks, as the party for the eventual implementation of electronic payment and settlement, play the role of linking the buyers and sellers. Online electronic payment service provided

by banks is the most critical element of e-commerce and the highest level, which is directly related to the development of e-commerce prospects. In this sense, with the development of e-commerce, e-banking development is an inevitable trend. Online financial operations are characterized by:

(1) The Internet is characterized as high return and low investment. By its convenient message transmission, high efficient work and low cost, it has become the general connecting mode between banks, between banks and enterprises, and between banks and customers. The Internet undoubtedly becomes a good channel for the transmission of financial information in a very short period of time. Eventually, all banks will conduct part of the financial business on the Internet. Currently, most banks have launched online financial services, and most banks will have their own high-level websites to process the traditional bank services in three years.

(2) Internet banking can reduce the number of its branches, lower operating costs and increase revenue sources, and there are no space and time limitations for the users. With a PC, a telephone line, whether at home or on a trip, people may connect with banks and enjoy the uninterrupted service of seven days a week and 24 hours a day. It was reported that the operating costs of Internet e-banking accounts for 10% of its income, while the operating costs of the traditional banking business accounts for 60% of its income. Meanwhile, the establishment of a online bank is of low cost since all the necessary software is readily available. Compared with an online bank, a traditional bank branch needs to be set up with higher costs, not to mention the relatively high additional operating costs every year. Besides, providing online banking services could save costs. The costs for the traditional banking transactions are about 100 times the cost of those on the Internet. Internet banks can also provide a source of income because the banks can charge by the level of service, types of transactions and accounts. In this volatile market, Internet is a stabilizing factor in ensuring the increase of revenue for the majority of banks. Therefore, Internet banking is obviously an extremely economical alternative to the traditional banking network system, which indicates the future direction for development of electronic banking.

(3) E-finance enterprises have achieved an unprecedented broad market. This is a global market which may worth several trillion US dollars with hundreds of millions of Internet users, the number of which is increasing at the rate of 70% each year. Thanks to the globalization of the Internet, e-commerce has integrated the world economy together and provide enterprises a new marketing approach, which could help us easily achieve the internationalization of financial industry. Since the arrival of the era of global networks, nobody knows who you are behind the network. Even a big bank has got just one IP address and a small bank has one too. Therefore, no matter whose strength is bigger, all the banks are all equal on the network. So many banks have the opportunity to rebuild their positions in the network, and the forces of competition are changing quietly. The strength of enterprises has been newly identified and it becomes easy for the small

banks to turn to large ones and for the regional banks to become international ones. Multinational operation is no longer the exclusive rights of the big banks. At present the development of the banks no longer relies on land and capital, but on the improvement of competitiveness resulted from advanced technology.

(4) E-commerce will provide the services that cover the entire functions for the bank customers who hope to enjoy all kinds of services in a bank. The e-commerce expands the competition among banks to the other industries which can also provide financial services because of the popularization of the network in the society. To provide the clients with better services which can meet the specific needs of them has become the fundamental survival skills of the banks, and may also become the biggest issues facing the financial service industry in the next 10 years.

Now, in the United States, banks have only 20% of the household financial assets and 30% of the commercial deposits, while 20 years ago banks absorbed 34% of the household financial assets and 7 years ago 42% of the commercial deposits in the US were kept in the banks. The non-bank institutions selling credit cards now occupy 25% of the market shares, while in 1986 the percentage was only 5. In the past banks formed their own systems for management and cooperation, and this situation will change in the era of e-commerce because in the Internet era, many small investment companies can also launch a range of financial services on the network. The institutions which offer more services with lower cost will take the advantageous position on the Internet and gain more customers. Reducing costs and enhancing service capabilities are the issues which deserves people's attention to in the information age. Since the network economy involve many parties including the government, businesses and shops, the cooperation among all the parties becomes very significant.

Eighteen banks have begun their cooperation in the United States. The Citibank and the Travelers Corporation have been merged into a super provider of financial services for banking investment and insurance services. The Bank of Tokyo and the Mitsubishi Bank in Japan have been merged into Bank of Tokyo-Mitsubishi. And the most successful e-commerce corporations in Taiwan are groups owning institutions of securities, insurance and banks. Cooperation will become a trend in the development of the banking industry.

(5) E-commerce makes the brand image of the Internet banks particularly important. The Internet banking cannot be seen or touched, so how can they retain their customers is an important issue facing the future banks. With so many choices on the Internet, how can they help the customers develop the habits to visit one site frequently? To achieve this purpose, the brand image is particularly important.

At present, little financial products are the special proprietary of one bank. With the gradual convergence of financial products, the demand for higher quality of service is increasing. How to realize the differentiation of brand by providing high value-added products and services is the important issue.

A typical example is the telephone credit business provided by the Citibank in Taiwan, which is very popular now. Other banks began to provide the same services soon after, but the Citibank can still make money from this product with two reasons. The first one is the brand effect since it is the first one to provide this service. The other reason is the quality of service. It will only take the Citibank four days to handle customers' information, while other banks need seven-day work, which truly reflects the idea that we'd better offer what others do not offer and offer the best.

In addition, consumers are always the marketing objects of all the businessmen. Only the most enthusiastic net users can be regarded as the most profitable customer groups. According to the White Paper published by US Web, the study found that common user purchased only two bank products while online bank users purchased three. The annual household income of the online customers is over USD 66,700 while the one of ordinary customers is USD 42,000 in average. Currently, the number of households using online banking functions or paying bills online at least once a month has increased to 33.5 million in 2005, accounting for 31% of the total number of households in the United States.

E-commerce combines the computer and telecommunications network and becomes a new method of the transmission, management and operation of business. Since it provides network access to the global market with millions of customers and hundreds of thousands of products and service, e-commerce will surely enhance the productivity and strengthen the capacity of institutions involved in commercial competition. Since the completion of e-commerce activity on the Internet requires the information flow, material flow and capital flow in the public network, it should at least involve the three parties of users, merchants and financial institutions, in which the services of the financial institutions play a decisive role. Only through remote online payment, e-commerce operation can be completed, and e-commerce can really be promoted.

A complete e-commerce environment should include the Internet, secure transmission system of information, interactive systems; the lines associated with the information flow, material flow and capital flow.

E-commerce actually makes the business conducted in the traditional offices, shopping malls, banks and other places to a public media, the Internet computer network. E-commerce covers a very wide range of issues, including supply chain management, remote banking, procurement, acquisition, network market, advertisement, and family shopping. The application of e-commerce can be divided into business to the following three areas: business to business, business to consumer and information dissemination.

(1) Business to business

E-commerce has greatly reduced the management costs, increased the number of suppliers and partners, shortened the business operating cycle and improved operational efficiency. E-commerce can bring closer the relationships among manufacturers, wholesalers and the market, and it is also beneficial to the

integrated services of cooperative maintenance, repair and management, especially chain management services. The basic applications supporting chain management generally include management over suppliers, inventory, distribution, channels, payment, accounting and marketing staff productivity. Financial services are mainly responsible for the payment of funds among the banks in the whole process.

(2) Business to consumers

E-commerce is an information-based business process in which the ties with customers are strengthened through network advertising, market development, network orders and network customer service. Since 1996 this service became the dominating form and was mainly related to plane ticket booking, hotel registration, network bookstores, and online shopping malls, etc. It is also the current main form of payment.

(3) Information dissemination

In e-commerce, the new information-based products are both practical and accessible, such as e-books, software and practical information. E-commerce and media are combined to open up markets and services and a new e-commerce model based on the information is formed due to the rapid development of digital communications and computer technologies.

Online Electronic payment is the key to e-commerce and also a new direction of financial development. The e-commerce without the support of proper electronic payment means is only an electronic business, electronic contract or low e-commerce. Meanwhile, electronic payment not affecting electronic transactions will become purely financial products and financial means of payment.

The Internet banking is the basis for the development of electronic commerce, and online transactions has realized with the support of online banks. At present, there are two kinds of Internet banking model. One is pure online banking built on the Internet, all business of which is completed online, such as the First Security Network Bank of the United States. Another one is the extension of the existing banking business to the Internet, which will open new service windows. China's online banking business is still limited to the latter model.

(1) Family bank

Family banks can provide complete financial services personally. The individuals are allowed to access online bank using personal computers or other equipment anytime. They can inquire and manage the checks, savings, money market and deposits in the family banks. Also it is possible for them to check the balances of their current accounts, transfer funds and make use of financial software. They can pay bills online, clear checkbooks, and check account, such as using checkbooks, planning all their financial affairs, and even tracking and analyzing their expenses. In addition, they can enact capital plans for tax, consumption, and savings. They can also enjoy financial consultation services through the network.

(2) Online banks

The online banks provide such services as information inquiry, monetary

payments, savings business, clearing and online investment for enterprises or individual businessmen, such as releasing financial information (the current interest rates of products and monthly fees), completing basic check operation (supplying a variety of payment methods, online recording and registration, online records of cleared check and financial reports), money market service, credit card business, and basic savings business. It also provides customers information searching, private security services and other financial services.

(3) Internet shopping and consumption

E-commerce environment demands the malls, factories and government departments (tax bureau, administrative bureau of industry and commerce, customs, etc.), banks and institutions of authentication to be connected in one network, so as to form unimpeded flow of information, goods and capital. Customers can preview, order and pay for the commodities in the online shopping malls and individuals can also book tickets, go shopping and entertain themselves.

Under the influence of the new technological revolution, the constant development of e-finance, and fierce merger and competition of financial institutions, the center of the global financial management system reform creates comprehensive system of customer management. This structure can be understood from the following two aspects:

The first aspect is the technical electronic network system. The Internet is the largest computer network in the world, which provides financial and trade information to the clients. In recent years, network banks grow rapidly, causing the widespread concern in the international banking field. The network banks have a very large number of customers, and have set up departments of finance, customer service and personal finance with 24-hour customer service for their customers. Online banking customers only need to input their names and passwords to enjoy a wide range of services.

The second one is the service object network system. Commercial banks view all the customers as a whole and they also regard the relative foreign enterprises and overseas and local corporations as the object of their services instead of merely considering the existing customers. In this way they have established a client-oriented management system. The establishment of this system changed the previous internal division of responsibilities in the traditional banking system based on saving, loans and foreign exchange into a customer-oriented system with the integrated management of the related customers.

The service industry which provides the integrated services to improve the quality of life is a new developing industry. The mutual penetration between the various financial businesses is gaining its importance because of the development of network system for integrated customer management and the diversified and complicated needs of the customers. In the United States, banks have been involved in the securities business while securities companies are engaging in certain banking operations. Banks have also been integrated with the insurance

industry. In addition, commercial banks have established alliances with their foreign counterparts to increase the development of the customer network system by making use of each other's financial experts and computer system. The European Central Bank of the European Monetary Union will establish the large-scale network of integrated customer management within this region. The online services provided by the Internet banks can be classified into three categories:

① The first category is the introduction of the company's advertisement, history and news.

② The second category is the specific online services and introduction of them.

③ The third category is the real-time services of inquiries, transfer of funds, online shopping or e-trading services provided for the individual users and enterprise groups through the Internet.

The following are Internet banking services provided by some typical banks:

(1) Security First Network Bank

Security First Network Bank of the United States is the world's first bank engaged in the online banking business and it represents the emergence of a new business model and the future direction of development. The security first network security bank was born in the United States in October 1995. That bank has no buildings and address with only a web site as its business office and all the transactions conducted through the Internet. It has only 10 employees, but the balance of deposits in 1996 was as high as USD14 million and it reached more than 400 million in 1997. All transactions are conducted through the Internet, and maintenance and management of the network is the staff's main task.

Security First Network Bank of the United States provides the following specific products and services:

① Advanced banking products—SFNB

- Current interest rates: Providing the prevailing interest rates on existing products and monthly fees.
- Basic check business: Providing 20 types of electronic check payment free-of-charge, online detail list and online registration, online check clearing and financial records.
- Interest check business: Being convenient for the calculation of interest for the basic check business and the payment of attached instruments.
- Currency market: Providing some of the highest interest rates in the monetary market. Currencies can be invested in the SFNB monetary market to earn interest and when payment is require, the money can be transferred to check accounts.
- Credit cards: Visa Classic and Visa Gold card issued by SFNB to the qualified customers. When they are settled, customers will know what will happen next on the schedule.
- Capital deposit business: Making profits through competitive savings rate.

- CDs: Negotiable securities of large amount is the easiest way to earn interest through the transfer of funds and SFNB provides a part of the highest interest rate.
- SFNB private policy: Understanding the confidentiality of private information in SGNB.

② SFNB services

- Deposit information: The deposit information in the SFNB accounts needed by the customers is easily and conveniently accessible.
- Letter from the President: Introduction on how to use the SFNB online services to save money.
- Online services, you are welcome to open bank accounts: Is it the first time you open a bank account? It tells you how to set up accounts, payment and verification of accounts.
- SFNB Form: Online ordering of deposit slips and envelopes to create ACH deposits, and ordering checks and changing addresses.
- No-risk guarantee: How can SFNB ensure your 100% risk-free transactions?

(2) US Citibank

The Citibank is the largest financial service organizations in 90 countries and regions all over the world serving about 0.45 million customers. Citibank's major online service is Direct Access, which is a convenient and secure online approach to arranging the finance. Moreover, it's absolutely free of charge (free of monthly cost, free payment of bills, free fund transfer, free stock quotations, and free customer service). The major services provided are the driver testing, the browser checking, signing in, private secret and security, user guide and user agreement. If you want to open an account in the Citibank, you only have to enter the Browser Checking to see whether your browser is in agreement with Direct Access test; if it is, you may start your business online of the day, or to experience the Direct Access by using test drive. If you have not opened an account in the Citibank but still want to use the Internet business, the Direct Access also provides the service of opening accounts. The Citibank's commitments to protect the information security of the global users are as follows:

- That the Citibank shall protect the information offered by the customers with the most stringent security and confidentiality.
- That the Citibank shall restrict the collection and use of customer information to a minimum, provide quality services to the customers, including recommending to customers products, and services and other opportunities to manage financial affairs.
- That only authorized staff of the Citibank are trained to be able to visit the information and that the staff who violate the privacy promises shall be punished.
- That the Citibank shall not divulge customer information to any organization unless it has noted the customer in advance, or got the customer's authorization, or acted in accordance with the legal requirements.

- That the Citibank shall inform the customers of the market conditions with concise language at least once a year and that the customers can contact the bank to clear their confusion of the market at any time.

(3) Bank of America

Bank of America is the biggest part of Bank of American and is recently ranked the 145th in the top 500 enterprises listed by *Fortune,* just after the United States Citibank, Chase Manhattan Bank. Bank of America's online banking business was mainly concentrated on the Home Banking and Bank Online.

With the Home Banking service of the Bank of America, you can use a computer to conduct banking business conveniently at any time. It allows you to decide the time to conduct banking business. By clicking the keyboard and mouse, you may be linked with the check, savings, money market and other deposit accounts in the American bank. You may check the current account balance, transfer capital, download the financial management software you preferred and pay the small-amount monthly expenses with the "pay bill" function of the Home Banking.

① Home Banking is an effective way to pay bills online promptly. You can use the Home Banking to pay all the bills online, and task will be fulfilled secretly and efficiently.

② Understand how the Internet Home Banking works for you.

③ Liquidation checkbook: It is very easy to clear the checkbooks with Home Banking and you can deposit money into or draw money from your savings account and settle your account 24 hours a day. Once you enter Home Banking and click "Access Info", you will see the checks added into your account at the end of the last trading day.

④ Budget for expenses: With the financial software of Home Banking, you can effectively use your checkbook and arrange all the financial matters—even to track and analyze your expenses. You may prepare for paying tax, retirement or college education.

You may be surprised at the function of Bank Online after you've used it. It is very convenient; you may put money into or draw money from the accounts with it 24 hours a day and any day in a week. It is also easily controlled and helps you arrange financial matters at a higher level so that you can clearly understand how to use money and how to save money for the future.

(4) National Bank (USA)

National Bank (the United States) is one of the largest financial service companies in the United States. Through its extensive retail banks, network business and diversified global financial activities, it offers services for more than 800 million families in the United States and selected international markets. It has recently been listed the 163rd in *Fortune*'s list of Top 500 Enterprises of the World.

National Bank (the United States) provides the following services:

① National Bank Online: Through the Internet, the customers may put money into and draw money from the individual and commercial accounts in the National Bank, check account balances over the business accounts and transfer funds. The

National Bank may send customer service notice and forward customers' requirements, e.g. to have a check or a copy of the check or the detail list, to download the selected financial management software and to try in person some of the services provided.

② Commercial expression and personal expression: The customers can check account balances and history of commercial operations, transfer the funds between two accounts in one bank, check and reconcile the accounts, pay the employees' wages through electronic means, move the account information to the spreadsheet software, understand the interests of the check, print the detail list of the bank and accept various financial reports. In addition, there are daily reports of the balance sheet and displayed details of six types of reports. These reports are summarized balance sheet; revised form account assets and liabilities, detailed business record, report form of paid checks, detail list of the bank, and table of historical averages.

③ Financial management: It offers the completely personal financial management software, which allows the customers to read the account information, transfer funds, pay bills, check accounts and generate reports. It includes the introduction of arranging finance, free downloading of software, showing online menu, real-time account opening or money management. It has set up an exchange board where the customers can exchange the personal feelings and ideas of using the services of the National Bank.

④ Investment: It provides services of putting money into and drawing money from the personal accounts and paying discounting expenses online. It also offers such services as starting trade, checking balance, business summary, security market situation, data of the exchange house, and real-time quota. There are also the following types of investment for the customers' option in order to meet their needs:

- Understanding of the implications of investment: Risks exist in people's investment activities, and the risks of investment have something to do with stocks and funds which is different from the savings.
- Personal investment consultation service: This service includes product introduction, account opening and investment consultation.
- Payment of discounting expenses: This service includes product and service introduction, investment information, opening accounts and online transactions.

(5) First Bank Corporation of America

First Bank Corporation is a big American bank which is recently included in *Fortune*'s list of the World's Top 500 Enterprises and ranks the 323rd. Its services include new creation, personal finance, small business finance, the company, employment opportunities, entertainment and sport events, the profiles of First Bank Corporation and interviews into First Bank. In its service of "new creation" the First Bank launched its online banking services which teach the clients to lead a more relaxed life.

The Bank Online service will bring the banks beside the customers and provide

an “easy to use” banking business service and bill payment service. The simple click is the only performance for customers. It makes banking business easier and customers can use it at any time. Electronic banking has achieved substantial progress, but it is still at its initial stage; as there are many unexpected problems to be solved and e-banking needs further improvement and development.

① E-banking security

The most concerned problem in e-banks is the security problems which include the way to identify the legitimate status of the users and the way to ensure that the accounts and information would not be stolen or altered in their preservation and transmission, and the way to stop illegal intrusion into the core banking mainframe and data systems.

② Confidentiality of the data in the course of preservation and transmission. The security level of an encryption system depends on the method of encryption and the length of the cipher key. The longer the cipher key is, the more difficult it is to be deciphered. The length of the key is often shown with the digit capacity of the figure. The more digit capacity there is, the higher the degree of confidentiality of encrypted data. In theory, the huge amount of computing and such a long period of time is needed to decipher such an encryption system that it is unfeasible in practice.

③ The identification of private data access (password, security code and other information, which remain valid until the user quits the system).

④ Prevent unauthorized users from accessing the mainframe database systems and banking. The firewall technology and network management systems strictly examine the illegal entry, filter illegal data, and ensure the safe operation of the mainframe system and the integrity of the core database.

(6) Electronic banking technology

Since the adoption of electronic technology in the financial industry from the beginning of the 1970s, computer and network technology have found large-scale application in the financial institutions. Therefore, it is wise for us to develop e-banks with the combination of the existing resources. When running the procedures provided by the software companies and installing the hardware and communication equipment, the impact on the existing structure should be taken into consideration and the use of available resources and the normal operation of the existing network should be ensured. The software developers, hardware providers, system integrators, communication operators and the financial industry should strengthen their cooperation in the development of electronic banking standards to ensure the compatibility of the software, hardware, and communication protocol so that the establishment and future expansion of new electronic banks will be guaranteed. The electronic bank in the future will be a closely connected global integration. An error or paused service in any links may lead to paralysis and the collapse of the system, thereby affects the functioning of the entire bank which may bring the clients and financial institutions huge irrecoverable losses. Thus, the sustainable technology should be adopted in the network and mainframe

systems so that a breakdown can be automatically switched to the backup system or the malfunctioned equipment can be replaced with the system. It ensures the uninterrupted operation of the system and maintains the normal operation of the entire electronic bank.

(7) Electronic banking supervision

People have certain access to the Internet by following certain rules, and e-bank users visit the websites of the financial institution according to the established agreement while the financial institutions can provide services to the users throughout the world. Such cross-border electronic bank operations have also surmounted the national laws and financial regulations of the different countries. For example, when the users entered the Bank of America in the United States and become the online customers of the Bank of America, should this bank be subject to supervision of the laws and regulations of China? Faced with the newly born e-bank, the governments and financial institution of different countries should cooperate with one another and hold negotiation to decide the overall direction of developing e-banks from a strategic point of view in accordance with the characteristics of e-banks. They should reach the agreement on the supervision of electronic banks and jointly draft and perfect the laws and regulations for electronic banks to promote the smooth development of the electronic banks.

Although e-banking financial institutions have been established in many countries, it has not been popularized yet. Due to the high cost of initial investment, many financial institutions are still reluctant to carry out such a large investment. The complicated technology and the shortage of talented people are also the barriers for the popularity of electronic banks. Beside, the customers' lack of knowledge about computer technology and the small amount of network users are not conducive to the development of electronic banks. However, in the face of increasingly brutal competition the far-sighted financiers are bound to follow the trend and promote the further development of e-banks. The financial industry of the 21st century will be a world of electronic banks. Great productivity will burst out with the combination of the two most promising industries, the Internet and the financial industry.

According to statistics, nearly 1,000 banks and financial institutions have begun to publicize corporate image through the Internet, and most of them have embarked on open financial information services.

Currently, there are a good environment and conditions for the establishment of electronic banks.

(1) The tools for the clients to obtain the electronic banking services develop rapidly. The tools for the electronic and automatic banking service geared to the needs of the clients are constantly improved, upgraded and developed. E-banking service-oriented electronic tools mainly include the electronic cash, electronic wallets, electronic credit card, electronic debit card, smart card, smart phones, electronic cash, and secure coins.

(2) Client-oriented bank equipment is constantly updated and developed. Currently the Automatic Teller Machine (ATM) network has been established and becomes more and more popular. Points of Sale (POS) connected with the bank computer have been widely used. A variety of self-banknote circulating machines and automatic teller machines have been widely used too.

(3) Various modern bank payment tools and settlement system have been extensively applied. These tools include various modern payment systems and online systems of large-amount payment, various payment systems of small-amount batches, electronic Internet banking system (EIBS), automatic clearing systems, automatic system of public business, bank deposit systems, electronic payment systems and secure electronic transactions (SET), which have been extensively applied.

(4) Online financial services develop fast

The online financial services provide financial information services to the customers through PC, modem and data communication lines or telephone lines. The online financial services include e-mail, electronic billboard, online information retrieval, online financial information transmission, real-time exchange of financial information online. The online financial services are featured by its interaction and help the users choose or accept financial information or publicize financial information, which is conducive to the users' rapid access to financial information over long-distance and the timely release of financial information.

(5) Modern financial computer system has been developed quickly and applied extensively. With the rapid development of computer network technology in the banking and financial sector, the financial computer information service systems (FCISS) spread very quickly. Large quantities of modern financial management information system (MIS), decision support system (DSS), decision makers Information System, office automation system (OAS), strategic decision support system (SDSS) brings about the systematic, scientific and modern operation and management of the banking and financial industry and the development of this field with the combination of the digital network and information technology.

Along with the prosperity and development of the international trade, the rapid increase in cross-border investment, the rapid development of international banking business and more fierce competition among banks, all the banks develop in almighty and international, intensive, and the direction of diversification. Therefore, the banking and financial sector of the entire world has attached great importance to scientific and technological progress. The high-speed development of the modern technology particularly the progress in computer science and information science has created favorable conditions for the reformation of the banking industry. The development and application of virtual reality technology and the emergence and development of e-banks have shown the development direction of the banks in the near future and basically unified the thoughts of the people. Electronic banks have specified the right direction of the development of the bank all over the world.

13.2.5 Case Analysis of E-commerce in Petrochemical Industry

According to the statistics and projections of the well-known consultation firm Forrester, the trade volume of B2B in the United States (including EDI) was USD 43.1 billion in 1998 and over USD 1.4 trillion in 2004. The years 1999—2002 saw the take-off of the application of e-commerce in the petrochemical industry. The total trade volume of e-commerce transactions in 2003 was USD 178.3 billion accounting for 13.4% of total trade volume of e-commerce in the United States. This figure ranked the third in the United States, just after that of the computer and electronic products and automobiles (see Table 13.2).

Table 13.2 US e-commerce trade in Various Industries

Unit: USD 100 million

	1998	1999	2000	2001	2002	2003
Total	431	1093	2511	4990	8552	13308
Computer and electronic products	197	504	1214	2291	3191	3953
Common design	71	154	322	629	1106	1695
Petrochemicals	47	103	226	480	968	1783
Automobiles	37	93	227	532	1143	2129
Aviation and national defense	25	66	148	256	340	382
Consumer products	14	29	61	127	260	519
Energy and office supplies	13	29	64	143	311	652
Logistics	12	29	68	154	327	616
Food and Agriculture	3	30	63	131	267	536
Medicine	6	14	35	85	267	441
Construction	4	16	34	70	200	286
Heavy industry	1	13	25	47	87	158
Industrial facilities	1	13	24	45	85	158

According to the trade statistics and forecast of AMR Research Consulting Company through ITE (independent e-commerce transactions website), the turnover of the e-commerce transactions through ITE accounts for only 0.2% in all manufacturing industries, but this figure would amount to 57.6%. Being different from Forrester's forecasts, AMR held that the chemical/petrochemical transactions through ITE in 2004 would take the fourth place following the electronic products, biological products/pharmaceutical and manufacturing industry (see Table 13.3).

According to the forecast of Forrester, in the next five years the chemicals sales of the whole globe will reach as much as USD 1.87 trillion, then 25% of the transactions will be conducted through the electronic channels. Such an estimate

Table 13.3 B2B e-commerce growth in 1999-2004 through ITE (AMR)

Industry	Proportion of ITE transactions to the total sales in 2004		Trade amount of ITE in 2004 (In millions of dollars)
	1999	2004	
Mining and construction	0.3%	27.1%	66,822
Manufacturing	0.2%	57.6%	977,522
Biological products / pharmaceutical industry	0.4%	58.0%	112,815
Clothing and other textiles	0.3%	56.0%	13,524
Mechanical and electronic products	0.1%	33.0%	14,884
Manufacturing	0.4%	65.0%	86,353
Chemical / oil products	0.2%	68.0%	76,391
Electronic products	0.2%	72.0%	458,457
Industrial equipment	0.0%	35.0%	37,894
Transport equipment	0.0%	33.0%	51,133
Aviation and national defense	0.1%	69.0%	50,493
Others	0.1%	35.0%	75,578
Transport, trade, financial	0.1%	54.5%	1,698,458
Service sector	0.1%	37.7%	240,773
Total	0.1%	52.3%	2,983,575

is similar to that of the United States securities firms, as shown in Fig. 13.3. AMR estimated that the e-commerce transactions of the chemical industry in the world would rise from USD 11 billion in 1999 to USD 400 billion in 2004.

From a different aspect of the revenue of e-commerce providers, we can also understand why almost all the hardware and software providers are optimistic about this petrochemical e-commerce market. Table 13.4 shows the statistics of AMR Corporation about the sales revenue of e-commerce providers from 1998 to 1999. Generally speaking, the annual income of the manufacturing industry accounted for 44% of the total annual income while that of the service industry was 56%. Among all of the manufacturing industries, the annual income of the computer and electronic products accounted for 11% and ranked the first while that of the petrochemical products was 3% which took the second place in parallel with the biological pharmaceutical technology. In addition, the growth rate of e-commerce application in petrochemical, pharmaceutical and other industries is very high, with 58% growth in the petrochemical industry and 89% growth in the pharmaceutical industry. These are the hot spots of the market with extraordinary growth, so it is not surprising that many information technology providers actively engaged themselves in the application of e-commerce in the petrochemical industry.

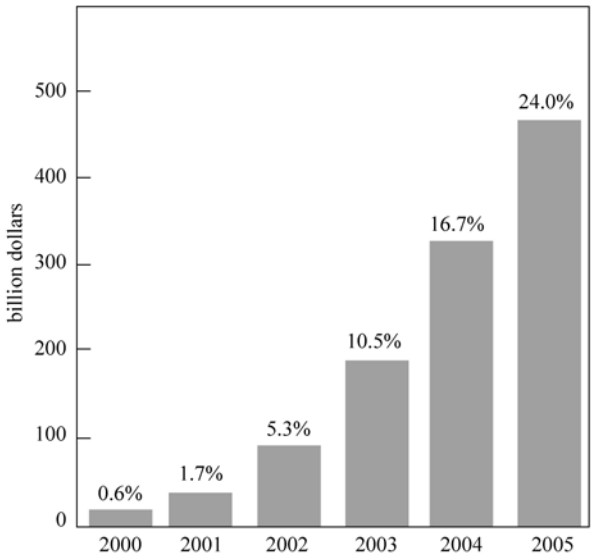

Figure 13.3 The Growth of e-commerce Application in Petrochemical/Chemical Transactions

Table 13.4 E-commerce Software License Revenue and Market shares of the Vertical Industries

Industry	Income of 1998 (In millions of dollars)	Income of 1990 (In millions of dollars)	Growth of (%) 1998—1999	Proportion of income in 1999
Textile	12	21	78	2%
Clothing	7	11	60	1%
Wood products, paper, printing	7	10	45	1%
Petroleum, chemical, materials	17	27	58	3%
Pharmaceutical/Biotechnology	15	29	89	3%
Raw/metal processing	11	14	28	2%
Mechanical (agriculture, construction, factories)	10	15	48	2%
Computer and electronic products	58	102	76	11%
Vehicles and spare parts	26	46	76	5%
Aviation and national defense	17	31	76	3%
Food and beverage, consumer goods	16	26	64	3%
Other manufacturing industries	35	71	104	8%
Total in Manufacturing industries	231	402	74	44%
Total in Service industries	285	509	79	56%

If the total revenue of the e-commerce providers in the manufacturing sector in 1999 originated mainly from the North America, which shows that most of the well-known e-commerce technology companies are from the North America. According to the estimates of the US, Europe has lagged behind the US for 12 months except a few companies while Asia is even more backward in this aspect.

The three major operations of e-commerce in the petrochemical industry are e-commerce websites of the third-party website trading platform, the international commonwealth. The following briefly introduces the three forms.

The first form is the websites of the petrochemical manufacturers. Most chemical products are standardized products with the complete data of the product quality specifications and large volume of transactions. Besides, the logistics of the chemical transaction is conducted in a one-to-many, many-to-many or many-to-one form, which is in line with the trading flow of online transactions. Therefore, when the large and medium-sized petrochemical enterprises begin with business through e-commerce, the first step is to establish their own portal websites. In addition to providing product catalogs, and issuing information, they also offer the service of online ordering and secure transactions.

A typical example is the Bayer Corporation in Germany, which has started to do business with their clients through their website Bayer One. In addition to placing orders, Bayer One can also carry out the procurement process of shipment tracking and inquiries about the material safety data sheets (MSDS), chemical proof (COAS) and historical records of purchase. Dow Chemical Company has established its My Account @ Dow and Eastman Chemical has established www.eastman.com, both of which offer the function of electronic transactions for their clients. The China Petrochemical Corporation has established its own e-commerce portal and the turnover reaches RMB 1.42 billion three months after it has been formally launched on August 15 this year. It is expected that the annual turnover of the online transactions would reach RMB 10 billion in the future.

The second form is the third-party website trading platform (also known as the independent e-commerce transaction websites). More than 40 specialized chemical products transactions websites have been established all over the world and more websites will be established. Some websites have got the investment of large petrochemical manufacturing companies, but most of them are self-financed independent operators. The PWC Corporation (Price Waterhouse Cooper) divides them into four categories:

(1) Office-based websites (primarily commodity trading platform), for example CheMatch, ChemConnect and e-Chemicals, etc.

(2) Catalogue-based websites (primarily providing lists for product and service information), such as ChemNet, ChemExpo, PlasticsNet, i2ichemicals and yet2.com, etc.

(3) Broker-based websites (supporting e-procurement, e-auctions and sales), such as Chemdex, SciQuest, etc.

(4) Community-based websites (part of the vertical industry network providing

information, news and independent consultation business), such as the Chemical Online.

AMR has made an investigation into 600 independent e-commerce websites this year and found that there are three chemical websites in the top 10. They are CheMatch (ranking the third with the USD 60 million transaction volume in the first quarter), e-Chemicals (ranking the seventh) and Chem Connect (ranking the eighth). Table 13.5 lists some relatively well-known independent websites which charges lower fees charged for intermediary services, e.g. 0.5% of CheMatch and 2.0% of ChemConnect.

Table 13.5 Websites for online transactions of chemicals

Website	Chemical products supplied	Types of chemicals e-commerce
CheMatch.com	Bulk chemicals	Auction and transaction
ChemConnect	Bulk chemicals and special chemicals	Auction and transaction
Chemdex	Supplies for labs and scientific research	Catalogs and procurement
ChemNet	Fine chemicals and intermediates	Catalogs and procurement
Covalex	Basic chemicals	Auction, transaction and catalogs
E-Chemicals	Various types of chemicals	Catalogs and procurement
Gepolymerland	Plastic	Catalogs and procurement
Chemicals	Industrial products	Auction and transaction
PlasticsNet	Plastic	Auction and transaction
SciQuest	Labs and research products	Catalogs and procurement
VerticalNet	Research and industry	communities
WorldWideTesting	Chemicals for quality testing	sampling, analysis and testing

The third form is the international consortium (Consortia). Since last year, some of the major traditional chemical/petrochemical manufacturers have been looking for the ways to face the challenges in the wave of e-commerce and found that the solution is creating an electronic marketplace together.

Envera is a consortium created by 22 companies introduced by Ethyl Corporation (including Lyondell/Equistar, Occidental Chemical, Solutia, etc.). This is the global B2B market designed for all members, and all the multinational oil companies, their customers, suppliers, distributors and retailers can access the website to obtain information guidance, make out invoices and contact trading partners. Therefore, they claim to be “B2B” (Business to Business). Now, over 60 companies have expressed their interests in joining the consortium which has an annual sales volume of USD 230 billion.

Omnexus is a consortium website established by 5 large petrochemical companies of BASF, Bayer, Dow, DuPont and Ticona/Celanese. The goal of this website is to provide plastic model products and related services. The website was launched in October 2000 with the expected annual sale of USD 50 billion.

Newco co-established by ATOFINA, BASF, Bayer, BP Amoco, Dow, DuPont,

Mitsui Chemicals, Rhodia, Rohm and Hass and Sumitomo Chemical has raised USD 150 million of startup capital.

The chemical manufacturers in Asia have quitted the wait-and-see policy and started to take action. The 24 major plastics manufacturers in the Hong Kong Special Administrative Region have signed an agreement to expand cooperation in the Internet market, planning to build online plastics market to keep the advantageous position of HK in international chemical trading.

In addition, there are some regional websites such as Ceerchem of the Eastern Europe, Chemunity of the EC and ChemCross of South Korea, Asia.

According to the estimates of PWC, in the next few years, the following pattern would appear in the e-commerce market: 31% the direct channels of the petrochemical companies, including the company-company pattern and the company-customer pattern; 23% of the products would be traded in the electronic marketplace created by the consortia; 29% through the procurement website and 17% through third-party transaction and auction platform.

The following is a typical case of e-commerce applied in petrochemical business.

The pioneers who started their practice of e-commerce fairly early in the international trade are Dow, BASF, Bayer, Celanese, Chiba, DuPont, Eastman, Merke, GE Plastics, Mitsui Chemicals, Rohm and Hass. These companies entered this field sever years ago, and have been increasing their investment into the establishment of a number of websites, and now they are at the stage of integration of e-commerce. In the following part two examples will be cited to illustrate this point.

Dow Chemical Company started to build up its own e-commerce platform My Account as early as in 1998, and the website was formally inaugurated in 1999. Dow has required to improve the interface with its customers, simplify and improve its relationship with its suppliers and purchasers and participated in creating new market channels. Dow Chemical has also invested and bought shares of a series of e-commerce transaction platform such as ChemConnect, SciQuest and Zonetrader; it also participated in launching the websites of some consortia such as the plastic consortium website of Omnexus and the chemical e-commerce consortium website of NewCo.

In 2000 Dow Chemical Company decided to invest USD 100 million and more than 200 persons for e-commerce integration hoping to shift 80% of its chemical business onto the e-commerce track within a few years. Eastman Chemical Company placed special emphasis on e-commerce. On one hand, it has built its own website; on the other hand, it has also participated in the construction of a wide range of e-commerce websites.

The success of e-commerce application in the petrochemical industries in Europe and the United States has fully demonstrated the feasibility and potential advantages of the highly standardized products in the chemical field to develop e-commerce. Domestic enterprises like Sinopec have taken a positive part in the area of electronic commerce and have gained considerable achievements. Clearly,

the application of e-commerce in the chemical industry which occupied a greater share of the gross national product is really beneficial to promote the development of both national economy and the chemical industry itself. Therefore, the enterprises in the chemical industry should change their ideas and catch up with the wave of the scientific and technological revolution in order to make full use of electronic commerce in this field.

13.3 Summary

This chapter introduces a method to assess e-commerce websites and case analysis of the application of e-commerce. At the same time it analyzes and summaries the application of e-commerce in different fields of agriculture, commodity circulation, finance, petrochemicals and e-commerce supply chain according to the features of e-commerce application in these fields. In this way the readers can grasp the methods of case analysis and sum up the experiences of the pioneers so as to establish a truly useful e-commerce system.

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