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Information Technology for Small Business

Managing the Digital Enterprise

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ISBN 978-1-4614-3039-1 ISBN 978-1-4614-3040-7 (eBook)
DOI 10.1007/978-1-4614-3040-7
Springer Dordrecht Heidelberg London New York

Library of Congress Control Number: 2012934248

To Bruce, a mentor, an entrepreneur,
and a friend

Preface

With information technology (IT) going mobile, thanks to the deployment of faster and more reliable broadband networks, we are experiencing yet another technology-driven transition. As technologists, we are intrigued by this rapid transformation and see a need to describe its impact on the small and medium enterprise (SME) based on our own experiences and that of successful entrepreneurs who have embraced emerging IT applications such as "as-a-service" systems and mobile technologies.

The innovative uses of IT by the firms described in the cases in this book are representative of a paradigm shift, from when only large IT driven companies realized the benefits of technologies, to a much more level and competitive playing field for SMEs using new, innovative and mobile broadband technologies. Part of this shift can be traced to the small and flexible nature of these firms, especially since most have essentially one person in charge. This allows SMEs to adopt these new technologies and use them in innovative ways much quicker and in a more effective manner than can older and much larger firms.

Included in the paradigm shift is an approach, which might be called "*IT for all,*" that we have seen across each analyzed company. Successful enterprises focus on building a specific skill set or niche, using innovative IT to adapt and expand their specific market needs. **Transport Designs** (TD) is a good example of this. Its small size allowed TD to adopt computer design software and use it in ways that large competitors were slow to react to. TD augmented this with market flexibility, specifically with a policy of never turning down customer requests, even if they had never been done before, and of producing unique designs.

New technologies are paving the way for new market creation. Social media are at the forefront of such efforts. This is especially true for markets that represent so narrow a niche that they might not, at first glance, seem commercially viable. *Niche market definition* can also extend to the creation of new markets within old markets, cases in which a firm defines itself as an alternative to the mainstream or norm. This is the strategy of **Wiggly Wigglers**: be a homegrown and environmental friendly gardening entertainment company instead of a large, impersonal commercial company.

New technologies can reinvent existing industries. These new technologies can go as far as reinvigorating stagnant industries that appear to be on their way out. This is

particularly true for industries that have traditionally been based on tacit employee knowledge, which is difficult to document or verbalize. IT, combined with innovative and effective knowledge management, can recombine and enhance existing knowledge, thus creating a great competitive advantage. **Tecnomodel** makes extraordinary use of its employee technical knowledge and skill sets to practically reinvent product design, expanding into full-blown partnerships and consulting with shoe brand holders. Tecnomodel has made itself much more efficient and effective by codifying tacit knowledge with shoe design specifications, transforming manufacturing in a way that would be impossible without IT.

Technology makes "*mass customization*" *possible*. Take the **Fifth P Solution**'s approach to marketing. Rather than having a product-based mass production and marketing strategy, Fifth P Solution (FPS) emphasizes the importance of a strategy based on customer needs. By using IT as the driver of learning (e-learning), FPS is able to scale its offerings to some of the largest corporations in the world, and to do so while remaining a small firm. FPS remains committed to not only its "anywhere, anytime" definition, but also to "anything" in this particular case. The small, flexible size of FPS, combined with the innovative possibilities of broadband technologies, enables customized e-learning in the same tradition of the marketing and brand strategy FPS advocates: flexibility to customer needs through people and the brand promise.

Unifying all the divergent factors in the selected cases and across this book is *flexibility*. Flexibility means not only adapting to new circumstances, but also being open to "thinking outside the box" and thus creating and delivering customized solutions to address customer needs. Forever desired on a marketing level, broadband technologies are finally making this flexibility possible for many firms at an organizational level. Being an early adopter is only part of the story. Making effective use of information technology to address changing industry needs and business strategies, and doing so while growing and developing a brand promise, represents the real challenge as well as the real opportunity. In this book, we examine emerging information technologies, industry needs, strategies, and implementation and maintenance of IT, particularly innovative IT, with the objective of providing suggestions on how to transform IT implementation challenges into growth opportunities for the small and medium enterprise.

Small and Medium Enterprises

Small and medium-sized enterprises (SMEs) are becoming a new driver of innovation in broadband technology, characterized by continuous or "always on" connectivity. Conversely, broadband technology is becoming a key enabler of such businesses. Although the economic importance of SMEs has long been recognized, they were considered comparatively unimportant during the great Internet boom of the 1990s and early 2000s. Significant innovation in and use of broadband information technology (IT) required extensive investment in technological assets and a long term

access to capital. Such capital requirements were, for the most part, not available to SMEs. Today however, with continual improvements in Internet technology as well as breakthroughs in cloud computing and mobile connectivity, these and other changes permit SMEs to compete and excel in ways that were never before possible.

What advantages do SMEs offer that larger entities cannot leverage? A large organization's main advantages are access to capital as well as an established brand name and value chain. On the other hand, one of the greatest advantages SMEs have is flexibility. Many SMEs have a single leader or owner who is free to change policies, technologies, or whatever the leader may wish to change, even on no more than a whim. The owner of a small grocery store may decide to use broadband to create an automatic reorder system with suppliers. The president of a small bank can decide to enable customers to process checks on mobile devices. In both cases, these leaders are free to make innovations. They can offer new services and change internal processes without having to clear a multitude of committees that would exist in a large organization. Nor would they have to worry about whether or not their innovations might create problems across a large employee population. Cloud computing, open source software, and the proliferation of "smart phones" have brought down the investment requirements and costs to a point where many SMEs can now use applications and adopt innovations that were once restricted to large organizations that could afford such expenditures. This has leveled competition to the point where SMEs are beginning to have as significant an effect on the technological playing field as their larger and better established rivals. As a result, SMEs, whether their goal is to streamline business processes, grow the customer base, or augment existing offerings, can now make use of the awesome and exponentially growing power of broadband technologies.

Although technological adoption of broadband among smaller firms has accelerated, SMEs are often constrained by struggling operations. SMEs tend to be more concerned with growing their core business than with supplementing and improving their offerings with broadband technology. Even so, some SMEs are able to commit to new technological trends and innovations. There are those SMEs that stay on top of technological trends and adopt brand new and high potential technologies as they become available. One might say these SMEs are striving to be among the "glamorous" few. Then, there are SMEs that adopt new technology only if it is clear that it will be of practical use to their business processes. We might call these the "ambitious" SMEs. IT innovation by both glamorous and ambitious SMEs is in stark contrast with those whose leaders see their firms as constrained by circumstances or as focused solely on their core business concerns. However, such enterprises should take heed of the increasingly technology-dependent business environment. Those delaying adoption of key technologies may find that their products or services have become obsolete. The rise of wireless and mobile Internet technologies and the new advantages they bring to early adopters make this an exceptionally relevant concern.

These mobile devices are the applications that perhaps best epitomize the nature of modern broadband, which is not only "*always on*," but also of an "*anywhere, anytime*" functionality. The rise of the "smartphones" in the form of the iPhone, Blackberry, Droid, etc., has given unprecedented growth and popularity to such technology.

Because mobile devices by definition are not tethered or attached to any one point, they are flexible enough to use almost everywhere, and offer a sort of interface combining the best of both Internet and telecommunications interconnectivity. The applications and possibilities are limitless, but there remain challenges. Besides technology itself, other obvious implications include having a skilled workforce to utilize such technology and being able to safeguard data security and privacy through these untested channels.

The workplace also has become something of a more digitized and abstract entity than an actual location for many SMEs. Distance working and "telecommuting" are rapidly becoming a standard for many technologically-inclined firms. Few have overlooked such innovations as videoconferencing, which has cut down on employee transportation and logistical costs tremendously. But with mobile devices and innovations in cloud computing for data transfer and storage, "work" for many intents and purposes can be conducted almost anywhere. This might extend to the point where, with no central business offices, all SME business will be conducted through diverse and diffused "satellite" offices. With this comes a much greater amount of flexibility for employees in how, when, and where they get their work done.

This changing work environment creates new challenges for managers and owners of SMEs to balance remote work environments without the added and irreplaceable benefit of physical presence. It has raised concerns about how international and globalized workplaces can avoid clashes among language, cultural, regulatory standards, and other barriers that inevitably exist. Along with bringing people together from around the world, increased interconnectivity brings competition closer together, with broad implications for outsourcing, cost pressure, and local economic conditions. Apart from these broader concerns, adjusting to these new realities might be hard or disorienting for employees who are used to working in the traditional "office," which requires physical presence. As with any technology, SMEs must take care when switching to such radically different business methods and paradigms.

One major issue for skeptical SME owners and managers is to sort through a myriad of options concerning which information technologies to embrace and what applications and methods of delivery would be best. It may be that the "best of breed" is not the best for these organizations. Factors such as cost, capacity, user requirements, or limited space for upgrades (or protection against obsolescence) come into play. Whether a SME is seeking to administer its own backend systems, software, and applications or is seeking a more virtualized solution, "as a service" computing is a real opportunity that may eventually change the nature of the SME's industry and business model.

Among the plethora of available services, practical concerns prevail. An enterprise must know if these investments will be profitable or add value to the organization. It must also know if security measures are sufficient, or the possibilities of data breach, denial-of-service attacks, and the resulting need to be protected are too great for whatever service or infrastructure it elects to use. Since several ways of protecting computer systems and data, as well as maintaining security, are available, therefore, evaluation is not only necessary, it is essential. This evaluation is also critical for

an even greater concern, the proliferation of smartphones and other mobile devices, which must be selected and secured to guarantee safe business practices.

The large number of applications, services, and technologies available in a rapidly changing technical environment has made it difficult for an organization to determine which tools to use. This is even more difficult for smaller firms who often do not have the skilled personnel to handle such inquiries and decisions, nor the capital to invest in such technologies. There are also different classes and hierarchies of technology, not only in terms of their technical specifications, but how the business will need and use them. This of course will vary greatly across different firms.

One might balk at the planning necessary to decide which services to use for SMEs in an IT context. And indeed, feasibility studies and planning to deploy IT services matter a great deal. Perhaps, most fundamental is the age-old question of how much added value the new technology will bring to the SME. It also matters if the technology is becoming a competitive necessity (i.e., business is beginning to depend on its use) and if the technology is compatible with the overall business strategy. Business needs, from the actual planning and implementation of the service to the operation and maintenance of the service, must also be considered. The key question remains whether there is indeed a concrete place for the new technology in the organization.

Project planning and implementating information technology for SMEs is one thing, but maintaining it is a whole other story. IT maintenance and administration services in many small and medium enterprises are often understaffed. Moreover, employees often are not trained to handle their duties effectively. How exactly and with what resources does the SME enterprise IT "department" maintain and operate its systems? This question can be answered by looking at the company's technology strategy and its strategic goals. The answer is also furthered by understanding how the types of services offered by the firm impact the firm's customers.

IT policy, infrastructure, and know-how are rarely sophisticated in the start-up phase of an organization, but eventually become a more advanced and operationalized system. Therefore, it is important to have an explicit IT strategy from the earliest organizational phases so that subjective personal attitudes and dispositions, which often define such firms are minimized. An IT organization resembles a pyramid, with infrastructure at the bottom representing the most crucial and integral of all services. The IT organizational pyramid tapers off at the top as the responsibilities become more specific. Knowledge management processes, which codify IT policy, structure, and strategy can become a critical advantage for any SME who wants to maintain a competitive edge, as well as know how its IT works during high turnover or extraordinary circumstances.

Once a company explores the opportunities opened by broadband technologies, decides on what services to add, and then implements them, the question becomes how does, or can, the company keep up with the new technology? This is an important question, as technology is continually improving and even the speed of improvement is increasing. How much and how often to upgrade are just two of the questions that must be addressed by SME owners and managers who intend to stay on top of technological trends and breakthroughs.

An Outline of the Book

This book provides an overview of how small and medium enterprises (SMEs) can use flexibility—anticipation, agility, and adaptability—strategies to better implement broadband information technology innovations. Small and medium businesses are generally late technology adopters. This laggard role often weakens the size, location, versatile workforce and dexterity advantages that could enable SMEs to achieve higher efficiencies and effectiveness by simply rethinking the way they use technology. This book alerts small and medium businesses about trends in technology (such as mobile communication services, customer and vendor management tools, scalable data and knowledge mining applications) that may have the potential to transform the nature of SME operations.

Chapter 1 defines what we mean by SMEs and explains the importance of broadband IT for SMEs' growth and success. In **Chap. 1**, we discuss how SMEs can use new technologies to compete successfully with larger and longer established firms. We particularly focus on how SMEs can make sound decisions about adopting broadband IT innovations.

In **Chap. 2**, we discuss how broadband-driven mobile technologies support SMEs' business needs. The focus is on innovative SMEs, their needs and interests. Finally, we review security and privacy protection review in the "anytime/anywhere" environment.

While Chap. 1 and 2 outline the opportunities and advantages that broadband IT can provide to SMEs, there are problems that can arise in parallel to these advantages. Issues that derive from changes in workplace and workspace brought about by broadband IT applications are the focus of **Chap. 3**. These changes center on the fact that broadband IT innovations make it possible for SMEs to operate with a workforce that is distributed across many physical locations. The challenges faced by firms with such a "remote" workforce are addressed.

The proper mix of information technologies can give an SME a competitive advantage. The key is the proper fit of multiple information technologies with the firm's actual needs. In **Chap. 4**, we discuss existing and emerging information technologies that enterprises can explore and adopt, as well as how to explore the question of "fit" within the firm.

Chapter 5 discusses how SMEs decide what IT applications they need and determine how best to deploy them. This chapter includes an "information technology implementation framework" that can be used to guide SMEs through critical decisions. The questions addressed concern business needs in terms of planning for, implementing, and operating new IT services, products, or applications.

A comprehensive model of the IT organization is presented in **Chap. 6**. Those process areas that are essential to promote SMEs' competitive positions through IT are emphasized. Employee training takes center stage in order to increase productivity and return on IT investments. Also vital is understanding and using knowledge management to build and sustain a knowledge-sharing culture. Such a culture supports the long term survival and competitiveness of the enterprise, especially smaller

enterprises whose processes and procedures are often stored "in the heads" of few employees.

The aim of **Chap. 7** is to further explain some of the concepts presented in the previous chapters with examples of successful practices. Toward this, end we have prepared a set of four case studies. Each involves a small entrepreneurial company that has effectively used IT in an innovative manner.

Throughout this book, we have referred to the leaders of SMEs without actually saying much about such individuals, even appearing to equate such leaders or owners with the organization itself. There is, of course, much more to understanding leadership in SMEs that engage in IT innovation. In the concluding **Chap. 8**, we discuss this issue, examining, in some detail, the nature of the "IT entrepreneur" and the crucial characteristics of successful IT entrepreneurs.

Acknowledgements

In a book that discusses broadband technology, and remote and distributed workspaces, we cannot emphasize enough the vital role played by mobile tools, virtual servers, teamwork/collaboration applications, and remote storage systems in the writing of this book. Therefore, our heart-felt thanks goes to the individuals that work at Skype, Apple, Microsoft, and Dropbox for creating and providing the (in many cases free) environments that supported our work.

As entrepreneurs are the soul of SMEs, our virtual team was the soul of this book. Each team member contributed their unique skills and the chapters reflect the results of an extended collaboration. Two important members that joined the team as research partners need special recognition. Michael Bull worked tirelessly on elaborating the experiences of the innovative entrepreneurs, using the podcasts of the interviews to develop interesting and challenging written cases. Gilbert Gatchalian researched and wrote the chapter sections that reflected his daily experiences with cloud services management in various IT organizations. Being a remote worker himself, he is also truly positioned to best discuss advantages and challenges of the virtual workplace.

We would like to acknowledge and thank Dell Inc. and the International Council for Small Business (ICSB.org) for supporting us in the development of the SME cases through their Global Small Business Excellence Award of 2008–2009. We also want to thank the CEOs of Fifth P, Tecnomodel, Transport Designs, and Wiggly Wigglers for discussing their business models and strategies, as well as Dr. Oyvin Kyvik, who supported some of the research in Chap. 7.

A special note of thanks to the publisher for patiently supporting the delivery of our work. We are grateful to Melissa Fearon, of Springer, for helping us move past the start-up phase to deployment and delivery, which we hope enhances readers' understanding of the increasing technology-based opportunities for SMEs.

Last but not least, our final thoughts go to our longtime friend and mentor, the late Distinguished Professor Dr. Bruce A. Kirchhoff, who suddenly left us in 2011. We still think we had so much more to learn from him about entrepreneurship, academia, and life in general. You will be missed!

Contents

Chapter 1
SMEs and Information Technologies in the Broadband Economy

Abstract Today's broadband-supported tools are enabling small and medium enterprises (SMEs) access to and easier management of information technologies (IT). These tools are offering new ways to communicate and reach customers. Although large corporations have resources and money to invest in emerging information technologies, they also have a major disadvantage: their size may cause complexities (and sometimes inertia) that may slow down new technology adoption. The size and dynamic nature of SMEs can enable such businesses to quickly take advantage of technological progress while minimizing risks. The key, however, is for SMEs not only to adopt, but also to effectively plan, implement maintain, and manage the broadband-supported technological evolution.

This opening chapter defines small and medium enterprises and introduces technological trends that can be leveraged by SMEs to gain competitive advantage. It discusses technological advancements (as well as limitations) caused by broadband technologies and maps the recent technological trends to SME business needs. The chapter emphasizes that technological investments must comply with the SMEs' core capabilities and business drivers. That is, choices about IT investments need to be planned, intentional, and driven by SMEs' business priorities and market demands.

1.1 Defining Small and Medium Enterprises

The definition of small and medium enterprises (SMEs) varies by country and, in some cases, by industry sector. In some regions, SMEs are mainly identified by the number of people they employ; in others, by various measures of revenues and characteristics of leadership. For example, SMEs can be defined in relation to the potential market size; based on whether or not they are managed by their owners; and whether or not they are part of a larger organization.

In the U.S., small and medium enterprises are referred to as small and medium businesses (SMBs) with less than 500 employees [1]. The U.S. Small Business Administration (U.S. SBA) specifies different size standards for small businesses interested in bidding for federal contracts. Such size differences are based on industry codes and they usually reflect the number of employees over the past twelve months or average annual receipts over the last three years [2].

K. Passerini et al., *Information Technology for Small Business,*
DOI 10.1007/978-1-4614-3040-7_1, © Springer Science+Business Media, LLC 2012

Table 1.1 EU definition of small and medium enterprises. (Source: http://ec.europa.eu/enterprise/policies/sme/facts-figures-analysis/sme-definition/index_en.htm)

Type	Headcount	Turnover	Balance sheet total
Micro	< 10	≦ 2 million €	≦ 2 million €
Small	< 50	≦ 10 million €	≦ 10 million €
Medium-sized	< 250	≦ 50 million €	≦ 43 million €

Beyond the purposes of Government contracting, a business with less than 100 employees is generally considered small [3]. A medium size goes up to 500 employees. An additional category is that of Small Office/Home Office (SOHO) or Micro Businesses, which are those with up to 10 employees [4].

In Canada, SMEs refer to business with fewer than 500 employees and less than 50 million in gross revenues, with small business topping 100 employees in goods-producing enterprises or fifty employees in service-based enterprises. A micro business in Canada has less than five employees [5].

The actual acronym of small and medium enterprise originated in Europe where different definitions abounded across various European Union (EU) member countries. In 2003, however, with Article 2 of the Annex of Recommendation 2003/361/EC, the EU consolidated and aligned the definitions, clearly stating the headcount and turnover requirements of SMEs. These requirements are used as an official guide to qualify for specific State aid programs or regulatory exemptions/benefits. Table 1.1 shows the ceilings in each category. In 2009, the discussion on whether the financial ceilings needed to be revised due to rising inflation pressures concluded that an annual 2% inflationary pressure was not significant enough to generate amendments in turnover or balance sheet limits [6].

Throughout this book, we present research findings, data, and case studies primarily from North America (i.e., U.S. and Canada) and Europe (with selected cases from UK and Italian small firms). While we will not focus on the size/revenue classifications each time, the aforementioned differences constitute a useful framework for comparison.

1.2 The Role of SMEs in the Economy: Small Is Big

Significant research shows that SMEs contribute to economic growth in multiple ways. We briefly list just a few notable aspects discussed extensively in the literature.

- SMEs foster *radical innovation* [7, 8]. Their presence in an economy leads to more competitive large enterprises that can outsource some of their activities to smaller firms [9].
- *Big numbers*. While the size-based definitions vary, there is actually a clear consensus on the role that SMEs play in the economy, and that is—a big role. In the European Union, SMEs represent 99.8% of all enterprises and provide around

Table 1.2 Number of SMEs compared to large enterprises in the non-financial business economy, estimates for 2008, EU-27. (Source: Based on [12] and Eurostat)

	Micro	Small	Medium-sized	SMEs (all)	Large	Total
Enterprises (%)	19,058,000 (*91.8*)	1,424,000 (6.9)	226,000 (1.1)	20,709,000 (99.8)	43,000 (*0.2*)	20,752,000 (100)
Employment (%)	39,630,000 (29.7)	27,652,000 (20.7)	22,665,000 (17)	89,947,000 (*67.4*)	43,414,000 (*32.6*)	133,362,000 (100)
Employees per enterprise	2.1	19.4	100.3	4.3	1006.1	6.4

Table 1.3 Starts and closures U.S. employer firms, 2005–2009 [1]

Type	2005	2006	2007	2008	2009
Births	664,122	670,058	668,395	626,400[e]	552,600[e]
Closures	565,745	599,333	592,410	663,900[e]	660,900[e]
Bankruptcies	39,201	19,695	28,322	43,546[e]	60,837[e]

[e]estimates

90 million jobs [10]. In the U.S., they represent 99.7% of all employer firms. They employ half of all private sector employees, 59.9 million in 2007 [11].

- *More jobs*. Compared to their relatively small sizes, SMEs create more jobs than large firms (67.4% compared to 32.6%) as indicated in Table 1.2, which highlights 2008 estimates for EU-27 [12]. While the European SME job creation engine faltered during the 2008–2009 economic crisis and displayed lower labor productivity per employee, it is expected to resume its lion share of job creation when the economy recovers.

  In the U.S., small firms created 65% of the 15 million net new jobs between 1993 and 2009 (17 year, with a slow-down in the 2008–2009 recession). Their role in technological advancement is critical considering that SMEs hire 43% of high tech workers and produce 13 times more patents per employee than large firms [1].
- *High dynamism*. The dynamics of enterprise birth and death for SMEs are also well-known—highly volatile. While about 1.8 million new enterprises were established in Europe between 2001–2006, over 1.5 million ceased to exist over the same time. Each year, the net entry was around 1.2–1.7% of the total enterprise population, oscillating between 10% new entries and 8.5% voluntary or forced closures. In the U.S., the annual turnover (births and closures) is about 10%. Not surprisingly, SMEs were hit hard during the 2008 recession. Table 1.3 shows trends from 2005–2009.

  According to the U.S. Department of Commerce, Census Bureau, and the U.S. Department of Labor, 70% of new employer firms last two years, 50% more than five years; 35% survive ten years and just 26% survive fifteen years or more [1].

This volatility is actually the reflection of positive drivers such as new technology adoption and higher competition. In part, volatility appears related to **adoption of new technologies**, deregulation, a more flexible labor market, and a growing cultural appreciation for self-employment. Additionally, the mortality rate of firms that have been displaced (and not replaced or acquired) signals that new enterprises enable more **competition** and force unproductive businesses to leave the market.

One example of how the use of technology favors SMEs comes from a study on small firm bankruptcy, which appeared in the *Journal of Small Business Management* [13]. The study compared a sample of bankrupt and non-bankrupt enterprises in order to identify root causes of bankruptcy. One of the significant characteristics of the non-bankrupt enterprises was the higher use of Internet in their business operations. All in all, this dynamism may reward the more forward-looking small enterprises that are flexibly adopting technologies to manage their operations. It is also a positive element for productivity and innovation [12].

1.2.1 The SME Size Advantage

Smaller size is advantageous to SMEs, particularly in terms of the ability to anticipate and respond to changes and achieve a deeper and closer interaction with the customers. For example:

- **Quicker decision making** and related re-orientation and execution of the new decisions [14] can result from a streamlined organizational chain. For micro and small enterprises, the founder actually owns the company and is the key decision maker effectively pushing and motivating changes.
- **Deeper customer knowledge** is derived from the direct interactions of the SMEs with their customers, whose shift in consumption patterns and needs can be quickly understood because of the proximity/attention enabled by the smaller size.
- **Increased employee interactions** are facilitated by an environment where everyone knows each other in the firm. Opportunities to work with others and to be aware of the business goals of the entire enterprise abound. Face-to-face contact with "the rest of the company" is an easier occurrence in an SME context.
- **Participation in planning activities** by many employees is also more likely in a small enterprise. Large companies use various strategies to stimulate participatory governance. However, the actual management of a bottom-up strategic planning process in a large company lends itself to prioritization choices that may eliminate minority ideas. In SME contexts, minority ideas can be more easily integrated in planning, thus fostering quicker buy-in and motivation [15].
- **Vested interest in business success** is also prevalent not only because employment is directly on-the-line, but also because employees in smaller enterprises are more engaged in all aspects of the business. Employees in SMEs tend to work long hours while being more satisfied with their work-life balance because they feel directly engaged with the services or outcomes [16].

1.2.2 The SME (Fading) Size Disadvantage

The smaller size of SMEs naturally raises a number of issues, many of which are discussed in Chap. 2 together with emerging technology-driven opportunities. Many of the traditional size issues and constraints though are slowly being overcome by technological advances that increase the manageability of small enterprises.

One key disadvantage that has prevented SMEs from being more competitive is the failure of technology vendors to market emerging technologies to SMEs because the return on investment was too low to justify sustained commitment. Today's reality, however, is that SMEs are finally becoming a viable business proposition due to the collapsing costs of technology. New software licensing models, available through software-as-a-service (SaaS), and evolving "cloud" services resulting in infrastructure remotization (discussed later in Chap. 4) are just two examples of how information technology provision can be customized also to the needs of smaller players. Other traditional "size" disadvantages that are fading away include:

- **Lack of IT personnel in house** is being replaced by new IT sourcing models whereby IT personnel can be "rented" together with equipment.
- **Limited IT infrastructural investments** are irrelevant as ownership of physical hardware and network infrastructure are no longer needed to run a business.
- **Limited (global) customer and product outreach** is superseded by the flattening of the economy [17], with impacts that span technology, marketing, and branding.

1.2.3 The "Resilient" Economic Disadvantages

Despite the opportunities opened, resilient disadvantages continue to exist in the limited access to financing; the higher labor and employee-benefits costs; the problems with administrative regulations; and, finally, the lack of access to skilled labor. These disadvantages pertain to external environments in which SMEs operate (i.e., economy, social, and regulatory aspects) and are not solved through the use of innovative technology. Not surprisingly, analysts' studies of SME issues in Europe [4] and the U.S. [18] are closely aligned with issues we found in the multiyear New Jersey Technology Council (NJTC) and New Jersey Institute of Technology (NJIT) annual IT Survey, which we will discuss more in Chap. 2. Even though this survey was extended to various countries during the last five years, the same economic, regulatory, and social constraints repeat annually regardless of state-of-the-art technological developments [19]. Therefore, while we report these market and economic constraints, we focus more on the actionable business and operational aspects, which may benefit directly from the technological advancement facilitated by broadband connectivity.

1.2.4 SME Opportunities with Broadband

Our interest in broadband derives from the realization that broadband is an enabler of several mobile services and facilitates access to the cloud services that are particularly relevant to the creation of new competitive opportunities through technology. Examples of such services are presented in later chapters. Broadband enhances access opportunities not only for large organizations, but levels the field also for SMEs that were once unable to significantly exploit technological advantages. Not only do broadband technologies stimulate growth for SMEs in developed economies, but they also enable SMEs in developing countries to leapfrog larger businesses by investing in the newer and leaner mobile infrastructure.

For much of the world, especially in developing countries, broadband can become a driver of economic activity and growth. According to a 2009 World Bank survey, developing countries experience on average a 1.38% increase in economic growth for every 10% increase in broadband penetration, as compared to 1.21% for already highly developed countries [20]. Mobile banking over cell phones for instance is making it possible for many people in developing countries, who would not otherwise have access to such services through a computer, to perform tasks such as paying bills online.

Another significant technological advancement facilitated by broadband connectivity is large scale and distributed cloud computing (also discussed in later chapters). In a nutshell, cloud computing makes computer resources scalable for a user through the use of a virtual "cloud" on which data and processing resources are shared from a variety of servers and data centers. It creates a centralized location in which computer power and data can be retrieved as needed, being very scalable and on-demand (only when necessary). The applications are obvious, not only through cost savings in resources and capital that would be otherwise needed in organizations for computer applications, but also through increased organizational and workplace efficiency. Examples of workplace changes enabled by cloud technologies are presented in Chap. 3. Cloud computing is also being increasingly incorporated into mobile applications. Its market is estimated to be worth more than $ 150 billion by 2013. These services together would neither be possible nor viable without the wide possibilities of interconnectivity and speed that stem from broadband ([20], pp. 82–90).

1.3 The Broadband Economy

Most of the new capabilities discussed so far can be linked to a single (but complex) technical advancement-broadband. Broadband is a loose term that can be used in several ways. According to the International Telecommunications Union (ITU), broadband is defined to describe Internet services that are "*always on*," in which a new connection is not needed every time. Further, as its name implies, it is *high-capacity*, being able to carry a high and variable amount of data at different speeds (determined

Table 1.4 Typical download times for multimedia files, at increasing broadband speed. (Source: adapted from [20])

Download type/capacity	56 kbps	256 kbps	2 Mbps	40 Mbps	100 Mbps
5 MB music track	12 min	3 min	20 sec	1 sec	0.4 sec
20 MB video clip	48 min	10 min	1 min	4 sec	1.6 sec
CD (or low quality movie) 700 MB	28 hr	6 hr	47 min	2 min	56 sec
DVD (or higher quality movie) 4 GB	1 week	1.5 days	4.5 hr	13 min	5 min

by the connectivity options and the specific subscription plan). This variable high-capacity enables the combined provision of data, voice, and video at the same time and over the same channel. Table 1.4 shows theoretical download times at different connection speeds, illustrating how higher capacity channels (i.e., 100 Mbps) support the real-time download of large multimedia files. Generally, quality on-demand video requires around 6 Mbps for a good download experience, although specific video-conferencing experiences may be run at lower speeds (i.e., Skype).

A more specific definition is available from Broadband Technology Opportunities Program (BTOP) and the Broadband Initiatives Program (BIP) (two U.S. government broadband programs), which both define broadband to be an Internet connection that is "providing two-way data speeds of *at least* 768 kilobits per second (kbps) downstream and *at least* 200 kbps upstream." This has since been updated into a universal benchmark from the U.S. Federal Communications Commission (FCC), which defines broadband as offering an *actual* speed of **4 Mbps** downstream and **1 Mbps** upstream. Either way, broadband defines not only a better quality system, but a faster and increased capacity type of Internet connection that is and will continue to be a game changer for SMEs ([11], p. 5).

In the broadband spectrum, there are numerous options available for SMEs, in both wired and wireless forms. But not all of them are available in all areas, and many are not cost effective for most SMEs. The cost structure from Internet service providers (ISPs) in the U.S. shows a disparity between advertised (ideal) speeds and actual (practical) speeds. This is leading to efforts by the FCC to come up with a standard by which ISPs may advertise and market connections. It is also leading to a re-examination of the oligopoly that controls the communication business ([11], pp. 5, 10–11) whereby only large providers dominate the industry. We will discuss some of these issues later in this chapter.

1.3.1 Wired Broadband

On the highest end of wired Internet technology, there is **Fiber-to-the-Premises** (FTTP), popularly known as fiber optics. FTTP typically ranges from 512 kbps to 50 Mbps, but has also been seen at speeds higher than 1 Gbps. Speed is flexible

Table 1.5 Summary of wired broadband connectivity options and sample costs. (Source: compiled and adapted from [11] Appendix F)

Type	FTTP (i.e., FiOS) (download/upload)	High-speed fiber for business (Opt-e-MAN)	Cable (download/ upload)	DSL (download/ upload)
Price range (month)	$ 30–195	$ 250–15,000+	$ 27–379	$ 35–195
Speed range	512/256 kbps–50/50 Mbps+	1.5–155 Mbps	From 256/256 kbps to 105/10 Mbps	From 768/384 kbps to 24/3 Mbps

as only the devices (i.e., modems) need to be upgraded to increase speed and bandwidth. For most SMEs, FTTP is unaffordable, costing upwards to more than $ 1,000 a month (for high-capacity, fiber-based circuits) depending on the type of fiber connection available according to the 2010 SBA report. **Cable-based connections**, slower than FTTP, take advantage of the coaxial cable system embedded within the cable television infrastructure and integrate it with Internet services. The cable-based service providers also use fiber optic distribution systems bringing **Fiber-to-the-Curb** (FTTC). It is considered fast, but due to the nature of the cable system, it is significantly faster downstream than it is upstream. It is still more costly than average and it is not as easy to upgrade as FTTP. About 33% of rural and 30% of metro small businesses subscribe to this service.

On the low rung for wired connections is **Digital Subscriber Line** (DSL). This service uses existing phone access lines with modems to offer higher speeds than traditional dial-up (also based on telephone access lines). Because of the proliferation of the telephone access system throughout the U.S., it is perhaps the most widely available wired broadband option for SMEs. Prices vary from $ 35 to 195 a month and speeds range from 768 kbps to 24 Mbps. About 39% of rural SMEs and 50% of metro SMEs use this service. Table 1.5 summarizes price and connectivity options for wired broadband [11].

1.3.2 Wireless Broadband

According to the Federal Communications Commission (FCC) Technical Paper #4 [21], today two-thirds of U.S. consumers have purchased fixed broadband services for their homes. This penetration rate has been reached in less than ten years. Growth of mobile wireless devices such as laptops and smart phones is pushing an even faster adoption of mobile broadband services delivered over radio networks. The International Telecommunications Union (ITU) estimated that by the end of 2011, mobile broadband subscriptions would top one billion users, up from the 73 million users only five years earlier [20]. This fast paced growth is pushed by access to affordable wireless data plans that are competitive with fixed access plans. In addition, development of new technologies such as High-Speed Packet Access (HSPA) is bringing

Table 1.6 Summary of wireless broadband connectivity options and sample costs. (Source: compiled and adapted from [11] Appendix F, and [21])

Type	Wi-Fi (WLAN 802.11x)	2.5G/3G EDGE, EV-DO	3.5G HSPA	Pre-4G-Mobile WiMAX (802/16x)	Pre-4G UMTS LTE	Satellite (down/up)
Price range (*often limited data downloads*)		From $ 40 to 60 (limited data)	From $ 30 to 55 (limited data plans)	From $ 30 to 55 (unlimited)		From $ 200 to 400
Speed range	Up to 54 Mbps	600/500 kbps, up to 1.5 Mbps	1.5/1.2 Mbps, up to 10 Mbps	6–15 Mbps, up to 100 Mbps	5–12 Mbps, to 100 Mbps	3 Mbps/ 512 kbps to 5/1 Mbps

more efficient transmission to existing networks, supporting download speeds of at least 7.2 Mbps.

The key difference among wired broadband (also called fixed) and wireless broadband (also referred to as mobile) is that fixed connectivity is delivered to a set location such as a home or a business location. Wireless broadband services are delivered to mobile devices that travel or change locations (together with the user). Quality of the mobile broadband connection, advertised and actual speeds, vary depending on the location of the user, the distance between the transmitting/receiving devices (mobile handsets) with the cell towers, the number of simultaneous users connected within a cell during a specific time, and the possible obstacles which degrade the transmission (i.e., walls or other obstacles).

Broadband wireless standards evolved differently overtime depending on the location and network preferences of the providers (wireless Internet service providers and telecom carriers). For example, radio frequencies and standards differed in Europe (GSM-based) and the U.S. (evolving CDMA-based, such as EV-DO). **Second generation** (2 and 2.5G) technologies supported basic voice, text, and data starting at 200 kbps. By 2010, **third generation** (3 and 3.5G) wireless technologies became standard with an average 0.4–1.5 Mbps download speed peaking at 3–7 Mbps. These speeds continue to increase with the rollout of HSPA technology [21]. However, **fourth generation** technologies are slowly developing through the use of (pre-4G) Worldwide Interoperability for Microwave Access (WiMAX), available in the U.S. since 2009 in urban locations, and the (pre-4G) Long Term Evolution (LTE) network. The pre-4G LTE is available in the U.S. through Verizon and AT&T partnerships with Ericsson and Alcatel-Lucent [20]. Table 1.6 shows typical wireless broadband connectivity options and associated costs.

Finally, **satellite broadband** is also available, at a higher cost, to customers that do not have access to other broadband services in their areas. This is if the user can install a satellite dish positioned correctly towards the low earth orbit (LEO) satellites. Despite the higher cost and the latency (due to the distance travelled by the signal) of satellite connections, about 7% of rural small businesses surveyed by the

U.S. Small Business Administration in 2010 have adopted this service [11] compared to 2% of metro users.

1.4 SMEs and Broadband

High-speed broadband Internet has reached a point where it has become as essential a utility to both businesses and private residences as plumbing, electricity, and water. According to a survey conducted by the U.S. SBA in April 2010 of 425 businesses U.S.-wide [11], more than 95% of SMEs respondents have access or the opportunity to access some kind of broadband service. SMEs have already benefited greatly from this proliferation and the endless array of applications (apps) broadband facilitates. By all accounts, it has transformed the fundamental way in which SMEs operate, communicate, and plan for the future.

Common applications enhanced and improved with broadband connectivity include ubiquitous e-mail (anyplace, anywhere on mobile devices), e-commerce advancement with the use of Web 2.0 technologies, widespread video-conferencing, remote data backup, cheaper voice-over-Internet Protocols (VoIP) options, remotization, real-time security camera feeds, and the new Internet (2.0 and 3.0). Using these services, SMEs can improve efficiency and productivity, both internally and externally. Video-conferencing, for instance, cuts logistic and travel costs, while data backup mitigates the risk and recovery costs of data loss or disk failure. Dial-up services are too slow to provide practical value and use for many of these integral apps and, thus, broadband has emerged as a general standard to which SMEs will need to adapt to remain competitive [11]. And, indeed, the more technically-savvy SME segments have already adapted to the technological and paradigm changes broadband has brought. About 90% of all the businesses surveyed by the U.S. SBA reported that they have broadband Internet access, which outpaces the 74% of homes that have broadband access.

1.5 Broadband Issues and Needs for SMEs in the U.S. and Beyond

Despite the opportunities, issues related to broadband access exist and direct policy initiatives need to be implemented to overcome several shortcomings. The U.S., despite its high Internet penetration, is still only mid-end when it comes to broadband connectivity and speed. According to a 2008 OECD survey, the country ranks 15th out of thirty countries in a composite index of speed, price, and penetration. Compared to that of average advertised download speeds of Internet speed leaders South Korea (52.7 Mbps) and Japan (107.7 Mbps), the U.S. can only offer 14.6 Mbps, 24th place out of thirty. This difference is critical, especially given that about 30% of SMEs surveyed by the U.S. SBA in 2010 stated that they need a connection speed of more

than 50 Mbps and more than 40% reported *not* being satisfied with their current speed. This lag in the provisioning of Internet capabilities can be traced to several different factors.

1.5.1 Lack of Competition

The monopoly and oligopoly nature of communications and utility infrastructures in the U.S. is stunting the growth of both improvements in infrastructure and Internet technology as well as leading to significantly higher pricing. AT&T and Comcast through mergers and acquisitions, according to recent market research conducted by Columbia Telecommunications Corporation [11] in San Francisco, hold more than 75% of the market. These market conditions stem from the concentration of the communications infrastructure within oligopolies. In the beginning Internet market, there were multitudes of dial-up and early DSL service providers who competed with open access to the infrastructures. However, a series of court and regulatory decisions later favored the move from a more open system in which multitudes of ISPs could compete on shared infrastructure to a much more proprietary one, in which infrastructure access was closed to all but a handful of players. The resulting market is unsatisfactory according to SMEs and they would like to see a more competitive system in the future ([11], pp. 26–29).

Particularly uncompetitive in the U.S. market is the disparity between advertised speeds from ISPs and actual speeds received by subscribers. According to an analysis by the FCC [21], mean and median download speeds were advertised to be 7–8 Mbps, while the mean and median actual download speed were 3–4 Mbps. While some of this cannot be controlled, this represents a deviation of about 50%, and gives subscribers unrealistic and inaccurate expectations of how fast their connection is supposed to be.

1.5.2 Shortfall in Policy Initiatives

According to a 2010 International Economic Development Council survey of 301 professionals [22], more than 90% of the respondents indicated that they found the U.S. federal government's goal of 4 Mbps speeds in rural areas to be inadequate for effective economic policy. More than 55% believed that 100 Mbps speeds nationwide would be needed within three years, rather than the planned ten year period ([22], p. 2).

This can be contrasted with the Internet connectivity levels of South Korea. This country ranks first in the OECD nations in terms of broadband and was also the first to develop a national information technology policy in 1987, called the "Framework Act on Informatization Promotion." The Korean government furthered this by combining policies with outreach directly to private enterprises. For instance, various

policy initiatives, including the "u-Korea Master Plan" in 2004, set out ambitious goals to expand fiber optic infrastructure nationwide. At the same time, it launched programs such as the "Special Law for the Promotion of Venture Businesses," designed specifically to support IT and high tech enterprises and the "Cyber Building Certificate," which promoted Internet café construction ([11], p. 30).

A short-fall in U.S. government initiative is partially to blame for the U.S.'s uncompetitive Internet connectivity. While it has pushed policy with "Advanced Universal Service," impacting communications infrastructure since the 1990s, it was focused on Internet for public institutions and residential areas ([11], p. 4). It thus has been slow to recognize the opportunities to be found in Internet technologies for small and medium enterprises.

1.5.3 Aging Infrastructure

Existing Internet enabling infrastructure in the U.S. tends to be very old and has large limitations when compared to newer equipment in more recently developed countries. This stunts the growth of Internet connectivity for the whole country, including SMEs. This problem is two-fold for the U.S. For one, because of the competitive nature of the infrastructure owners and no incentives from the government, it represents a lack of investment, as well as initiative and incentive, to continuously improve the infrastructure. Some of this stems from the fact that communications infrastructure is expensive to replace and there is less incentive to do so if older forms still function. The second issue is the uncompetitive ISP market. Since the large ISPs actually own the infrastructure, there is no incentive for them to lease service to other companies to provide access to the infrastructure, thus the small ISPs cannot possibly compete with the giants that make up the U.S.'s communication oligopoly. As a result, these giant firms do not upgrade their infrastructure or provide as higher quality of service.

1.5.4 Rural vs. Metro Internet Connectivity Disparity

Due to a lower amount of wired infrastructure in rural areas, broadband connectivity is also and issue. According to the 2010 SBA survey of SMEs, only 92.9% of rural SMEs with computers had Internet access, compared with 95.9% of metro SMEs. This becomes more pronounced when satisfaction and speed are taken into consideration. Nearly half (48%) of all rural-based respondents to the survey indicated that they are not satisfied with their Internet speed, as opposed to 37% of metro-based respondents ([11], pp. 2, 34). Some of this dissatisfaction probably stems from rural SMEs being forced to use slower-speed Internet connection methods, like satellite and dial-up because of no other options. The same survey showed that double the amount of rural SMEs rely on wireless broadband as opposed to metro SMEs (6 vs. 3 %). This, along with the obvious dilemma of extending wired infrastructure to remote areas,

probably indicates that wireless broadband will be instrumental in helping rural areas in general achieve parity with metro areas ([11], p. 14).

1.5.5 Low Penetration Rates

Despite the fact that broadband Internet usage is the highest it has ever been, with penetration expecting to top one billion by 2011 ([20], p. 21), some areas of the world, particularly developing countries, have low penetration rates of broadband. Some of this is development-bound, since countries like the LDCs (least developed countries) have neither the capacity nor the economic incentive to provide Internet services, particularly in areas where key infrastructure and effective governance is nonexistent. But some is also economic and market bound, with potential consumers of such services having neither access to compelling content nor purchasing power to subscribe to often excessively-expensive services ([20], pp. 164–165).

But economic development aside, there are still laggards in SME broadband usage, even in developed nations. In Singapore for instance, despite the country's stellar infrastructure, SME usage of Internet was only 62% and only 32% had company Websites in 2008 [23]. This aspect points to the fact that having economic development is not the only thing needed to have SMEs effectively utilize broadband. The SMEs also have to make investments in technology themselves. There probably exists considerable resistance to such investment, not only because of hard economic times, but also because older SME owners do not feel that such investment is necessary. Two potential solutions to this problem are possible. One is, where possible, for the government to directly fund the construction of network infrastructure, giving the government more control over the regulatory environment where it wants ISPs to compete. Another is to allow infrastructure sharing. In this approach, ISPs and wireless service providers agree to allow their customers to "roam" in a competitor's service area. This can provide an effective approach to increase both coverage and penetration in not only developing nations, but also in rural areas, where coverage might also be patchy ([20], p. 167).

1.6 SMEs and IT Priorities in the Broadband Economy

The advancement of broadband-driven technologies and the lowering cost of high speed access (either through cellular, wireless, or wired connectivity options) have significant implications for SMEs. Despite some of the issues and needs highlighted earlier, access to lower cost technologies, often open-source, can enable SMEs to improve internal management, business processes, their interaction with suppliers, and their access (and nurturing) of customers. These technologies can generally support SME operational activities in each of their industry-specific value chain functional areas (see Fig. 1.1).

Fig. 1.1 Generic value chain

Such activities include the identification and management of suppliers; procurement management; and replenishment of raw materials (inbound logistic). Production entails building a product, in case the SME is focused on manufacturing. If focused on services, the second component of the generic value chain refers to setting up and managing the operational activities related to the delivery of the specific service. Outbound logistic, or distribution, deals with the delivery of the product/service, sold to the end customers through marketing and sales activities. Finally, customer support is essential to manage the post-sales need and gather feedback on product performance.

The list of IT products supporting value chain processes across industries is too comprehensive to be adequately addressed in a single report. Therefore, rather than providing a list of the many technological options that populate a generic SME value chain, relevant technologies are grouped based on priority areas along the value chain, essential to sustain small business growth (Table 1.7). We identified these priority areas by surveying SME players both in the U.S. and internationally (see Chap. 2). The first column in Table 1.7 shows the priority areas identified by the surveyed SMEs as highly critical for their continued business growth [19]. These priority areas are matched to the value chain shown in Fig. 1.1 with sample technologies that can support them. These technologies, discussed in more details throughout the remainder of the book, are increasingly accessible to SMEs both in terms of costs and ease of use. Some of these applications have already matured and progressed through incremental innovation. Others are still in their infancy and may further lead to disruptive changes.

In order to support **innovation and the launch of new products and services**, technologies for open collaboration and collaborative work are increasingly accessible to SMEs at little or no cost. Knowledge generation and sharing platforms through wikis, blogs, or open-source document management tools (such as Google documents and sites) can now provide small enterprises similar advantages that larger collaborative platforms (IBM-Lotus, Microsoft SharePoint, etc.) have traditionally offered mainly to large enterprises. The simplicity, ease of use, and wide access of the open-source collaborative tools provide SMEs with an incentive to codify new and existing knowledge processes into well-documented processes and activities. We discuss examples in Chap. 6.

Lower costs in infrastructure spending can be achieved with new models of hardware and software sourcing, such as IaaS (infrastructure as a service) or SaaS (software as a service), discussed in Chap. 4. The key benefit from these systems is that they relieve SMEs from heavy start-up and operational costs because enterprises can scale and scope their access to technology based on their business growth (or loss).

Table 1.7 Technology-driven opportunities for SMEs. (Source: Adapted from [24, 25])

Priority area	Supporting tech			
	Suppliers and inbound logistic	Production/operations (manufacturing and services)	Marketing and sales, distribution (outbound logistic)	Customer support, post-sales
New product areas, innovation		Product developments through collaborative work, i.e., Wikis (see Chap. 3)		
Lower costs	Vendor-managed inventory (VMI) RFID tracking (see Chap. 2)	IaaS through the cloud (see Chap. 4)		
Ease of use		IT systems through SaaS replacing costly in-house (see Chap. 4)		
Service improvement	Increased workforce mobility (see Chap. 3)		Increased workforce mobility (see Chap. 3)	Ability to follow customers through social networking sites/blogs (see Chap. 3)
Better partner coordination	Mobile email; remote access to DB through smart-phones (see Chap. 2)	Improved information flow and knowledge mgt; expertise locator (see Chap. 6)		
Better marketing			Marketing through social networking sites; mobile web site (see Chap. 3)	
Better capacity management (Supply)	IT management improvement through SaaS (see Chaps. 4 and 5)	Increased process flexibility (see Chap. 2)		
Better demand management (increase in sales)	Higher global outreach (see Chap. 2)		Higher global outreach Mobile web-site (shared business; e-commerce web hosting) mobile transactions (see Chap. 2)	Personalized customer service (see Chap. 2)

Considering SMEs high annual turnover numbers, having this sourcing flexibility can make a significant difference in their ability to dynamically address the uncertainties of the start-up phase.

Service improvement can be achieved by capturing customers' feedback through social technologies and by bringing the business to the customer. Field workers using mobile applications can quickly interact with customers and fulfill orders in real time, augmenting the effectiveness of a face-to-face visit with speedy access to enterprise records, catalogues, or databases over handheld devices (see Chap. 2).

Marketing and **global outreach** are the big winners of the Web 2.0 technological evolution as social networking sites are making the end-customer more accessible to any enterprise, provided that the attention of enough Twitter followers or YouTube viewers is captured. Better marketing can lead to an increase in sales (on or off-line). If the sales transactions are transferred on-line or to a mobile device, data about the transaction, the location of the customer, his/her preferences, and emails become quickly available for follow up, service personalization, and possibly additional leads.

1.7 Overcoming SME IT Adoption Resistance

This chapter presents an overview of the key players and elements discussed in the book:

- The SMEs,
- The broadband economy, and
- The technologies.

We focus on highlighting key facts and changes that set the stage for the evolution occurring in the "always-on" and connected work environment. However, most of these aspects may remain part of a "wish list," if we are not able to move beyond the listing of trends into the actual application. It is easy to say that technology opens several competitive opportunities for SMEs, but it is not so easy to make the case strongly enough for SMEs to seamlessly participate by implementing such technology.

The International Council for Small Business (ICSB) notes that while SMEs worldwide recognize the importance of IT for their business success, and they are aware and interested in the latest trends, only a small proportion of enterprises actually **use** the technology. Numbers are scary: a mere 35% of business surveyed in the 2008 Dell/ICSB International Small Business Survey reported engaging in two-way communications with customers over the Internet. Only 39% reported a sustained Web presence [26].

These results show that SMEs suffer from a technology adoption problem and are slow to jump into technology-driven opportunities. We have reported these issues in earlier studies [24] drawing data from the 2005 National Small Business Poll from the NFIB Research Foundation. In the Poll, Dennis [27] noted that SMEs often take

a laggard role in technology investments. Even when the latest technologies and software are deployed, upgrades are often delayed. Most SMEs use off-the-shelf products (in 92% of the cases), thus the implementation is limited to standardized applications that have little or no impact on creating a competitive advantage through IT.

The adoption data presented underscores that when discussing technology opportunities for SMEs, small enterprises are rarely first adopters. Rather, they are often faced with implementation constraints that may dissuade any adoption (neither early nor late). This is why, in addition to discussing broadband-driven trends, which have the potential to revolutionize the way SMEs work, we present in later chapters IT planning, implementation, and management examples that will need to be cautiously and carefully used to sustain implementations. Strategies for vendor selection, prioritization of IT investments, evaluation of the alignment between IT and the business, the identification and codification of relevant internal and external know-how are as essential to the transformation of SMEs as the dynamic technological evolution driving change in the broadband economy.

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Chapter 2
SME Opportunities with Broadband-Driven Information Technologies: Supporting SME Business Needs

Abstract In the broadband economy, SMEs enjoy technology-supported opportunities to interact with customers in ways that were neither possible nor thinkable until recently. However, to effectively sustain SMEs' competitive position, technology must first meet the business needs of small enterprises. In this chapter, we discuss how broadband-driven mobile technologies can actually support SME business needs. In the first part of the chapter, we present examples from multi-year research focused on identifying SME business needs by mapping the technological evolution and investments of small enterprises that are at the forefront of IT adoption. In the second part of the chapter, we specifically introduce mobile applications and discuss how they can play a role in SMEs' competitive evolution. Finally, we cannot discuss an emerging topic such as broadband-driven mobile technologies without acknowledging issues related to security and privacy protection in the "anytime/anywhere" environment. Hence, the chapter concludes with a discussion of privacy principles that all professionals, and particularly the nomadic SME professionals, need to take into account when utilizing mobile apps.

2.1 Capturing SMEs Business Needs

SMEs are confronted with many challenges. Once they move past the start-up phase, they are faced with setting up daily operations that can support growing business demands. As discussed in Chap. 1, many SMEs are late technology adopters, or laggards. This is particularly common in the context of emerging technologies for which the value proposition is still unclear, because of high market volatility. However, by focusing on SMEs in the information technology (info tech) segment, it is possible to identify the issues faced by the innovators: those enterprises that are pioneers in technology adoption. Identifying the needs and experiences of these innovative firms can significantly lower the learning curve for other small enterprises and enable them to fearlessly move forward in technology exploitation. In this chapter, we present key characteristics and discuss the environment in which such enterprises operate.

K. Passerini et al., *Information Technology for Small Business,*
DOI 10.1007/978-1-4614-3040-7_2, © Springer Science+Business Media, LLC 2012

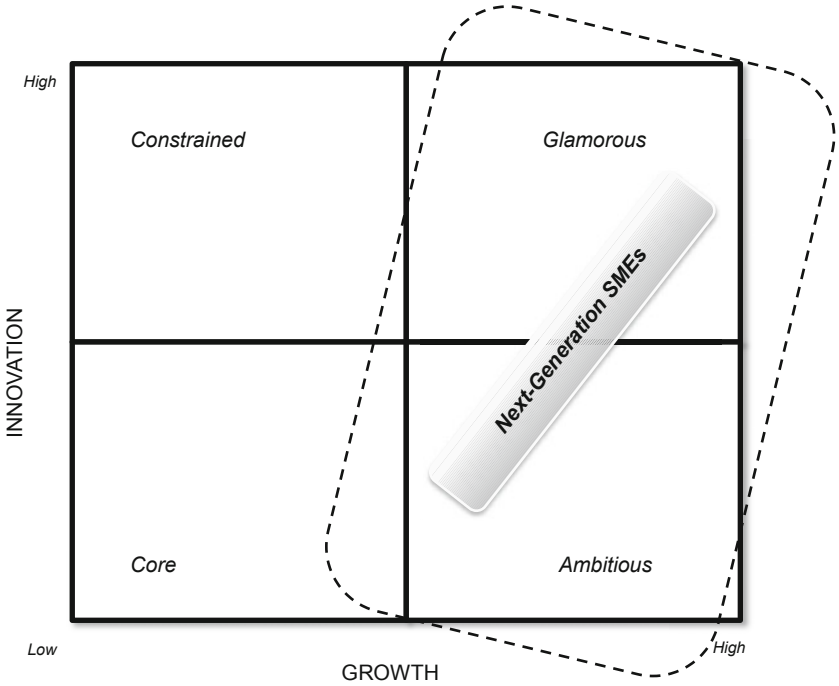


Fig. 2.1 Kirchhoff's typology of small firms. (Source: Modified from [2], reprinted with author permission)

2.1.1 Early Adopters in the Info Tech Industry (Next-Generation SMEs)

Kirchhoff [1] differentiated the typology of small enterprises based on growth and innovation potential. He identified a set of small firm start-ups that are more prone to tech innovation. Spencer and Kirchhoff [2] regard these firms as "ideal types" of new technology-based enterprises that are important drivers of innovation and economic growth. These firms include characteristics that lead to fast adoption of new technologies. While the "glamorous" firms (Fig. 2.1) are likely to coincide with first adopters of many technologies because of their high growth and innovation rate; "ambitious" firms are likely to invest only in, for example, new technologies that can increase productivity and operational efficiency [3]. On the other hand, lower costs of IT deployment, mobility advantages supported by broadband, and an IT services support system (now directly available as-a-service) can help the more IT-conservative small firms (such as the "core" and "constrained" in the figure) to transition to the new mobile apps. Incidentally, many enterprises have already embraced this transition, as discussed later in the chapter.

Ambitious and glamorous SMEs are found, for example, within the dynamic info tech sector. They adopt (and take advantage of) new wireless services faster than

other less dynamic core and constrained small organizations. They may also adopt wireless technologies faster than larger organizations [2]. These "next-generation SMEs" have more occasions to experiment and gain time-to-market entry advantages through innovative uses of broadband applications. They also have the opportunity to define the key requirements for adoption in their sector.

2.1.2 Key Issues to Follow According to Info Tech SMEs

We have surveyed info tech SMEs annually since 2006 in a study jointly conducted by the New Jersey Institute of Technology, the New Jersey Technology Council (NJTC) and other local and international partners (i.e., the Quebec Technology Association (AQT); the University of Quebec en Outaouais; the South African Consulate, etc.) [4]. The main goal of this annual study is to understand both local and international technology and business challenges faced by small and medium enterprises, which are members of regional technology councils such as NJTC and AQT. Key goals of the study include understanding the:

- Economic climate with in the region in which the enterprises operate and the confidence level of conducting business in that region
- Key technologies essential for continued business growth
- Availability of financing
- Strategic focus of the firms
- Revenue and investment forecasts in 2–3 year timeframes.[1]

We discuss the results based on the most recent data collection period (2010–2011) noting the remarkable consistency in issues, opportunities, and trends across various years (despite covering different economic cycles, including a recessionary one) concerning technological evolution. Differences emerge mostly in perception of the local economy, financing and revenue models, and the role of government support.

Within the info tech segment, these next-generation SMEs are application software developers, IT consulting companies (over 50%), application services and managed services providers (about 30%). Approximately 20% of the respondents are also involved in IT infrastructure/network services provisioning and business continuity. These enterprises view Microsoft platforms as critical for their continued business growth, but the importance of both open source and mobile platforms increased significantly over the years (see Fig. 2.2) with the importance of mobile and wireless increasing thirty percent since 2006.

The growth of mobile and wireless importance is particularly evident from the same data collected in Canada and Europe. Important areas listed by the respondents include software-as-a-service (repeated several times), cloud technologies,

[1] The mean response rate varies between 5–15% of council members within the IT industry segment. About 140 firms participate in each survey, with generally 70% of the respondents representing the tri-state area (New Jersey primarily, New York, and Pennsylvania). The sample broadly represents firms with less than 250 employees and primarily enterprises with less than 50 employees.

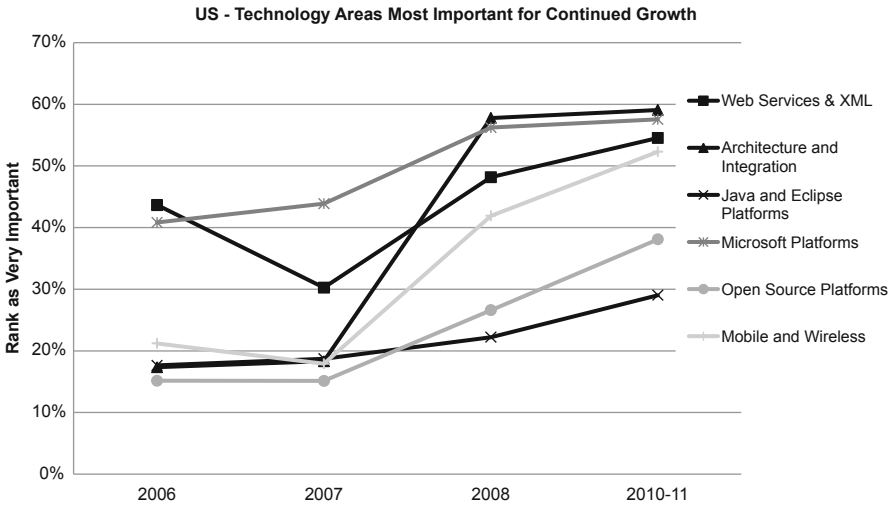


Fig. 2.2 Critical technologies for high tech SMEs growth in the U.S.

open source applications, Citrix applications (for remote computing), security applications, and unstructured data mining technologies. Other broadband-driven apps and platforms in the lead are Web-portals and components, e-commerce solutions, and mobile consumer apps [5].

Several statements[2] from the respondents confirm the upward trend of mobile and wireless, as well as the jump in architecture integration responses (Fig. 2.2). They can be grouped under "integration/mobility" and "service computing" themes:

- **Consolidation and integration for "anytime/anywhere" access (mobile tools)**

  The theme going forward for IT is consolidation and **integration**. Organizations that can provide their employees [with the right information at their fingertips the moment they need it] will have a distinct competitive advantage over those that cannot.
  Smartphones will continue evolving into the preferred instrument for constant connectivity, with voice interaction, facial recognition, location awareness, constant video and sound input, and multi-touch screens.

- **Utility computing, SaaS, and commoditization**

  Continuing Web application development will make the desktop thinner. You will have all you need on your remote device. Information flow will resemble **electricity**, a utility to tap into.
  [. . .] IT is enabling the commoditization of previously high-end services and blending them seamlessly in our day-to-day life. Examples include taking garage sale to national scale (eBay), library on the go (Kindle), area-wide product price comparison (barcode reader on your cell phone), worldwide stock data on your palm, anytime anywhere TV shows and music, and the list goes on.

[2] All quotes in this chapter present open-ended responses to the 2010–2011 NJTC's question on forecasting the direction of the IT industry within the next 5 years.

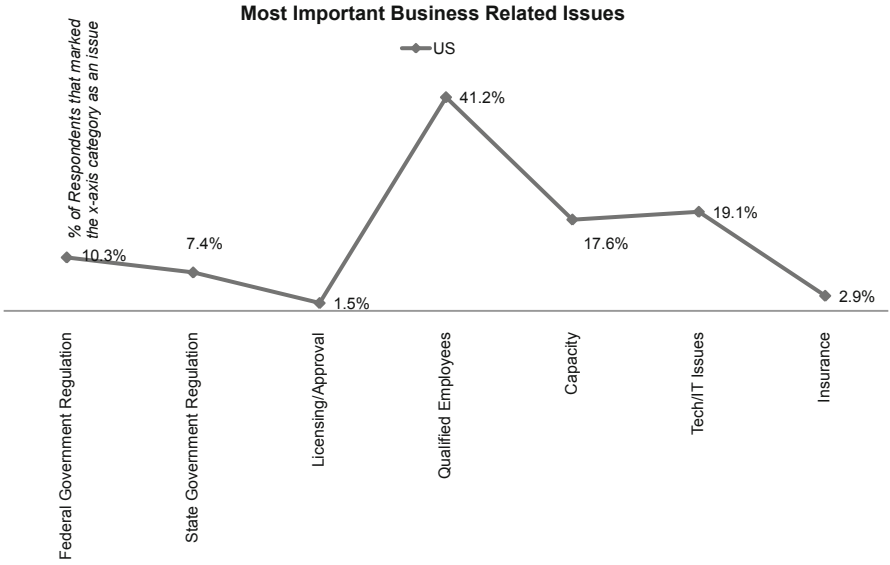


Fig. 2.3 Most important business issues for U.S. info tech SMEs

The picture emerging from these statements is one whereby IT systems become so embedded in the daily life of individuals that enterprises delaying adoption may quickly become obsolete. Smartphones have made the anytime/anywhere model successful, while utility computing has opened IT access to the masses (no matter how large or small the group) [5].

2.1.3 Business Issues and Priority Areas for Info Tech SMEs

While info tech SMEs aggressively test and push the adoption of emerging technologies, their business models are still constrained by environmental, regulatory, and economic factors that may impact their growth rate. No matter how innovative the product, access to financing, administrative barriers, and market conditions will cause significant differences in achieving success. While some federal and state regulatory requirements are an issue primarily in the U.S., our study shows that lack of access to qualified employees is the highest and most significant problem reported both in the U.S. and in the international data (see Fig. 2.3).

Employment With regard to lack of skilled resources, the following statement summarizes the respondents' major concerns:

> Bigger growth is happening in Asia, with the removal of more jobs from the American workforce; and our education system is not graduating enough engineers.

Local info tech start-ups face fierce competition globally because the same broadband technologies that are enabling the anytime/anywhere model are also abolishing trade barriers. In the "flat world" [6], IT services can be sourced from any location, as long as they are accessible at satisfactory data transfer rates. It is logical to expect that info tech SMEs will suffer when competing with software development giants located in India and China. The lack of access to skilled resources on-site is particularly taxing because these enterprises cannot fully exploit their "localization" advantage by offering customized and personalized services to customers. If these SMEs do not have the right personnel that will be able to sell as well as support the post-sales activities at the customer site and if clients can obtain similar services via a remote Cisco tele-presence connection, clients will usually pursue the lower cost solution. In some cases, SMEs themselves outsource their own services and work primarily as customer interfaces. This is one of the reasons why higher growth is happening elsewhere.

In addition, the declining interest in STEM (science, technology, engineering, and mathematics) in the U.S. leads to lower enrollments and, thus, lower graduation rates. While foreign international students continue to enter U.S. STEM programs, many of these students return to their home countries after graduation or, seek positions in other countries. In addition, foreign STEM graduates may not seek SME employment as they will obtain more support in processing work visas from larger organizations.

Finally, even if workers are available and employable, is the local human resources pool able to address the increasing complex need of the cloud computing model? We have mentioned several times that IT is becoming simpler to the end-user, but not necessarily to the providers of IT services who find themselves supporting larger and more distributed systems. During the dot.com boom, novices from any field were able to learn-on-the job. However, today's IT skills requirements are highly specialized and the generalist professionals have ceased to be competitive.

Regulation With regard to the regulatory requirements highlighted in Fig. 2.3, high costs of fringe benefits, especially health insurance costs, are particularly taxing for SMEs. This is exacerbated by declining federal and local investments in research and development, particularly during recessionary cycles.

> Federal and state governments need to create an environment where it's strategic and healthy to invest in technology innovation and new product development.

Because info tech SME business models are grounded in innovation and product development, lower incentives may spiral towards lower innovation rates and conservative investments. Long-term innovation goals are traded-off for short-term survival needs.

Customer Service Development Info tech SMEs complain that even when new products are brought to the market, buyers are not ready for adoption. Therefore, they need to invest significant more resources in marketing and customer development. Based on the 2011 data collected from our study [5], resources are shifted from the research and development (R&D) budget to marketing and product improvement, which will eventually constrain the competitiveness of the enterprise [5]. Product

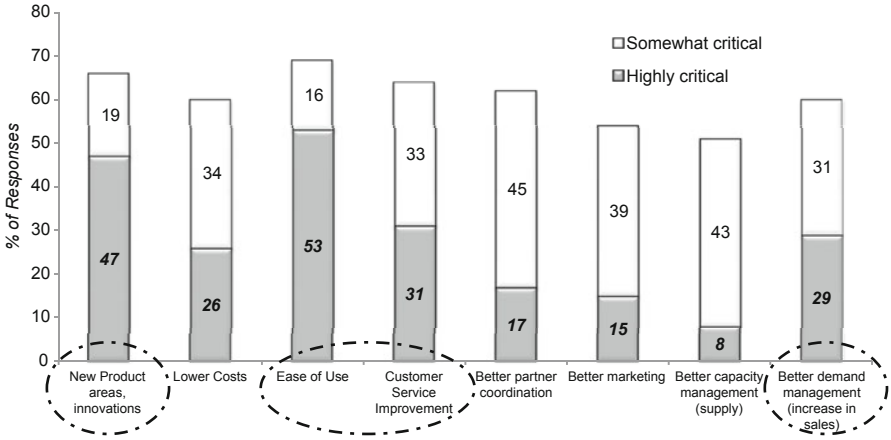


Fig. 2.4 Most critical areas for U.S. high tech SMEs (# of responses)

Table 2.1 Spending distribution of info tech SMEs (2010–2011)

Spending on existing products vs. research and development?	Less than 5%	6–15%	16–25%	26–35%	More than 36%
Existing products (%)	18	*28*	15	16	21
Research and development (%)	*25*	22	22	9	21
Sales and marketing (%)	15	24	24	*24*	10

improvement through incremental changes is a viable strategy mostly for the short term. It essentially helps retain the loyalty of existing customers. While this strategy does not help in acquiring new customers, it maintains customer satisfaction and enhances their experiences. As Fig. 2.4 shows, info tech SMEs perceive that customer service improvements, plus the simplification of technology interfaces, are critical business drivers in the current economy.

- **Simplification (ease-of-use)**

  Front-End Simplification. While environments grow more complex on the back-end, clients will expect the user experience to become more streamlined and easy to use. The **cloud** is the natural progression of this desire, and as cloud provisioning becomes more prevalent other non-cloud based IT resources will be looked at to match that ease-of-use.

Innovation While Fig. 2.4 shows that info tech SMEs still report new product development (NPD) and innovation as being critical priority areas, the data presented in Table 2.1 about their IT investments shows that the highest number of responses (as a percent of total responses, in this case 25%) in R&D investment is associated with the lowest investment value (less than 5% of total expenses).

Possibly, the high investments in sales and marketing (24% of responding enterprises state that between 26 and 35% of their total expenses are in marketing)

Table 2.2 Priority areas for SMEs

	Priority areas (in order of importance)	Highly critical responses (%)
1	*Ease-of-use*	*77*
2	*New product areas, innovations*	*68*
3	*Customer service improvement*	*45*
4	*Better demand management (increase in sales)*	*42*
5	Lower costs	38
6	Better partner coordination	25
7	Better marketing	22
8	Better capacity management (supply)	12

are driven by the notion that better demand management, another critical area for info tech SMEs, will lead to sales increases. The rise of new marketing models on the Internet (social media-driven) can support their need to achieve increase in sales (Fig. 2.4). For example, according to American Express Chief Marketing Officer, the promotion of the Small Business Saturday's event in Facebook increased SMEs transactions by 28% [7].

- **Social Platforms**

  The role of technology in our business and personal lives has changed dramatically [. . .]. Social platforms will evolve into new and timely sources of business intelligence. Company Web sites might no longer be the first stop for customers interested in your product or service. . .

Key priority areas for info tech SMEs are listed in Table 2.2. Over 40% of the respondents concurred that highly critical needs for their business success included customer/market-related issues such as ease-of-use, new product areas/innovation, and customer service improvement, Lower priorities include supply-related issues such as capacity management, better partner coordination, and lower costs. Info tech SMEs believe that they will be able to boost their firms by focusing on innovative, user-friendly, and customer-oriented products.

To the extent broadband technology can support these business priorities, it offers real opportunities for business improvements. However, as respondents highlighted:

> I think successful IT companies will be those who are able to combine efficiently carrying out projects and implementations with a real understanding of how the solution will integrate into the way a company does business and makes its money. The technology is now at a level where one can pretty much do anything one wishes with it, the question is "Does the solution or product you are proposing really fit your client's business and needs?"

We try to answer the question of how mobile technologies may indeed support SMEs business and needs in the next sections.

2.2 Mobile Technologies Landscape

Mobile technologies provide remote and transient **collaboration and communication** capabilities by enabling anytime anywhere voice, data, and services access. Mobile technologies encompass software applications, various types of supporting networks, and corresponding hardware (see Fig. 2.5). These components' seamless integration is essential to providing innovative services to the end users. Mobile technologies have invaded our personal and professional lives. Smartphones adoption rates have skyrocketed (pushed by killer devices such as Blackberrys, IPhones, Google-Android phones, Windows Mobile phones). Companies exploiting mobile applications are reporting operational growth, new business opportunities, and better customer outreach. Technological advances (from standards, to sensors, equipment, providers, frequencies, etc.) in mobile infrastructure occur daily, improving throughput and quality.

In terms of **hardware,** mobile devices are not tied to a specific location. They are portable and movable and are designed to enable data collection and transfer via various wireless channels. They include laptops, smartphones (of various brands), tablets, and other devices such as GPS receivers and electronic readers.

In terms of **applications,** the list is exponential. In general, applications may use more or less complex visual interfaces. They may range from simple and low bandwidth demanding SMSs to sophisticated applications downloaded on devices. Despite the high numbers, the most significant apps for business users are email and Internet browsing services. Games are the killer applications for the consumer market. Data access is achieved at various speed and quality level, depending on the type of *network* connection used (for a list, refer to Chap. 1).

Given the highly dynamic and complex nature of mobile technology, it is not surprising that some enterprises are still cautious, aiming for a laggard entry rather than an early adopter role [8]. Enterprises are struggling with the cannibalization of existing products, fear of security and privacy breaches, data interoperability problems, just to name a few challenges. In this section, we look at the opportunities as well as the difficulties of adopting mobile technologies.

2.2.1 Uniquely Mobile Opportunities

Opportunities to exploit the advantages of the mobile and wireless application explosion exist throughout the SME value chain. Realizing these opportunities requires identifying which technologies can support long-term business growth, especially for incumbent SMEs whose key core competencies are not within the IT industry sector. Such identification is based on the analysis of current and forward-looking business trends within the SMEs' specific industries and entails making decisions on priorities. While Chap. 5 describes a framework for making such decisions, this section provides some examples of mobile applications that easily map the identified

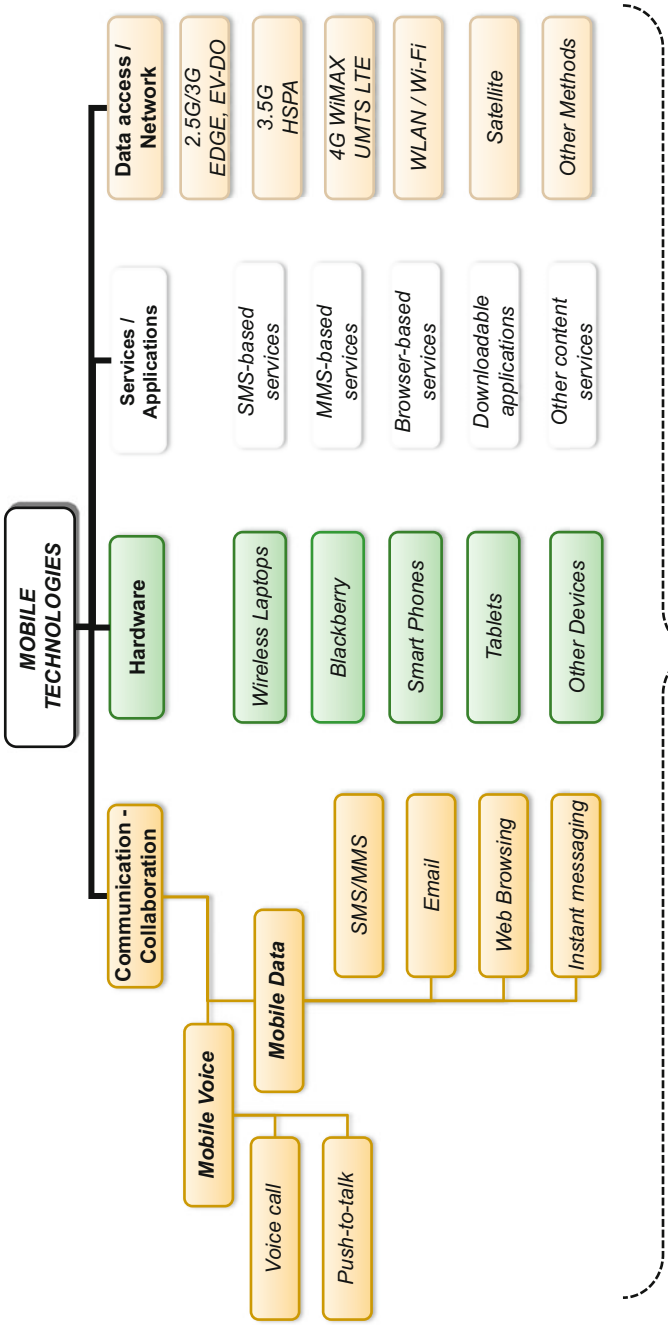


Fig. 2.5 Mobile technologies landscape. (Source: Passerini, updated and reprinted with permission of Cutter Consortium, www.cutter.com)

priority areas (see Table 2.3) and are affordable and quickly implementable by SMEs (assuming that employees have access to suitable mobile devices).

Other opportunities include:

Opportunities for mobile workers Wireless access enables mobile workers to remotely access resources to complete their work-tasks, extending their connectivity and reach. Business users are no longer limited by wired local area network connections to their workspaces, offices, and homes. They have the flexibility to stay connected anywhere the business operates without being physically wired to a place or device [9]. Individuals are now expected to work in virtual teams and be always available to interact at any point in time. Using mobile technologies has changed the traditional view of work taking place at the office. Work is now where and when it makes most sense, regardless of the context in which individuals are operating. Teams collaborate across countries and locations and hierarchies are flattened across teams. Such changes first impact individuals and then extend to organizations, changing entire organizational models.

Opportunities for edgy enterprises Bess [10] finds that the opportunities for mobile technologies reside specifically at the "edges" of companies. He introduces the notion of "rethinking the edge" by focusing on the exploitation of supplier/partner/customer relationships (those at the edge of the enterprise) that might have been overlooked by an inward focus on internal implementation and management. For example, organizations continue to be ambivalent towards expanding investments in mobile technologies. Greco and Nickolaisen [11] found that shifting IT investments away from traditional IT systems was rather difficult within traditional hierarchies. They describe a journey against the tides of a traditional and inflexible structure mostly held back by the inability to envision the benefits of quickly transitioning to mobile technologies.

Opportunities across industries Schuster and Lee [12] present examples of applications available in the agriculture industry, where Florida citrus growers are testing the use of mobile devices, such as 3G smart phones, to speed data collection efforts by human scouts who walk the fields in search of signs of spreading diseases. The added bonus of the 3G phone data collection is the ability to better pinpoint the exact location of the observations through the phone GPS capabilities. As long as the data is transferrable seamlessly across systems (that is the interoperability issues are lowered), the possibilities are limitless.

Opportunities for communities Chaka [13] describes social networking "gone mobile" (mobile-SN) with MXit, an instant messaging application that has enabled its developers (Mxit Lifestyle) to gain market shares in over 120 countries, claiming 19 million subscribers. Being able to follow Tweets and connect to Facebook anytime/anywhere has taken an entirely new dimension. It has enabled community self-organization that eventually led to the demise of entire political regimes.

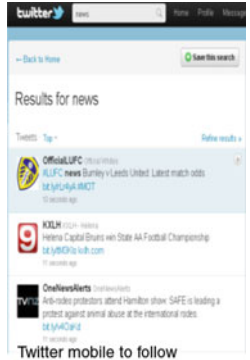
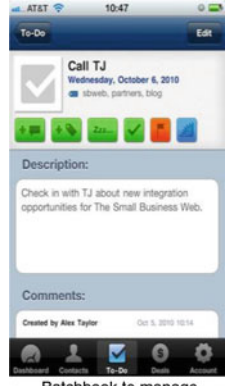
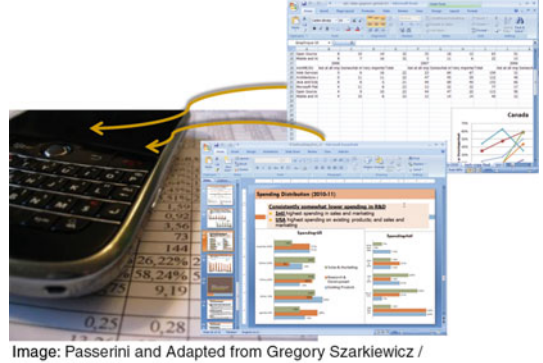
Table 2.3 Mobile apps for SMEs

Priority area	Mobile apps	
	Description	Sample interfaces
New product areas, innovation	In addition to collaboration and communication tools for open innovation, applications in this area make searching information easy. For example, SocialCitNet can be used to quickly analyze patents during the innovation process. Other examples include IBM collaboration software such as Social Everywhere and Chat	
Lower costs	Smartphone applications integrating bar code scanning capabilities can increase inventory management accuracy and speed. The CS40 mobile phone is an example http://www.intermec.com/products/cmptrcs40/index.aspx	 Image: Salvatore Vuono / FreeDigitalPhotos.net
Ease of use	Since the Apple iPhone revolution, the majority of smartphones applications have evolved into user-friendly interfaces	

Table 2.3 (Continued)

Priority area	Mobile apps	
	Description	Sample interfaces
Service improvement	Applications that support SMEs' mobile workforce enable better internal management (reporting and easing contact management and administrative paperwork) and external client management (lowering response time and follow up) With reference to internal client management: mobile apps on smartphones and tablets can ease time reporting tasks by capturing length of time calls with clients (voice call) with automated emails sending at the end of the work day (enhanced data service). Location-based tracking can further automate tracking of time spent at client sites With reference to external client management, applications for customer-relationship management (CRM) span from extensions of current proprietary systems now accessible through mobile devices, to newly developed applications. See for example at http://www.practicalecommerce.com/articles/2763–17-Mobile-Apps-for-Customer-Management: – Sugar mobile with sugarCRM to simultaneously logs calls and data – Sales force mobile – Oracle mobile sales assistant (to access data) – SAP one mobile to access reports, inventory and alerts – CWR mobile for microsoft dynamics to log open/closed sale opportunities	 Image from SHUTTERSTOCK IMAGES LLC, with permission
Better partner coordination	Mobile apps to follow the status approved documents, for example, allowing complete approvals directly from the smartphone interface	

Table 2.4 (Continued)

Priority area	Mobile apps	
	Description	Sample interfaces
Better marketing	Mobile apps have contributed to bringing marketing to the next level. These new marketing models are based on the exploitation of the power of social networking. Salesforce personnel can connect to customers on Facebook and Twitter for quicker follow-up and updates. Social networking sites can be used to expand reach to new customers. Sample apps include HubSpot Leads to ease access to new customers; Batchbook, an application for SMEs to manage social networking contacts	 Twitter mobile to follow updates  Batchbook to manage social networking leads
Better Capacity management (supply)	Leverage location-based services to follow the supply chain integrating geo-service with SMS and email messaging. Use mobile device management systems to follow the logistic cycle (routing and dispatch, and pick-up and delivery field services)	
Better demand management (increase in sales)	See marketing apps (above) for additional leads. For demand management, Nice Office applications for SMEs (from AT&T) enable taking the office on the go by synchronizing databases, calendars, forms and documents. They are offered "as-a-service." http://www.wireless.att.com/businesscenter/solutions/industry-solutions/mobile-productivity-solutions/nice-office.jsp	 Image: Passerini and Adapted from Gregory Szarkiewicz / FreeDigitalPhotos.net

2.2.2 Uniquely Mobile Challenges

The key challenges for SMEs technological evolution are listed at the bottom of Fig. 2.5 and are primarily security and privacy issues. Interoperability (or lack thereof) is also a particular concern in a dynamic market still dominated by many different devices, standards, and applications.

Security Challenges Security of proprietary information is a key concern to organizations that are using mobile networks because of the vulnerability of the connection and the additional disclosure of location-based data. Managing security is considered the most important issue by SMEs adopting, or considering, mobile and wireless Internet [14]. Security issues are only partially technology-related. Data breaches can be caused by inappropriate policies or by user negligence (weak passwords, loss of devices, etc.). In order to addresses these issues, SMEs need to identify security protocols/policies and shape employee behaviors that may limit their traditional flexibility. For example, SMEs should limit sensitive data downloads on mobile and portable devices (including USB thumb drives), which could be subject to theft or loss.

Lineman [15] describes security threats opened up by mobile technologies and underlines many of the risk factors. These risks are exacerbated by a slowly moving and mostly reactive legislative framework that often plays catch-up with technological advancements. Useful risk mitigation strategies exist, but enterprises need to take a user-centered security mindset, which focuses on educating professionals on how to safely manage their data. Security education is essential for enterprises of any size. Even in the context of large enterprises, Lineman finds that while companies are aware that security breaches are mainly related to human errors, most of their investments continue to be on technical solutions rather than user education. Data from the 2009 CSI-FBI Computer Crime Survey (http://gocsi.com/survey) indicates that security awareness training spending was less than 1% of total security spending.

Privacy Challenges Closely related to safeguarding security is the broader notion of safeguarding privacy. Broadband supported applications tend to be invasive of privacy. To access the benefits of such applications, users need to disclose information about themselves, their preferences, and their location. This makes privacy one of the most compelling issues of the broadband economy.

In order to effectively protect privacy, its underpinning principles need to be identified and defended. Holtzman [16] states that privacy is founded on three basic principles (the 3-S): Seclusion, solitude, and self-determination. Seclusion refers to the right (of one's own personal information) to be hidden from others; solitude refers to the right to be left alone; and self-determination deals with the right to control information about oneself [16]. These three principles are extremely difficult to protect simultaneously, especially in mobile environments where infringement examples abound because of the anytime/anywhere traceability of individuals.

For instance, adding historical location information to individual personal data could provide a history of a person's habits and whereabouts, which can be easily

cross-linked with the whereabouts of other individuals. Coupling this with the fact that some companies (legally) sell customer data to other companies that may have access to additional databases and start profiling (a better and more politically correct term would be segmenting) various users, the scenarios for the infringement of seclusion, solitude and self-determination principles become infinite. While growing legislative and judicial interventions have tried to address these problems, a lot still needs to be done as the legal system tends to play catch-up with the fast-paced technological innovation [17].

In this chapter, we discussed how with the broadband economy, SMEs enjoy technology-supported opportunities to interact with customers in ways that were neither possible nor thinkable until recently. We also addressed how broadband-driven mobile technologies can actually support SME business needs. We concluded with a discussion of security challenges and privacy principles that all professionals, and particularly the nomadic SME professionals, need to take into account when utilizing mobile apps.

In the next chapter, we introduce another problem that can be or more complex that just technology. The reduction of connectivity barriers between business and employees causes a dramatic change in the "workspace" and "workplace" environment. In today's information age, where the work output is mostly digital and easily transmitted in the broadband medium, the pressing need for physical interaction in the workplace is diminishing. Chapter 3 illustrates the evolving nature of the "workspace" and "workplace." The digitization of work along with the increasingly expanding and accelerating rate of connectivity resulted in the evolution (or revolution) currently underway. The path to balance digitization of work with the increase rate of connectivity will be difficult and SMEs need to understand and prepare accordingly.

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Chapter 3
The Changing Nature of "Workspace" and "Workplace:" What It Means for SMEs

Abstract As the virtual pipelines are laid to extend the reach of broadband connectivity to remote locations and to increase capacity on already available locations, connectivity and availability with those previously unreachable is increasing as well. The connectivity barriers are constantly being reduced as the broadband reach extends. The breakdown of connectivity barriers causes a dramatic change in the "work-space" and "work-place." In an information age, where the work output is mostly digital and easily transmitted in the broadband medium, the pressing need for physical interaction in the workplace is diminishing. Add to that the growing technology that digitizes the human senses (auditory and visual), virtual communication methods allow for increased remote interaction. In this chapter, we discuss the evolving nature of the "work-space" and "work-place." In the past few years, the digitization of work along with the increasingly expanding and accelerating rate of connectivity resulted in the evolution (or revolution) currently underway.

3.1 The Global Workplace

As network connectivity expanded across the globe [1], the way business is conducted, regardless of transaction or business size, has dramatically changed. Physical products are now sold and sent across vast geographic locations (even across continents) in a rapidly increasing rate without any physical interaction [2] between parties. Larger companies are rapidly expanding globally as they can create presences across the world enabled by the low cost of the necessary infrastructure to connect the global presences.

For small and medium enterprises (SMEs) the expansion of broadband connectivity has a massive reach impact. These enterprises, which would have been limited to a local physical "reach," can now reach out to a larger audience, including global customers. This results in a dramatic increase for possibilities for SMEs they conduct their business.

3.1.1 The Remote Workspace

A visible impact of broadband on the workspace is the growing rate of workers that work remotely from the office [3]. The connection speeds across various locations

K. Passerini et al., *Information Technology for Small Business,*
DOI 10.1007/978-1-4614-3040-7_3, © Springer Science+Business Media, LLC 2012

(including public places and even some airplanes) yield a workspace that is very close to the experience of physically working in the office. With the exception of the office furniture (or maybe even the pajamas you have on), everything else might feel the same, especially for those that perform a large majority of their work in front of the computer.

A lot of the physical aspects of the workplace are in some cases replaced by digital methods distributed through broadband. For example, some meetings are now held virtually using video conferencing or screen sharing technologies. Some of the technologies are inexpensive or in some cases free. Examples of these virtual meeting technologies are **WebEx** and **GoToMeeting**, with alternatives quickly developing (i.e., **Skype**). The usage of visual applications such as virtual meetings is forecasted to grow significantly [4].

With the ability to completely work remotely, enterprises now have an expanded reach in client base. For example, with the integration of voice and data telecommunications (Voice over IP or VoIP), globally remote offices can provide call center services (particularly those in India and the Philippines). Small and medium enterprises can now use these services for a relatively inexpensive cost from countries with lower labor costs and shared services.

The same goes for the small and medium enterprises as well. The same way that they can now obtain global services, most can provide services globally as well. Small development shops can provide development services to a larger audience since they can perform all development work remotely. Design services can be fully performed remotely. Most administrative services are remotely possible now as well (i.e., a remote personal assistant).

3.1.2 Satellite Workspaces

With broadband, SMEs can now work effectively with satellite workspaces. In some cases, a small and medium enterprise can have multiple workers and no central office. Satellite offices are now widely used by larger enterprises for various reasons, including:

- Expanding geographic reach
- Adding more workspace
- Employing resources only remotely available

Broadband allows for the deployment of a satellite workspace with minimal additional cost. Some SMEs may also encourage home-based satellite workspaces, which could further reduce cost by leveraging existing home connectivity.

3.1.3 Working Remotely (From Home or On-the-Road)

For those still headquartered in a physical office, broadband provides additional flexibility for workers by allowing them to work from home. Broadband provides

a wide reach to residential locations as well and allows for this flexibility at little additional cost to the enterprises [5]. As the technology and connectivity continue to expand, business acceptance of remote work is increasing and a majority of decision-makers are more accepting of working off-site [3].

Working from home provides the benefit of work-life balance to the workers. Having the ability to work from home provides workers the ability to fulfill personal activities during normal working hours with minimal interruption to work responsibilities. The flexibility of remote work can also impact productivity. As noted in "**The Future of Workplaces**" ([3], p. 19), several business leaders see increased productivity from remote workers. Not only is productivity positively impacted by remote work acceptance, job satisfaction is also positively impacted by remote work. The morale and motivational impact this provides could prove invaluable to corporations [3].

Broadband is not just confined to physical locations. Mobile technologies have improved to near broadband speeds and reliability. This allows for work completion on-the-road. For the road warriors, some smart devices/phones allow for tethering, which lets a computing device use the smart device's Internet connection for access. Another alternative is using hot spots, which is a small device with mobile Internet access and allows computing devices to tether using a secure Wi-Fi connection.

Smart devices are constantly getting smarter. As these devices continue to add functionality, this allows remote workers to perform more of their duties directly in the device, limiting the need to bring full computing devices (i.e., laptops) on the road. The increasing functionality of mobile devices is resulting in the increasing adoption of mobile abilities other than merely making calls.

3.1.4 Managing Virtual Teams

The shift in the workspace poses an interesting challenge for managers of any size organization. Without the added level of communication provided by physical interaction, remote workspaces provide a similar challenge to losing one of your senses. Management has to balance the decreased communication medium with the increased benefits of virtual teams. With careful management, a virtual engagement should yield significant positive impact to an organization.

3.1.5 The Global Workspace Attention Areas

A global workspace needs special mention in this chapter. There are significant differences between countries and cultures that should be noted when establishing remote work offices:

- Language
- Work culture
- Politics

- Finances
- Labor laws

Failure to fully understand the differences within the workspaces could be detrimental to the growth and survival of the organization.

3.2 The Growing Competitive Market

Broadband expands reach, allowing small organizations to access customers and resources previously unavailable. Organizations with larger aspirations now have a greater chance of reaching their previously out-of-reach customers and resources through broadband technologies. The Internet provides access to a multitude of vendors and services. The same provides the ability to massively market and sell the organization's products and/or services through largely distributed means (i.e., Web sites, social media, Groupon).

Even organizations with a local geographic reach (i.e., a pizzeria), now have the ability to extend their reach beyond its geographic location. A small organization can rapidly extend its reach using social media. For example, marketing on Groupon for sales, engaging customers through an online community in Facebook, joining online review organizations (i.e., Zagat) are all viable (and in some ways completely free) ways to reach out to customers in otherwise unreachable locations. Now this small organization has become a competitor to all other pizzerias outside its usual reach.

3.2.1 Job Boards

Companies are reaching out to resources and workers in farther locations (i.e., another state, sometimes another country) [6]. In some cases, an organization's need for human resources cannot simply be achieved by limiting their search to a local geographic range. Internet job boards prove to be a valuable tool. With a choice of available job search tools (i.e., LinkedIn, The Ladders, Monster, Dice), global talent is also quickly within reach. With social media, organizations can perform a wider array of evaluations on candidates, even prior to any interaction (i.e., using Facebook profiles, recommendations on LinkedIn, etc.) [7].

3.2.2 Outsourcing and Crowdsourcing

Outsourcing is another increasing workplace trend. By leveraging the speed of broadband connectivity and lower cost of labor in some countries, SMEs can both provide and receive outsourced services. With lowered costs, organizations get shared services through outsourced means. Some examples of outsourced work are call centers, operations, development, Web site design, etc.

Another growing workplace/workspace trend is the use of crowdsourcing. Crowdsourcing is a form of outsourcing, but instead of using defined resources to perform a work task (i.e., a contract company), crowdsourcing uses widely unknown individuals to perform the tasks.

Wikipedia is a great example of crowdsourcing. Through the use of the "crowd," Wikipedia is able to amass a vast wealth of knowledge, which is now used globally as, in some cases, an "authoritative" source for information [8].

While crowdsourcing provides a way to retrieve massive amounts of data through a widely distributed source, there are challenges to this approach. The greatest challenge is the reliability of the sources providing the work or information. Members of the crowd providing the assistance will have varied motivations for their cooperation. Moderation will have to be seriously considered for crowdsourcing efforts.

3.2.3 The Competition

As mentioned earlier, while broadband has massively expanded the reach of SMEs, its adverse effect is the expansion of their competition as well. SMEs have to constantly keep in mind that they may have competition creeping up without their knowledge.

Geographically dependent enterprises (i.e., retail stores, food establishments) now have greater competition than before. For example, retail stores have increased competition with Internet retailers. Digitization of products poses an even greater threat for retail stores. The digitization of music and video products have resulted in the eventual downfall of music and video retail organizations (i.e., Virgin Records, Tower Records, Blockbuster, etc.) [9].

Since previously confined enterprises now have the ability to serve a much wider range of customers, specialty retail stores can also provide products and services through broadband methods. Specialty stores (i.e., antiques, limited items such as collectibles) can sell products through various retail methods (i.e., eBay, Amazon) and have them shipped to customers anywhere.

3.3 The Dynamic Workplace

The capability of broadband to extend reach allows for a "work anywhere" approach to operations. The extended reach enables taking a more dynamic approach to the workplace or even to follow the worker (the workplace is where the worker is).

3.3.1 Software-as-a-Service/Platform-as-a-Service

The surge of "as-a-Service" offerings provides a dramatic change in the workplace. Where previously an enterprise would have to deploy multiple computer systems in

place to achieve multiple aspects of an enterprise (i.e., accounting systems, customer relation management (CRM) systems, security), an enterprise can now use "as-a-Service" offerings to fulfill the same need. Using an "as-a-Service" offering may also result in better systems than local deployments at a fraction of the cost.

"As-a-Service" offerings also lower maintenance costs by leveraging shared maintenance resources to maintain performance and availability. Enterprises do not have to acquire computer systems for services that the offering provides (i.e., servers, network devices) nor do they have to employ resources to manage these systems (i.e., system administrators, network administrators). These cost savings could be significant [10].

3.3.2 Mobility

The continued expansion of mobile technologies led to a dramatic change in the workplace [11]. Depending on the nature of the job, workers may no longer be dependent on any physical location to conduct work. Broadband Internet first allowed workers to effectively work from home or another remote location. Virtual Private Networks (VPN) allowed for securely working from any remote location.

Wireless networks allowed for expanded connectivity and for the expansion of connectivity for remote work as well (i.e., Wi-Fi for cafes, restaurants, hotels). The mix of broadband and continual acceleration of wireless speeds has revolutionized the notion of a remote workplace.

However, broadband still has one physical limitation because broadband Internet requires physical connectivity to a central station, mostly to a telecommunications or cable company. Mobile technologies are rapidly growing which is further revolutionizing the remote workplace.

Mobile technology speeds effectively allow work to be accomplished from almost anywhere using smart devices, which enable the work to be performed using smaller devices, some pocket sized. Mobile technologies allow basic email and Web services on most mobile devices. The continuing transition of applications to Web technologies is also expanding capabilities to remote workplaces, since most smart devices have Web capabilities.

3.4 Challenges With the New Workspace and Workplace

The new workspace/workplace provides a significant shift in how work is conducted. This has resulted in a changing work environment across the board. As we shift more towards the information age, the primary product, information, is easily portable and transferable. The product, information, minimizes physical location requirements, making the new workplace more feasible.

Significant care needs to be exercised when adopting or adjusting to the new workplace to maintain order in any organization. Some factors could be severely affected with the new workplace such as worker morale, productivity, etc. Following are some challenges/concerns that organizations should consider prior or during the adoption of the new workplace.

3.4.1 Enterprise Adoption

As adoption of the new workplace increases, some enterprise departments are establishing casual workplace arrangements. In some situations, SMEs already have technologies in place (i.e., VPNs, remote access to enterprise systems) to technically enable the new workplace but they do not have policies, or the know-how to manage a distributed workforce. For example, casual arrangements can cause conflicts among resources or departments. Consistency and fairness are critical during the transition to remote work to minimize conflicts that may arise.

Some enterprises may be able to fully launch the new remote workplace for all employees, while others might be limited by physical location or physical requirements (i.e., warehouse work). For these tasks, the remote workplace is not an option. SMEs need to consider these developments in order to provide equitable opportunities for their entire workforce (i.e., rotational roles).

3.4.2 Workforce Retention

Adoption of the new workplace also provides a work/life balance for an enterprise's workforce, which can help to retain a valuable workforce. Key individuals may be placed into new roles without the need for relocation. With this flexibility, SMEs that have not adopted the new workplace could actually be at a disadvantage and lose valuable talent to other SMEs.

3.4.3 Globalization/Geographic Distance

One of the primary concerns with the new workplace is the capability to support the remote or mobile workplace, which allows fully distributed resources across many different geographic regions.

All logistics requiring physical intervention will have to be considered. For example, materials will need to be shipped to/from the remote workplaces, additional travel arrangements will be necessary for any activities requiring physical presence/interaction with those working in the remote/mobile workplace.

3.4.4 Cost Implications (It's Not All Cost Savings)

As mentioned in the prior section, there could be cost implications from the new workplace. Any activities/logistics that require physical interaction would incur additional cost such as shipping or travel. Additional processes, systems, or technologies need to be deployed as well to facilitate the new workplace. While some of these systems may incur minimal cost, their impact still needs to be considered. Fortunately, some of the technology solutions may be free.

The new workplace may also incur additional intangible costs. For example, the cost of time for new technology training may also be needed along with new coordination costs for managing virtual teams.

3.4.5 Business Continuity

It is important for enterprises to ensure that business continuity is in place should any unforeseen disaster occur (i.e., severe weather). One advantage of the new workplace is that the distribution of workplaces minimizes the impact of unforeseen disasters, due to the geographic separation of the workplaces. Also, unforeseen impacts from commuting daily to work are greatly reduced when workers remotely work from home.

While the workforce could be distributed or dispersed through the new workplace, some enterprises still require shared services (i.e., datacenters, systems). A distributed workforce does not fully mitigate risks for outages from shared services. As such, enterprises still need to have business continuity plans for shared services outages or other issues. An example is deploying alternate communication methods for email system outages.

3.4.6 Technical Challenges

The new workplace provides technical challenges for SMEs since the distribution/dispersion of the workplace also introduces the distribution of technology platforms used by the workforce.

For technologically adept enterprises, the distribution of technology platform is a minor issue. However, for enterprises that are not as adept, the distribution of platforms would be a significant challenge, particularly for their technical support staff. One recommendation to minimize the issue is to deploy one centralized technology platform.

Other technical challenges depend on the nature of the enterprise's business and any regulatory authority impacting their business. Certain applicable regulations (i.e., security regulations) would pose significant challenges to the technical implementation of the new workplace.

Other technical challenges for globally diverse workforces include network distribution, extended support hours, and globalization (i.e., multi-language support for information systems).

3.4.7 Cultural Challenges

As a result of the massive distribution capabilities of the new workplace, SMEs will have to face challenges from the global employment of personnel to servicing global customers. These enterprises with a large geographic scope will need to seriously consider different cultures within the new workplace.

Some of the cultural challenges for the new workplace include:

- **Workforce culture**—The the enterprise needs to account for different, underlying workforce cultures both individually and with different types of workforce groups.
- **Customer culture**—The the enterprise needs to account for different, underlying cultures for all the different types of customers as well.
- **Time Differences**—Enterprises enterprises need to account for time zone differences if applicable to their workforce and customer base. One advantage of the new workplace is the ability to distribute the workforce to provide a "follow-the-sun" model, allowing personal service across various time zones. One challenge with a workforce distributed across various time zones in the new workplace is the coordination required to work around the time differences.

3.5 Implications for SMEs

Advances in broadband technology allow for a remote workforce that can be sourced from any location (i.e., wherever talent is available). Advances in mobile technology and mobile devices now allow for broadband connectivity anywhere. These advancements lead to a mobile workforce that can be constantly on the road, always close to the customers, yet always connected and available at any time. This remote, distributed, and mobile workplace is critical for growing a competitive market and expanding the customer base across any distance.

However, this new workplace also creates new challenges. Even SMEs that do not transistion to remote work models could be susceptible to new workplace challenges, for example, losing key employees who are able to achieve better work/life balance by accepting mobile and remote work options offered by competitors.

Small businesses daily use information technology encompassing various hardware and software, which influences employee productivity, which, in turn, affects their competitive positions. A healthy competitive position typically, in turn, yields success in business.

There is of course, more to productivity and business success than technological prowess. Still, the role technology plays in making small businesses viable competitors should not be underestimated. In Chap. 4, we discuss the existing and emerging technologies for SMEs.

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Chapter 4
Existing and Emerging Information Technologies for SMEs

Abstract Every enterprise has the challenge of establishing a stable and competitive environment. In most enterprises, information plays a key (if not critical) role. Establishing the best fitting information technology could break or catapult an enterprise to the next level.

In today's competitive marketplace, the proper mix of information technologies can provide a competitive advantage for an enterprise. The key to gaining a competitive advantage through the use of information technologies is the proper fit and the compatibility of only the multiple information technologies needed by the enterprise. In some cases, the "best of breed" information technology does not equate to the best "fit" for any particular enterprise.

In this chapter, we discuss existing and emerging information technologies that enterprises can explore and possibly deploy in their environments. We also present an enterprise's exploration of best-fit information technologies.

4.1 Broadband and "As-a-Service" Computing

"As-a-Service" computing provides customers of the service an information technology service without the need for the customer to administer all the back-end systems powering the service (i.e., servers, networks, data centers). For example, if a customer contracts a "software"-as-a-service, the customer does not have to worry about the platform supporting the "software" and its inner-workings as well.

Broadband plays an important role in the as-a-service computing success. From a serving perspective, broadband provides as-a-service companies an enormous amount of bandwidth, which they in turn use to provide services to a large number of customers. From the customers' perspective, broadband also provides significant bandwidth, which allows for impressive speeds in the delivery of information. Coupled with the increased network speed and the continually increasing processing speed for the back-end systems, as-a-service is not just a feasible solution; at times, it is the best fit.

By leveraging shared infrastructure and support resources, as-a-service offerings can also provide significant cost savings while offering improved support. In addition, the rapid expansion of as-a-service demand can result in lowered costs for the customers.

K. Passerini et al., *Information Technology for Small Business,*
DOI 10.1007/978-1-4614-3040-7_4, © Springer Science+Business Media, LLC 2012

Fig. 4.1 SaaS applications [1]. (Adapted, used with permission of copyright owner)

4.1.1 Software-as-a-Service (SaaS)

Software-as-a-Service (SaaS) is an offering where a customer receives a software service while the hosting company handles the entire application stack hosting the software/application. This is widely used in today's information technology industry [1].

The contribution of broadband to software-as-a-service offerings is highly significant. Its speed allows for almost immediate feedback and input on software-as-a-service offerings. Its reach extends access to software-as-a-service to a larger audience over a greater geographical area.

Improvements in web technologies also help in the expansion of software-as-a-service offerings by providing increased functionality. As Web software improves, more applications and services are becoming available through the use of Web browsers as clients. Applications are increasingly deployed solely through the use of Web browsers for clients, allowing for adoption across various operating systems and devices, including mobile devices. Using a now popular term, applications reside "*in the cloud*" and users only need a Web browser to access them.

For general information technology needs, software-as-a-service offerings can provide a cost effective way for enterprises to add accounting services and customer relationship management systems to their internal processes without adding new employees. As displayed in Fig. 4.1, financials (accounting) and CRM are also the most popular services, based on a 2008 Gartner's Users Survey. Other popular SaaS services include email, expense management, and sales management.

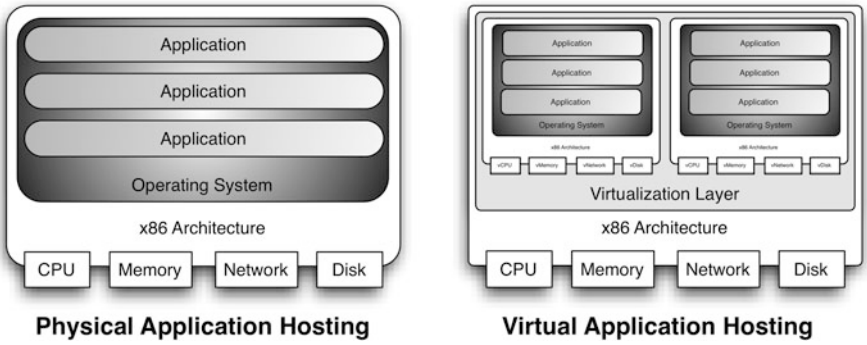

Fig. 4.2 Physical vs. virtual application hosting. (Source: Adapted from [2], © VMware, Inc. This figure contains graphical images copyrighted by and used with permission from VMware, Inc. Use of these graphical images does not imply endorsement by VMware, Inc. of this figure/text)

4.1.2 Infrastructure-as-a-Service (IaaS)

Infrastructure-as-a-Service provides even greater flexibility for enterprises. Infrastructure-as-a-Service allows customers such as SMEs to install their own products/applications in a shared environment quickly and easily.

The key piece of technology that makes Infrastructure-as-a-Service offerings possible is virtualization. Virtualization is the ability to create a virtual representation of an otherwise physical hardware platform. In an Infrastructure-as-a-Service model, virtualization applies to computing hardware (i.e., servers).

Virtualization allows for the creation of smaller virtual instances (emulated servers/computing resources) within one larger physical instance (see Fig. 4.2). This allows for multiple "server" installations to be deployed within one physical piece of hardware. The savings obtained by following this model are significant. First, it allows for more efficient use of the computing power within the hardware platform by running multiple apps at the same time. Second, it allows for multi-tenancy, sharing the same infrastructure with multiple organizations (or divisions within an organization). Multiple tenants can create and use different apps within the same physical platform (see Fig. 4.3). There are some concerns with the multi-tenancy advantage, which we will discuss later in this chapter. Third, it allows for a utilitarian usage model, which means that customers only pay for computing resources they use, much like electricity or gas resources. In summary, the key three benefits are:

1. Energy Savings
2. Multi-tenancy
3. Pay-per-use.

Infrastructure-as-a-Service has significantly impacted the information technology industry. Infrastructure-as-a-Service provides an alternative for hosting an enterprise

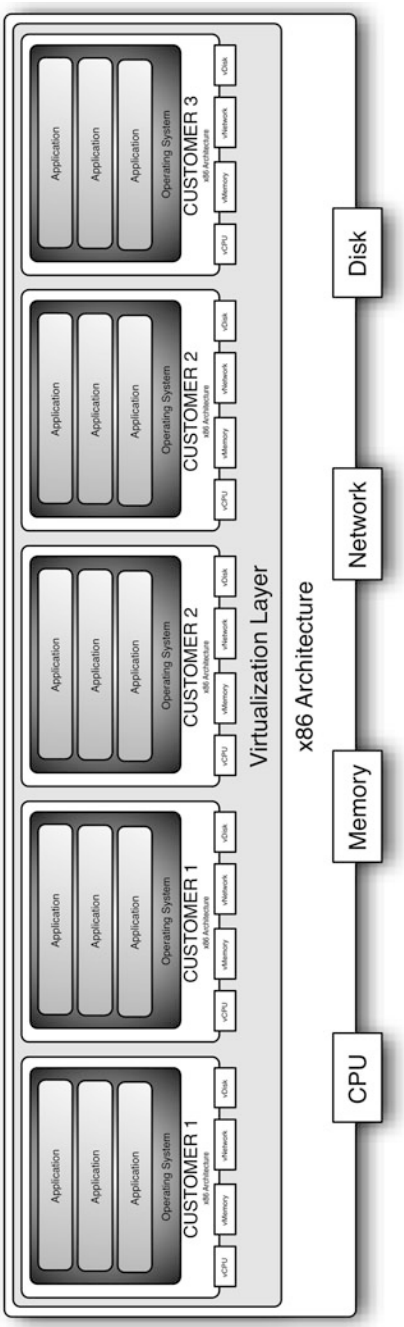

Fig. 4.3 Multi-tenant infrastructure. (Source: Adapted from [3], used with permission of copyright owner)

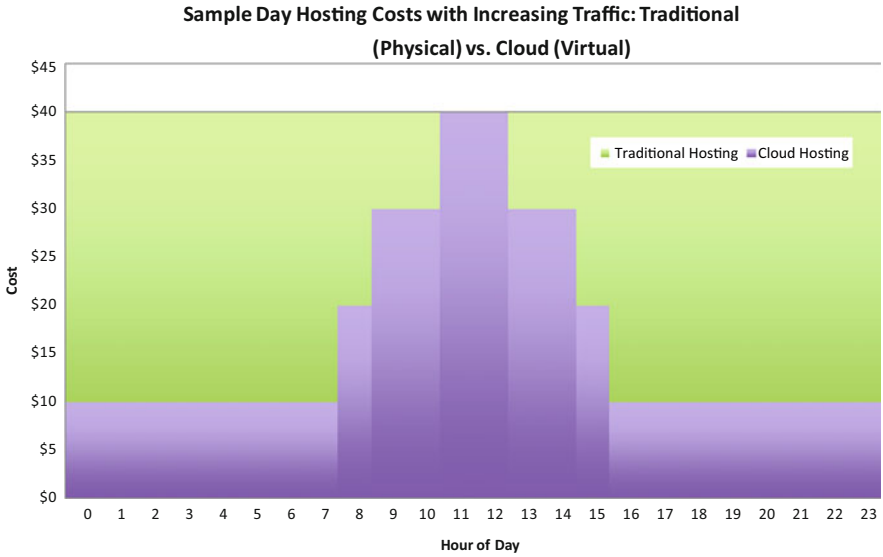

Fig. 4.4 An example of wasted capacity cost in a classic hosting model. (Source: Adapted from [4], used with permission of copyright owner)

systems and applications. Prior to Infrastructure-as-a-Service services, enterprises would have to host their applications either in their own datacenter (with all the implications of running your own datacenter such as real estate, utilities, infrastructure and human resources), or a collocated datacenter.

Infrastructure-as-a-Service gives small enterprises the ability to have their business applications hosted on a centralized platform with a utilitarian billing model and virtually unlimited capacity. Particularly for start-up companies, this is very valuable.

In Fig. 4.4, we show two of the primary advantages of an Infrastructure-as-a-Service hosting model, otherwise known as **cloud hosting** for SMEs. In this sample day of a Web application, we provide an estimate of $ 1 per server per hour cost.

In a traditional hosting environment, the infrastructure needs to be set to withstand anticipated traffic plus a buffer in the event of underestimating traffic. In a traditional hosting environment, one challenge is the velocity of resource increases when warranted. In some datacenters, this increase could result in a multi-day or multi-week deployment. As such, the estimated capacity needs to be established on the initial phase and needs to stay active for the duration of the application activity, regardless of traffic. The active servers will incur a cost. Also, for some datacenters, traditional hosting would require an extended agreement (usually monthly or annually), adding additional risk.

In a cloud hosting environment, SME deployed applications can be more flexible. The rapid deployment of computer resources in a cloud environment allows

enterprises to only provision capacity based on current traffic, instead of anticipated capacity. Automation can be put in place on a cloud hosting environment to dynamically resize the deployment based on current traffic.

In Fig. 4.4, the sample traffic increases as a regular business day progresses, peaks at noon then tapers down in the afternoon. A traditional hosting environment would result in a cost of $ 960 for the sample day. A cloud hosting model with the same traffic pattern would result in a cost of $ 400. The $ 560 reduction in cost is significant (over 50%), particularly for SMEs with tighter budgets. The rapid deployment that a cloud hosting environment provides also increases "Infrastructure" confidence for SMEs, because it allows them to deploy at a smaller footprint (and lower cost) with the ability to rapidly ramp up should traffic increase.

4.1.3 Platform-as-a-Service

Platform-as-a-Service provides a middle ground between Software-as-a-Service and Infrastructure-as-a-Service. Targeted particularly for enterprises that create their own applications, this is an interesting service for enterprises in the information technology service business.

The key to Platform-as-a-Service offerings is that it provides application service enterprises a central platform to host their applications. All back-end components of the infrastructure for application hosting (i.e., load balancing, hardware, operating systems, scaling, infrastructure monitoring) are all fully managed by the Platform-as-a-Service provider.

While this provides some level-of-ease and peace-of-mind for the application provider, the services do have some limitations, which application developers will have to work around. Some examples of Platform-as-a-Service services include Google App Engine and Amazon Elastic Beanstalk.

4.1.4 Everything-Else-as-a-Service

Software-as-a-Service and Infrastructure-as-a-Service have paved the way for a multitude of other services. Information technology companies are now providing service offerings for various other infrastructure or business needs. Some of the offerings available include:

Cloud management portals Virtualization and cloud computing have triggered the creation of another information technology specialization, cloud management. Cloud management portals provide administration, automation, and also monitoring of cloud/virtual instances. Examples of cloud management portals are Rightscale and Abiquo.

Database-as-a-Service This service provides database instances through the Internet for customers. Amazon's Relational Database Service (RDS) provides various

MySQL and Oracle database instances for use, particularly for those using Amazon's Cloud products.[1] Another example of this service is Xeround (http://xeround.com/).

Security-as-a-Service This service leverages mainly on the SaaS model. Security companies (i.e., McAfee) provide a Security-as-a-Service offering which meets various security needs by enterprises. SMEs can obtain significant security advantages by acquiring email security services, Web protection services, vulnerability assessments and certification services (i.e., PCI) all through an as-a-service model.

Storage-as-a-Service With storage costs lowering and broadband speeds increasing, Storage-as-a-Service offerings are available. With fast transfer speeds, users now have the luxury of cloud-based storage services. A few of the advantages of cloud-based storage are:

- **Redundant storage**. files are replicated across multiple environments, ensuring high-availability of files
- **External hosting**. files are stored remotely by the service provider, eliminating data loss concerns for local locations (i.e., fires, acts of God).
- **Remote file availability**. cloud-based file hosting allows for remote and immediate availability of files, including through mobile devices

An obvious concern for Storage-as-a-Service offerings is data security. User files are generally available through authenticated means only (username/password), with the exception of shared files. Some Storage-as-a-Service offerings provide desktop integrations for automated synchronization of files. Some even allow for complete backups through their service.

Monitoring-as-a-Service Monitoring-as-a-Service offerings provide enterprises and system administrators managed and hosted monitoring capabilities. Through an external monitoring service, service enterprises can ensure round-the-clock managed monitoring across various locations. For example, Webmetrics provides external Web monitoring service for Web sites across various locations globally. This helps enterprises ensure that a specific Web site is fully available and performs consistently throughout the world.

Some monitoring services perform profiling of an enterprise's applications.[2] Profiling is the ability to perform deeper diagnostics on an application, allowing visibility to more granular metrics/activities, otherwise unavailable. This is accomplished through the inclusion of monitoring agents in the application servers, which report metrics to a centralized reporting environment. Customers can retrieve their monitoring metrics through a central portal or other methods (i.e., APIs). For a SME, this means that they can quickly identify bottlenecks, inefficiencies, or other exceptions in their applications, sometimes down to the particular snippet of application code.

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[1] Amazon's Elastic Compute Cloud (EC2). EC2 instances have an internal route to RDS instances in the same region so they can easily integrate.

[2] An example is New Relic (http://newrelic.com/), which provides deep dive monitoring services for Java and Ruby applications.

Analytics-as-a-Service Analytics, particularly Web analytics, is a critical part of most Web-based enterprises. For example, SMEs using e-commerce channels can better understand their customers by identifying traffic patterns, which can lead to other metrics (i.e., shopping patterns, frequently viewed pages/products, most successful leads). Analytics is a key performance indicator (KPI) for enterprises that perform Web-based operations (i.e., eCommerce, marketing, etc.). Analytics in the Web world are equivalent to the tracking of physical customers for a retail store. Analytics can track the following (and even more) items:

- The number of users that visit a Web site
- Where users come from geographically
- How users were referred to the site (i.e., search engine, social media)
- Pages visited by the users
- User activity
- Other information such as Web browser used, screen resolution, which is used for development efforts.

Analytics-as-a-Service are accomplished through the inclusion of HTML code, usually either a Javascript or a transparent image inclusion, which makes every visitor contact available to the Analytics-as-a-Service provider, plus provides basic browser information. The Analytics-as-a-Service provider receives and indexes the information for analysis and reporting.

Automation-as-a-Service Other than monitoring, some information technology companies also provide automation services, or the scheduled/event-driven execution of tasks. Some enterprises provide automation services through the deployment of agents in the customer environment. The agents then regularly check for schedule changes and job/script changes from a centralized server managed by the service provider. Others take a more active approach and reach into the customers' environments directly from their environment.

Tokenization-as-a-Service Tokenization is used for data security. Tokenization is the process of abstracting sensitive data into a token or series of tokens. According to Cybersorouce, this is "the replacement of sensitive data with a unique identifier that cannot be mathematically reversed" [5]. Tokenization-as-a-Service is now an increasing trend in the data security and eCommerce industries. Tokenization provides a significant security advantage, particularly for eCommerce companies. By offloading the receipt and storage of sensitive information (i.e., personally identifiable information, credit card information), SMEs can be relieved of the burden of maintaining security and compliance.

Logging-as-a-Service Logging is another service that is critical not just for administration and operations, but also for analytics. Logging-as-a-Service companies reduce the burden of analyzing log files by providing consolidation and analysis services. Consolidated logging allows for quicker correlation of logs for review, troubleshooting, and, in some instances, compliance.

Content Delivery Network This technology has been available for a while, but only recently has it become more affordable for SMEs. Content Delivery Networks (CDN) bring the content closer to the customer, resulting in faster responses to the customer and greater efficiency in content delivery. CDNs can also cache the content within their network, minimizing traffic and server load for the enterprise hosted "origin" system.

Mechanical Turk This "As-a-Service" technology is still in its infancy. IT provides technology services for tasks that are not immediately available through technology. The Mechanical Turk leverages crowdsourcing, providing compensation for individuals by allowing the use of their human intelligence to accomplish tasks. Mechanical Turk provisions human tasks, or tasks not feasible through pure computing resources only. Some examples of Mechanical Turk tasks include product categorization, article translation, resume evaluation/comparison. Other examples are available at the Amazon Mechanical Turk Web site (https://www.mturk.com/mturk/findhits?match=false)

4.1.5 Challenges with As-a-Service Computing

The Allure of New Technology As innovation increases, new technologies are sprouting. Enterprises need to be cautious when evaluating new technologies. The temptation to immediately adopt new technologies increases as innovation increases in popularity.

Before proceeding with new technologies, enterprises must thoroughly evaluate their needs. Some enterprises adopt technologies for the sake of adopting technologies, not necessarily to meet a business need. This is the same temptation that causes some people to buy the latest gadgets as soon as the gadgets are available to take advantage of new functionality, even when there is no need for the new functionality.

For SMEs, caution is more significant. Even technologies with low costs can burden an enterprise if the technologies are misevaluated or misused. Besides evaluating the need for new technologies, an enterprise should also evaluate the new technology to see if it is the most effective and efficient way to fill the business need. Failure to thoroughly evaluate new technology and purchasing the wrong technology can cause an enterprise to lose an existing competitive advantage. This failure could even be fatal to an enterprise. For this reason, we present a thorough review of technology selection and implementation strategies in Chap. 5.

Profitability As with any investment, enterprises need to ensure that their technology investment yields positive returns, which eventually can lead to profits. Without carefully analyzing the financial aspect of technology investments, enterprises could find themselves is locked-in to a long-term contract with high switch-over costs.

Since emerging technologies, such as cloud computing, have massively expanded computing power, computing power is virtually infinite. With the right account setup, almost any enterprise can launch a new virtual or cloud computing service. Within a

few minutes, the required service can be operational, with the appropriate computing cycle available for the customers' immediate use.

Since it is so simple to obtain additional computing power in a cloud computing environment, coupled with relatively inexpensive hourly rates, SME managers may ignore the full financial evaluation and implications of their service launches. Enterprises must always consider the impact of each service launch on their bottom line.

Security Enterprises need to understand that cloud computing and as-a-service offerings leverage shared infrastructures and resources, making security planning a critical priority in cloud computing and as-a-service offerings.

As cloud computing and as-a-service environments expand, malicious activities also increase targeting these large environments. Therefore, enterprises have to take additional precautions to ensure security of their applications and data hosted in cloud computing and as-a-service shsared environments.

Denial-of-Service This is a concern for every administrator managing publicly accessible systems. In a cloud computing / as-a-service hosting infrastructure, denial-of-service is an even larger concern. Malicious individuals or even loosely-organized groups are able to target a greater amount of possible victims in this space. Unfortunately, cloud computing / as-a-service host address ranges are publicly known. Malicious groups themselves can become customers of these services resulting in resource limitations for the real customers. In some instances, the attacks on legitimate businesses are executed from within the targeted infrastructure as well.

Some cloud management portals allow for auto-expanding arrays, which is a great feature for enterprise Web services that require the ability to adapt to varying Web traffic patterns. Denial-of-service attacks could result in massive auto-expansions that are unnecessary, which result in added costs.

Protection is critical in cloud computing / as-a-service offerings. Enterprise customers need to fully evaluate the protection and security capabilities and limitations of a chosen Infrastructure-as-a-Service offering. Here are some of the capabilities and limitations that enterprise customer should concider in an Infrastructure-as-a-Service offering:

- **Isolation**—Infrastructure-as-a-Service offerings should ensure that enterprise customer data would not be otherwise accessible by any request outside of the customer's account. This is particularly critical for enterprise customers that receive process or store sensitive information (i.e., Personally Identifiable Information, Payment Card Information (PIIPCI)) within the Infrastructure-as-a-Service.
- **Network Access Controls/Firewalls**—These help provide isolation capability as well. By default, all access requests should be isolated at the network level. Customers will have to explicitly allow for outside access for each service request. This includes internal network access as well. However, there is only a limited amount of protection that Infrastructure-as-a-Service offerings can perform without severely limiting their service offerings. As such, enterprises will have to deploy their own security measures to ensure that their systems are not too open to

the public and, more importantly to malicious individuals. Most small enterprises should install at a minimum at least one local firewalls, such as iptables.

- **Bandwidth/Connection**—Enterprises should deploy protection mechanisms that provide denial-of-service protection classes, particularly bandwidth and connection limiters. Bandwidth and connection limiters prevent clients / locations from overwhelming a service by setting thresholds, upon which when hit by a certain client, the service will disallow further access. When the connections are back to a manageable limit, access is allowed again. Enterprises need to be cautious with this approach if it limits or prevent real client traffic or potential new client traffic from accessing their service. Enterprises should perform real-world regression and load testing when this protection class is enabled.

Data Extraction Data extraction is a growing concern for any enterprises that provide Web services. The hacker community is continually growing in capabilities (some freely available) and performing more sophisticated attacks. Even large, global corporations have been significantly impacted by attacks from smaller hacker communities. Data extraction attacks are harder to detect and prevent from a network perspective since they don't appear as a denial-of-service activity.

- **System Protection**—Enterprises need to ensure that only authorized access is enabled for all services (public or otherwise) in their local system. Access whitelisting (limiting network access to services to specific sources only) should be deployed as much as possible on all services. Out-of-band management should be deployed for administrative work.
- **Application Protection**—Enterprises need to ensure that their applications are absolutely secure. No unauthorized success should be allowed by the application. Encryption should be enabled as appropriate (i.e., logins, secured sessions, administrative tasks).
- **Storage Protection**—Measures should be taken to encrypt all sensitive data stored in file systems and database systems (i.e., personally identifiable information, payment card information, other proprietary or sensitive information). This should be considered during the architecture and application design. In the event of an actual unauthorized data extraction, encryption provides another layer of protection.
- **Regulations/Compliance**—Enterprise must also consider deploying data security measures outlined by various regulatory / compliance directives that apply to their respective businesses or application areas. For example, applications that receive or process payment card information should adhere to Payment Card Industry (PCI) data security standards (DSS) [6].
- **Legal Protection**—Particularly for external or third-party dependencies (i.e., storage-as-a-service, database-as-a-service, infrastructure-as-a-service, other external hosting, support agreements), enterprises should take all necessary legal measures to ensure that the third-party contract providers also take all possible measures to minimize liabilities for security vulnerabilities. PCI DSS v2.0 outlines shared hosting provider requirements in Appendix A available on the Internet at the PCI standards Website [7].

4.2 Mobile Computing

In the last few years, smart phones have become the norm in our technology culture. This mobility shift has resulted in a shift for connectivity for small and medium enterprises.

4.2.1 Broadband Connectivity

Improvements in mobile connectivity, particularly the narrowing gap of mobile and wired connectivity, provide greater connectivity for mobile work. As discussed in Chap. 3, increased broadband speeds for mobile devices allow for the fully functional mobile workplace. Also, a majority of required business systems are now widely available as mobile apps (i.e., Web applications, email, conferencing) giving enterprises the capability to achieve full mobility.

These improvements affect not only enterprises, but also individuals, since broadband connectivity is also available for end-users. For SMEs, these users can now become customers. The constant and broad connectivity now available and widely used by customers allows enterprises to effectively reach out to their market-base in near real-time.

4.2.2 Mobile Applications

As the capability of mobile devices improve, these devices have evolved into computing devices. The operating systems powering mobile devices also improved greatly over recent years. These improvements in hardware and operating systems proved to be the missing link that now allows for the installation of third party applications.

These smart devices allow SMEs to increase their reach. Mobile applications distribution (MAD), discussed in Chap. 6, offer additional functionality such as the usage of location data, photographs, contacts, etc. Location data in mobile devices can be used to validate location for most customers. Photographic capabilities in mobile devices also can be used to validate location or be used for reporting.

4.3 Emerging Technologies Implications

By providing ready to use, end-to-end solutions, emerging technologies allow SMEs to focus on their core business, instead of using valuable time and resources to establish and maintain back-end business systems. Emerging cloud technologies have opened the landscape for almost limitless possibilities for small and medium enterprises. In the cloud evolving market, SMEs still have great opportunities to emerge not only as users but also as technology providers of ad hoc services, especially other as-a-services discussed in this chapter.

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Chapter 5
Selecting, Planning, and Deploying SME Broadband-based Information Services, Applications, and Technologies

Abstract The existing and emerging information technologies discussed in Chap. 4 demonstrate how information technologies can be used to provide a competitive advantage and add value to SME businesses. This chapter describes what SMEs should consider and what they need to know once they decide to use information technologies. It is not a "how to" step-by-step manual, but a guide to what questions SMEs should ask and which decisions they need to make as they first select the right information technologies for their business and then plan and deploy them.

We provide an information technology implementation framework that SMEs could use to evaluate their own business needs and make information technology decisions. This framework helps SMEs to evaluate business needs based on organizational characteristics, environmental characteristics, and technological characteristics. The first part of this chapter discusses key SME considerations as they move through the planning and deployment stages. Once SME owners determine the information technology strategy based on the business needs, they should conduct several different "*feasibility analyses*" to select the specific information technologies and the related service providers. The decision is then made to determine whether the project is conducted in-house or outsourced to a third-party.

The last section of this chapter discusses how, once the appropriate technologies and vendors are selected, SMEs should plan and deploy the new information technologies to insure that the technologies are installed in a cost effective manner and actually perform as expected. The information technology implementation framework may also be used by SMEs to understand and consider how new services impact SMEs' business, customers, and finances.

5.1 Evaluating SME Business Needs

The information technology implementation framework described in this chapter can be used by SMEs to evaluate their own business needs and make decisions concerning the three major types of information technology implementations:

K. Passerini et al., *Information Technology for Small Business,*
DOI 10.1007/978-1-4614-3040-7_5, © Springer Science+Business Media, LLC 2012

- *Upgrades* to existing information services, applications, and technologies
- *Replacements* of obsolete information services, applications, and technologies
- *New* innovative information services, applications, or technologies to replace existing services or to provide new services.

The new information technologies that SMEs might consider may be the newest and most innovative, or they may be more common and used by forward-looking enterprises, or they may be tried-and-true information technologies that an individual SME had not considered or used in the past. The choice depends on each SME's specific business needs. As mentioned in Chap. 4, some enterprises adopt the "newest" information technologies in order to have the newest and best, but these technologies may not fit their business need. Plus, SMEs have a much bigger risk due to the cost and time necessary to deploy technologies that may not be right for their business.

All enterprises, including SMEs, should thoroughly evaluate their business needs. Using the information technology framework described in this chapter helps SMEs to evaluate business needs based on organizational characteristics, environmental characteristics, and technological characteristics. Organizational characteristics include specific business products, services, or specializations, the size of the enterprise, its cost and investment strategies, and its decision-making and other management processes. Other organizational characteristics include the quality of the internal IT resources, the availability of an IT champion, top management support, and a current technology strategy and plan. One operational characteristic especially critical to SMEs is the involvement and innovativeness of the owner. Another critical SME characteristic is its type of business strategy: product or service-oriented; quality-oriented; or market-oriented.

Environmental characteristics generally include external factors such as pressure from competitors, suppliers, and customers, support from technology vendors, government rules and regulations, and factors unique to specific industries, (i.e., competitors leaving the industry, mergers and acquisitions, new entrants).

Technological characteristics can be defined many ways. When using the information technology implementation template, we first start with the business strategy from which the technology strategy is developed. We then consider the business needs and evaluate the capabilities of the existing information services, applications, and technologies. Based on an evaluation of current services, a determination can be made if newer or emerging information services, applications, and technologies are also needed. This evaluation is commonly called a "technical feasibility study." Besides the nuts and bolts analysis of the technical features and capabilities of the information services, applications, and technologies, other technology evaluation factors include its relative advantages and benefits, complexity of the technology and its compatibility with existing technologies, as well as the technical perception of the business from the perspective of its customers and vendors or suppliers.

Once the need for certain types of information services, applications, or technologies has been determined from the technology feasibility analysis, the next step is to move forward to implement new technologies on a priority basis. SMEs should start by planning and then deploying what is most needed. First, develop a "*Technology Strategy*" based on the business strategy. Then, identify what technology alterna-

Table 5.1 SME information services, applications, and technologies implementation framework

IMPLEMENTATION PROJECT PHASES / SMEs BUSINESS CONSIDERATIONS	PLANNING (Section 5.2)	DEPLOYMENT (Section 5.3)	MANAGEMENT & MAINTENANCE (Chapter 6)
	• Matching the technology strategy to the business strategy • Evaluating and selecting the new information technologies	• Starting - Initiate the formal project • Project Planning - Prepare the project plan • Doing - Design and install the new systems technologies	• Managing day-to-day operations and maintenance • Evaluating the information technology performance
ORGANIZATIONAL • Business products, services or specializations • Size of the enterprise • Enterprise cost and investment strategies • Enterprise decision-making and other management processes • Quality of the internal IT resources • Availability of an IT champion, top management support • Current technology strategy and plan			
ENVIRONMENTAL • Pressure from competitors, suppliers, and customers • Support from technology vendors • Government rules and regulations • Factors unique to specific industries, i.e., competitors leaving the industry, mergers and acquisitions, new entrants			
TECHNOLOGICAL • Technical features and capabilities • Relative technical advantages and benefits • Complexity of the technology • Compatibility with existing technologies			

tives are available, select the specific technologies and vendors, determine who will deploy the new technologies, and prepare a detailed deployment plan. Even if the deployment and on-going management and maintenance is outsourced by selecting as-a-service forms of technologies, the SME is still in charge and must manage the overall planning and deployment. Plus, the operations and maintenance of the new technologies must be managed. If SMEs decide to manage the services in-house, then the planning and deployment are even more essential.

We describe these different aspects in more detail later in this chapter using commonly accepted project management strategies and processes for the planning and deployment stages for any information technology implementation project. Chap. 6 discusses in more details the ongoing management and maintenance of the new technologies, once deployed. Table 5.1 shows a simple high-level view of this information services, applications, and technologies implementation framework.

5.2 Determining the Right Information Technology Strategy and Selecting New Technologies

As described in Chap. 2, SMEs need to be very clear on why they are in business in the first place. As long as the business needs are determined first, SMEs can then consider the technology opportunities described in Chap. 1. For example, if the

business goal is to lower costs, a SME could consider vendor-managed inventory tracking systems. If the goal is to deliver improved services, a myriad of increased workforce mobility tools and technologies should be considered. Because SMEs are so much smaller in size than the large corporations, they could seek ways to increase all employee interactions with customers through improved information flow and communications, which is normally managed by only the sales or marketing force of a large enterprise. The use of the Internet by SMEs can also enhance productivity by establishing direct contact with customers, eliminating the need for intermediaries, which reduces transaction costs [1].

5.2.1 Matching the Technology Strategy to the Business Strategy

A technology strategy is based on the SME's business strategy and goals. A formal business strategy ensures that all employees know why the company is in business. For example, the business strategy should define if the business is product-oriented, quality-oriented, or market-oriented [2]. When developing a technology strategy, SMEs need to consider specific information technology factors that impact business strategy [3]. The first step is to list the specific business objectives that require new or improved technology resources. From an organizational perspective, the lack of critical resources and capabilities hinders the successful use of new technologies. Key questions to ask include:

- What is the SME owner commitment to the use of targeted technologies?
- How knowledgeable are the employees about the emerging technologies?
- What type of access do employees have to the data they need?
- Do they have mobile access to email or the Internet?
- Do they have remote access to company applications or databases?

SMEs must consider the firm's external or environmental perspective in order to make critical technology decisions [4, 5]. It is a good idea to understand the information technologies used by all competitors within a particular industry:

- Which information services, products, or technologies are the competitors using?
- Are they using bleeding edge technologies or are they laggards, waiting until everyone else is using a technology before they adopt it?

This analysis could give a SME company a significant early adopter advantage if innovative technologies were successful deployed.

- Are a SME's customers and business partners as technically savvy as the firm itself? More savvy?
- Does the SME business owner feel compelled to embark in technology investments to align to the firm's customer's needs?
- How similar are the customers?
- Do customers in many different locations need to be reached through marketing?

- Is the marketplace global or local?
- Is the SME owner considering selling products or services online?

As different types of technologies are considered, it is important to know how many customers have access to the Internet:

- Is a 24/7 customer support center needed?
- How do customers track their orders?
- Do the suppliers insist that specific types of software must be used to accept or process online orders?
- What are the security and privacy issues that need to be considered?

Another environmental consideration of the technological strategy is the state of the economy. For example in the SME legal marketplace, an economic down turn can significantly change the way these firms operate, thus requiring new strategies to compete. One key strategy is to consider reducing risk and increase the predictability of cost, which could be accomplished by adopting flexible offices and mobile technologies. An appropriate use of these new mobile technologies can help establish a culture of collaboration and continued communications, control expenses, and increase process efficiencies, and even develop flexible fee arrangements. During economic down turns, SMEs might adopt either a "stability plan" or a "growth plan."

The goal of a stability plan is to get through the sinking economic times without decimating the firm. Cutting personnel may be easy up front, but eventually these cuts will affect the firm's longer-term capabilities and prospects. Making personnel more effective and efficient up front should not jeopardize longer-term capabilities when reducing internal costs. For example, employee training programs could be implemented to improve business, technical, and communication skills. Technology could be used to allow more mobility and capture time and expenses, which will increase productivity while controlling costs. Current technology tools and software could be expanded to use more of the existing capabilities of existing technologies.

At one small legal SME, employees used their mobile cellular phones for basic email and phone communications. They added service-specific mobile apps including time and billing, digital dictation, client relationship management, and editing of Microsoft Word, Excel, and PowerPoint. Besides being more efficient, these employees also improved their responsiveness to clients, thus increasing client satisfaction and retention. Using social media services such as Twitter, LinkedIn, or Facebook can also help the SME to keep in touch with clients, prospects, and referral services.

On the other hand, a growth strategy during economic down turns, should be used to identify new opportunities, which can be targeted right away or implemented when the economy is better. New opportunities can be developed by using technologies to monitor client satisfaction, especially with responsiveness, productivity, and collaboration. First, SMEs need to ensure that the capabilities of the existing technologies are being maximized before upgrading. They should continually monitor competitive positions and innovate to maintain competitive edge over new entrants. Even in economic down turns, successful firms will embrace technology as a strategic

advantage rather than a cost center and share a passion for collaboration to better serve customers.

- A small business needs to anticipate what will happen to the existing technologies and services if new technologies are added to the current network of services.
- What are the SME current technological resources and relationships with technology vendors or business partners?
- Do SMEs feel compelled to embark in technology investments to align with a partners' or vendors' needs?
- Within a particular SME business, what type of governance processes including strategies, tactics, and operational processes are in place?
- How are any existing information technology hardware, software, services, and infrastructure currently managed?
- How is the decision or planning of information technology needs currently made?
- Are the existing technologies adequate for the business today? If not, what are the issues that must be dealt with?
- How will the technology change organizational structure and management processes? How will the deployment of new technologies affect customer interactions or the delivery of services?

Other factors to consider when developing a technological strategy are the availability of technical consultants or technology partners to work with if employees do not have the right knowledge or skills. There may be technologies and capabilities of which a SME owner is not even aware. The goal is to find out what can be done and fine-tune the information technology wish list.

Even though the potential technologies, features, and capabilities have been identified that may match the business needs and give a competitive advantage, the technology availability where business is located must still be determined.

- Who are the various suppliers in a particular geographical area that provide the telecommunications networks and services?

These suppliers and vendors must be met with before the technology strategy can be finalized to begin an "economic feasibility" study or financial analysis. The costs involved must be identified. SMEs must determine the costs to purchase, to deploy, and then to maintain the services, products, or technologies. Every technology decision is a trade-off and requires its own cost-benefit analysis. If a technology costs $50,000 to deploy and will likely help a business earn an extra $100,000 in the first year, this is probably a very good business investment. But if the SME does not have the $50,000 to invest, a less expensive option that may not earn as much must be found. The financial analysis part of the technology strategy includes economic and business case analysis of the potential technologies. It also includes forecasting, budgeting, and determining the necessary cash flow to keep a business running smoothly as the new technologies are deployed.

5.2.2 *Selecting the Right Information Services, Applications or Technology*

Once the technological strategy based on business needs is developed, the next phase is to explicitly define and select the services, applications, and technologies that will be deployed. This primarily involves considering the technical characteristics. However, changes in the operational or external environment may require changes to the technical plan. The technical strategy identifies three different types of technologies:

1. Technologies that are critical and considered must-haves
2. Technologies that a SME should probably have, but are expensive, and it's unclear how to use them or if they add any significant value to the business
3. Technologies that are the latest, newer, emerging mobile technologies, but its also unclear if these laptops, tablets, etc., with secure wireless technology or smart phones for all employees should even be considered.

This is where SMEs determine the specific services or applications to deploy and which vendors should be involved. By this stage, the SME has already talked with various vendors while conducting the feasibility studies as part of developing the technology strategy. The next step is to develop the technology tactical plan, exactly what is planned for deployment in the near future. To do this, SMEs must assess the internal information technology capabilities:

- Should applications be developed in house? Why? Why not?
- How will the business keep up-to-date with technical improvements and innovations?
- Have technologies been deployed previously that did not do what was expected? Why did they fail?
- Have technologies been successfully deployed that gave a competitive advantage for only a short period? What happened? Why?

We will continue to use the SME Technology Implementation Framework (Table 5.1) as a guide as we expand it to answer these questions and many others. Table 5.2 includes specific processes that we have earlier discussed to help develope the technology strategy.

SME owners or managers should find competent external consultants or business advisors when adopting new information technologies. The size of the firm does not affect its ability to acquire new Internet technologies. However, because SMEs usually do not have an enterprise IT manager, they should get help from as many places as they can [6].

When selecting hardware, all the features and capabilities of the computer or device must be identified. Those features or capabilities are classified: most critical, must-haves, would-like-to-haves, not important, or do not need. This will affect the cost of the hardware because it will help discriminate which features and capabilities

Table 5.2 Planning checklist for new information services, applications, and technologies

IMPLEMENTATION PROJECT PHASES / SMEs BUSINESS CONSIDERATIONS	PLANNING (Section 5.2) • Matching the technology strategy to the business strategy • Evaluating and selecting the new information technologies	DEPLOYMENT (Section 5.3) • Starting - Initiate the formal project • Project Planning - Prepare the project plan • Doing - Design and install the new systems technologies	MANAGEMENT & MAINTENANCE (Chapter 6) • Managing day-to-day operations & maintenance • Evaluating the information technology performance
ORGANIZATIONAL • Internal business processes • Personnel issues • Financial management • Physical facilities management • Employee IT knowledge and skills	***Matching technology strategy to business strategy*** – Document the business strategy and goals – Identify business objectives that need new or improved technology resources – Commit at the SME owner level to the use of targeted technologies? – Provide additional employee training about current and emerging technologies ***Evaluating and selecting new technologies*** – Document changes to the business objectives that impact the technical plan		
ENVIRONMENTAL • Customers • Government rules and regulations • Economic conditions	***Matching technology strategy to business strategy*** – Develop the customer strategy – Determine customer technology capabilities and needs – Identify strategies to meet the customer needs – Identify and understand the competitor's use of technologies – Determine if any customers mandate specific software / systems to do business – Consider the economic conditions to develop a stability or a growth plan ***Evaluating and selecting new technologies*** – Document changes to the business objectives that impact the technical plan – Identify alternative technology choices.		
TECHNOLOGICAL • Geographic / location –based considerations • Technology availability • Vendor availability and support	***Matching technology strategy to business strategy*** – Identify consultants, if needed, to support the SME – Identify all current technological resources – Document how current technologies are managed – Determine if any suppliers mandate specific software / systems to do business – Prioritize technical features and capabilities – Identify all existing vendors and service providers – Establish or reinforce the technology vendor / business partner relationships – Identify all alternative vendors – Verify/develop the conceptual design for the enterprise – Prepare a list of the components and applications – Define functional and system requirements for the component applications – Develop the technology strategy – Develop the economic feasibility (cost/benefit) study to determine if the project moves forward. ***Evaluating and selecting new technologies*** – Compile a request for proposal (RFP) – Develop a vendor short list – Solicit proposals – Assess proposals against criteria – Have vendors provide demonstrations – Make the final technology and vendor selection – Document the targeted return on investment.		

Table 5.3 Selection criteria for a smartphone features and capabilities. (Source: adapted from [7], with permission)

	Must-have	Nice to have	Do not need
• Price			
• Service Provider Coverage (3G/4G)			
• Size/Portability			
• SMS/MMS Capability			
• Contacts/Address Book Management			
• Aesthetics/Appearance			
• Digital Camera Capability			
• Voicemail			
• Email			
• Web Browsing			
• Calendar			
• Music Apps			
• Games			
• GPS Mapping Capability			
• Apps Availability for Download			

are not needed. A simple example of this feature analysis for a smartphone is shown in Table 5.3.

As technology needs are fine-tuned, SMEs will find that certain technology capabilities must be specified. For example, if considering mobile location-based services, such as enhanced billing, service call routing, or emergency assistance, specific type of services must be identified. "Geocoding" is needed to "find a specific location" or "mapping" technologies are needed for customers to be able to "visualize" directions. If eCommerce services are needed, the SME must specify a mode of remote access to the communications services, the types of Internet security and privacy services, the necessary speed of the Internet, and the interoperability requirements with all existing eCommerce applications [4]. The selection criteria for each of these types of targeted technologies must then be developed.

The number and types of service providers will vary considerably depending on the types of technologies considered. When considering leveraging technology within the value chain, the technology and equipment vendors, the application and system vendors, the content suppliers, aggregators and portals, the network infrastructure operators, the service and billing providers, and who will provide marketing, distribution, and customer care all must be identified. Table 5.4 shows the need, function, and types of providers for a mobile commerce (mCommerce) value chain.

It is easiest to make critical decisions if a conceptual information systems/technology design for the entire enterprise is developed. This step, which is critical, must be done before new technologies are deployed to make sure the new system can be integrated together with existing or other systems currently used.

The last part of the selection process is to determine the costs and necessary investments to get the right information technologies/services. It is more important to get the right functionality for the business at the right price than it is to get lots of functionality at any price. Most investments in information technology must generate

Table 5.4 Mobile commerce value chain service and product providers

Need	Function	Provider
Transport	Maintenance and operations of the infrastructure supporting data communications between users and application providers	Technology platform vendors
Enabling services	Server hosting, data backup, and system integration	Infrastructure equipment vendors
Transactions support	Mechanisms for assisting with transactions, security, and billing	Application platform vendors
Presentation services	Conversion of content of Internet-based applications to applications more suitable for mobile devices	Application developers
Personalization support	Gathering of users' preferences, information, and devices in order to provide individual applications	Content developers
User applications	General and specialized applications for mobile users	Mobile service providers
Content aggregators	Design and operations of portals that offer categorized information and search facilities	Mobile portal providers

a positive return on investment by either reducing the costs of doing business or by increasing revenue. A "request for proposal (RFP)" with the specific technology requirements is sent to a selected list of vendors and service providers. Vendors will respond with the actual costs based on the requirements specified. The actual costs may vary because of many factors besides the hardware cost including planning and deployment costs. Another factor is whether the services will be outsourced or provided in-house.

- Who will do the deployment of the services or systems?
- What internal recourses must be included in addition to the vendor bid prices?

When analyzing the vendor bid packages, SMEs must cautiously consider several critical assumptions. Hopefully, the objective of implementing a new system will result in higher revenues, but the current method of doing things usually needs to be analyzed and modified before the new systems are deployed. If current processes are not revised, the potential benefits of new systems may not matter and the new system will not generate the expected increases in revenue.

SME owners should make sure that the projected increased revenue to support the cost of the new system are not used to purchase the system for the same reasons, the benefits may not materialize. Other cautions to consider when analyzing the vendor bid packages are additional cost associated with a new systems and the full total cost of the new systems including all the different equipment devices.

New costs that may occur after implementing new applications or services include hardware and software maintenance, costs to convert historical business data and information, costs of interconnecting with other systems, existing applications, or

devices, additional costs from a short-term decrease in productivity while people learn the new systems, and any necessary consulting services [8]. Costs will always be the most important factor; however, it is important to recognize all the benefits to customers from the deployment. In some cases, these benefits will be intangible and are not easy to measure.

Other costs that need to be identified besides the purchase price, implementation, and training costs include applications software, network operating systems, workstations, portable devices, servers, uninterrupted power supplies, network and applications training, shipping, cabling and access points, printers, back-up systems, and technology selection costs.

5.3 Deploying New Information Services, Applications, or Technologies

Once the needed services or applications and the specific technologies and service providers are selected, it is time to deploy the new technologies. The best way to manage this is through the use of a formal project management process. This section discusses how to develop and manage this formal project. As we mentioned earlier in this chapter, planning and deploying the new services, applications, and technologies is the third phase of the iterative process where the business needs are first assessed, then the technology strategy is developed. The specific technologies are evaluated, the needs are fine-tuned, and the technologies and vendors/service providers are selected. During the deployment project, the business needs are continually fine-tuned and the exact way the new services, etc., will impact the other parts of your business are determined. If this continual refinement does not happen, unexpected consequences could occur, which may cancel out the expected benefits of the new services and technologies.

Generally, project managers are very effective at designing and installing the new technologies or services. But they are not as effective when considering how the new technologies will affect ongoing business operations. By using the Information Technology Implementation framework (shown in Table 5.1) during the deployment phase, the SME can make sure that all impacts are considered. Although, impacts on business operations are considered during the assessment and decision-making stages, it is during deployment when these important questions must definitively be answered:

- How will the business need change the marketing strategy?
- Will new employees need to be hired? What type? When?
- Will the accounting or human resource processes and policies need to be changed?
- Who will manage the new services? In-house or external?
- How will the new services or applications affect interactions with customers or the delivery of other services?

- What special technology training will customers or vendors need to do business with the SME business?
- How will the new services be financed? Its ongoing operations and maintenance?

Typically, implementation activities involve three deployment project phases: planning, design and installation, and operations, administration, and maintenance. Table 5.5 is the "deployment checklist" for installing new technologies. Deploying new information services, applications, and technologies involves starting the project by initiating the formal project, planning and preparing the project plan, and then doing the project by designing and installing the new systems and technologies.

Every project, whether building a new building, arranging a charity golf event, or deploying new information technologies has several key stages—starting, planning, doing, training, checking and controlling, and ending. The project gets started and is formally recognized as a project. A detailed project plan and schedule must be prepared. The features and capabilities of the new information services or applications must be detailed and or designed and then installed. The employees who will be operating the services need to be trained as well as the employees who will be using the new services. Also, SME customers who may be using the new technologies may also need to be changed.

- Do the SME customers also need any kind of training or special support?

The status of the project needs to be checked and controlled to insure quality and maintain the schedule. Finally, the project should have a formal closing and celebration at the end to recognize all the hard work.

A key question that needs to be answered early in the project implementation stage is if the SME should hire a project management firm to plan and deploy the new information technologies of should it be done in-house. This depends if the SME has qualified employees who can manage implementation projects, they should manage the implementation in-house for several important reasons. Using an RFP approach, The SME can hire a competent information technology project management firm or even use the vendor's own project people. However, a very specific contract identifying exactly what the third-party project manager and team will and will not do, does not cover everything that comes up. When faced with project issues, the third-party project manager may select what is best for his or her company rather than for the SME. This is because the project management vendor business objective probably varies from the SMEs. The vendor team needs to make sure that they complete the project within their contractual price or they will lose money. The SME project business objective is to make sure the newly deployed information technologies will perform as expected to reduce business costs or increase revenues, very different objectives.

5.3.1 Getting Started on the Project

Before a lot of work is done on the project, it should be formally initiated by identifying all the key stakeholders, determining the goals and objectives of the project, and having a signed contract or project charter. At this stage, the project manager

Table 5.5 Deployment checklist for the new information services, applications, and technologies

IMPLEMENTATION PROJECT PHASES / SMEs BUSINESS CONSIDERATIONS	PLANNING (Section 5.2) • Matching the technology strategy to the business strategy • Evaluating and selecting the new information technologies	DEPLOYMENT (Section 5.3) • Starting - Initiate the formal project • Project Planning - Prepare the project plan • Doing - Design and install the new systems technologies	MANAGEMENT & MAINTENANCE (Chapter 6) • Managing day-to-day operations & maintenance • Evaluating the information technology performance
ORGANIZATIONAL • Internal business processes • Personnel issues • Financial management • Physical facilities management • Employee IT knowledge and skills		***Getting started*** – Define the project scope – Define the project costs and schedules – Prepare the project plan – Specify specific internal employee requirements – Identify the impact on the organizational practices and processes – Identify project risks ***Doing the project*** – Determine project manager and / or project team (if in-house) – Direct and manage the project – Develop necessary operations and maintenance processes – Develop training information and documentation – Train the employees on technologies and new processes	
		Checking and controlling – Check and control the project work (if externally managed and/or if in-house) – Perform necessary change controls – Control the scope, schedule, and costs – Check and control project risks ***Celebrating the project closing*** – Verify that all actions and activities to transfer project results are in place – Verify that all work and deliverables are completed and acceptable – Pay final bills – Update inventories – Close contracts – Identify and document "lessons learned"	
ENVIRONMENTAL • Customers • Government rules and regulations • Economic conditions		***Getting started*** – Develop the project scope – Identify all the stakeholders – Develop the project charter / contracts – Identify the impact on the current customer services or products – Specify external customer requirements ***Doing the project*** – Manage the stakeholders' expectations – Develop training information and documentation – Train the customers	
TECHNOLOGICAL • Geographic / location – based considerations • Technology availability • Vendor availability and support		***Getting started*** – Develop the specific technology requirements – Determine the integration needs with existing infrastructure, services, products – Specify the technology types, models, etc. – Request bids or proposals, if not already received – Select vendors, suppliers – Place orders for selected technologies, etc. ***Doing the Project*** – Roll the technology out department by department or in one location initially – Perform quality assurances to ensure that appropriate quality standards are in place and appropriate operational definitions are used – Manage the vendors / suppliers – Install the hardware, software, networks, desktop hardware / software, etc. – Perform hardware, software, networks, desktop hardware / software, etc. technical and user testing ***Checking and controlling*** – Perform quality controls to assess the quality checks – Recommend necessary changes	

should be assigned and a detailed project plan should be prepared. There is a simple way to determine who should do the project, the internal SME project manager, an external third-party project management firm, or the vendor/service provider of the information technologies?

If the SME has an experienced information technology project manager who works in the business, he or she should be used to manage the project. Depending on the work load and the scope of the project, the project manager should be full-time on the project.

The project team will need other members if it is a large or complex project. One person might be responsible for working with the vendors or service providers. One person might be responsible for working with the employees, identifying their specific needs, and insuring that business is not disrupted during the project. On the other hand, project management consultants or vendors can be used as the third party project management team if the SME employees do not have the project expertise, technical knowledge or expertise, or do not have the time to work on the project. Either choice, in-house or third-party still requires a SME project manager who will oversee the project.

The detailed project plan should detail what is included in the scope of the project and what is not included in the project. This helps to insure that activities or features are not gradually added to the project thus increasing its scope. The project plan should include a detailed schedule of all the project activities, what resources will be used, and what are the costs for each of the resources. Using a simple project management software system, such as Microsoft Project, can help to manage the project and provide periodic status reports as necessary.

The project plan should also include how communications will be handled throughout the project. It should identify any possible project risks and include a contingency plan for each risk. This is where any previous project experience comes in handy and can be used to make allowances for any problems that the SME owner may have had in the past [2, 9].

For example, the lack of information technology experience and knowledge can be compensated for through the use of third-party vendors. The lack of prior information investments can be overcome by upgrading existing technologies as the emerging innovative ones are deployed. Plus SMEs can insure that key employees get the necessary technology training before the project starts.

If the SME owner did not already do this when selecting the specific technologies and vendors (discussed in Sect. 5.2.2), the actual employee technology needs need to be determined on an individual user-by-user basis in order to place detailed equipment orders. The exact requirements necessary to integrate the new technologies with the existing infrastructure, services, and products must be determined. Bids or proposals from all related vendors must be requested, the vendors must be selected, and the equipment orders must be made.

5.3.2 *Doing—Executing the Project Plan and Implementing the New Information Services, Applications, or Technologies*

The project manager and or the in-house project team are responsible for directing and managing the project deployment. They should develop necessary on-going operations and maintenance processes that need to be in place before the new technologies are deployed. They need to develop all necessary training information and documentation and then either provide training or arrange for the employees or customers to be trained on the new technologies and new processes by the vendors or third-party trainers.

A very important part of any technology project is to manage the stakeholders' expectations. Some of the stakeholders may have much higher feature or service performance expectations than what is actually being deployed. If not refined, this will lead to disappointment and project failure. During the project, the project team must also ensure that the appropriate technology quality standards are in place and appropriate operational definitions are used. Besides stakeholders, the project team must also manage the vendors and service providers.

- Are they providing what is in the contract?
- Are they following up on problems or issues?

One way to insure vendor cooperation is to make sure that the contract specifies vendor support and performance conditions. The actual deployment of any hardware, software, networks, desktop hardware and software, etc., can be done all at once with a "flash cut" to the new system or in gradual stages on a department by department basis or by a geographic location. There are pros and cons to both approaches. Either way, the new service should be piloted in one location or with one department first as a test of the project deployment processes and the technology expected performance.

A flash cut approach allows you to maintain the current services while you deploy and test the new services. When everything is ready, you "cut" to the new service over the weekend or during a non-peak business time. This approach saves costs of maintaining separate systems. It is also easier for a very small enterprise.

On the other hand, if the technology causes performance problems after the cutover to the new system, there is no back-up strategy in place.

A gradual cutover will take more time and involve more cost. It also may lead to the expansion of the project scope if newer features or capabilities become available during the expanded project. The pros and cons of the actual deployment must be evaluated on a project by project basis. All technical and user testing should be completed on the hardware, software, networks, desktop hardware and software, etc., before the cutover to the new service.

5.3.3 Checking and Controlling the New Information Services, Applications, or Technologies

Checking and controlling the deployment of new information services, applications, or technologies is the most important part of the entire project. The scope of the work can increase gradually increasing the overall costs, thus reducing or even eliminating the expected benefits. Plus the features may not work as expected, also reducing the expected benefits.

Even if a project manager is hired or an external project management vendor is used, the SME owner or an employee representative must check the work to make sure the plan is being followed exactly. If changes are required, the SME owner or an employee representative must approve and sign off on all changes. This change documentation is important. The basic rule of thumb to remember is that, if the scope of the project is expanded, it will also increase the time and the cost of the project. Increased time from approved changes may be reduced, but only by adding additional resources, which will increase the cost even more.

Part of checking and control the project also involves controlling the project risks, anything that negatively affects the project outcomes. Examples of risk can vary from within the organization when a critical employee quits or has a medical emergency to environmental where customers change their needs or a critical vendor goes out of business or is acquired by another. When dealing with emerging innovative technologies, the risk that the new services may not work as expected is an important one. One of the book authors had to suspend a project for six months to wait for the vendor to upgrade the features because the version being installed did not have enough capacity. Needless to say, no one was too happy.

By being prepared to anticipate and deal with as many of the risks as possible, SMEs owners can be flexible and prepare contingency plans for each of the risks. For example, if a key project manager leaves, the SME owner can make sure that the project plan is documented and that others on the project team have been groomed to step-in if necessary The contract should include specific statements that can protect the SME if the vendor goes out of business or is acquired.

5.3.4 Celebrating—Handing off to operations and maintenance (in-house or third party): The IT Business

By the time a deployment project for a major system is completed within very large enterprises, people move on to other projects and the people involved never have the chance to celebrate the completion of the project. This is where the SME has a big advantage—the ability to celebrate and make the completion of the project a party. SMEs should take time to congratulate all the employees (even if they were not directly involved) by recognizing all the hard work. They should make a big deal of the first employee to use the new technology or the first new customer as a result of

the technology. This not only supports critical employees but helps others to accept the new technologies.

Of course, there are real activities that need to be completed at the end of a project. All actions and activities need to be verified to document project results and technology performances. All the contracts need to be closed and final bills need to be paid. The last important step is to identify and document the "lessons learned" for future projects. Some critical questions that should be answered include:

- If the project was started over from scratch, what should be done differently?
- Is the information technology performing as specified by the vendors or service providers?
- Are the proper processes in place and employees trained to use the new technologies?

These "lessons learned" are then handed off along with the new technologies, processes, etc., to the day-to-day operations and maintenance employee or functions within the SME firm. This is discussed in Chap. 6.

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Chapter 6
Managing & Maintaining SMEs Information Services and Applications

Abstract The SME owner's understanding of the role of information technology (IT) in organizations may be sophisticated, yet the resources and staff dedicated to IT are rarely up to the tasks. In this chapter, we present a comprehensive model of the enterprise IT organization highlighting the process areas that are essential to promote SMEs competitive positions through IT. Of particular importance, even with outsourced IT work, is the focus on employee training to increase productivity and returns of IT investments. Equally vital, if not more important, is the ability to sustain a knowledge-sharing culture that will support the long-term survival and competitiveness of the enterprise.

6.1 What Does IT Do?

Information technology (IT) management within enterprises deals with a broad range of needs, from infrastructure to services and applications (set-up and maintenance). The more IT is aligned with company strategy, meaning that IT services actually support the long-term direction of the organization effectively, the more efficient the enterprise will be. To promote such alignment, it is important to look at the wide range of services covered, and then understand how they are scoped in the context of SMEs. A good proxy for the traditional IT organization is the traditional triangular representation (pyramid-like) displayed in Fig. 6.1.

The lower-level building blocks of IT are infrastructure components including wireless communications; telecommunications and network services; the physical hardware and the software to manage connectivity, networking, and communications. The lower-level is common for both SMEs and large organizations since any enterprise needs networking capacity to connect, collaborate, and communicate. Even when SMEs receive networking capabilities from third-party service providers, they still need physical hardware to connect such services. Hence, this is a common, and essential, layer.

Above the basic IT components are IT services which include security and risk management, data management, and system development [1]. It is unlikely that SMEs (unless they operate in the info tech sector or have quite unique capabilities and software that is the core differentiator of their business value) will manage this layer directly. As discussed in Chap. 4, much of the data and security management can be outsourced to service providers. System development will be sourced

K. Passerini et al., *Information Technology for Small Business,*
DOI 10.1007/978-1-4614-3040-7_6, © Springer Science+Business Media, LLC 2012

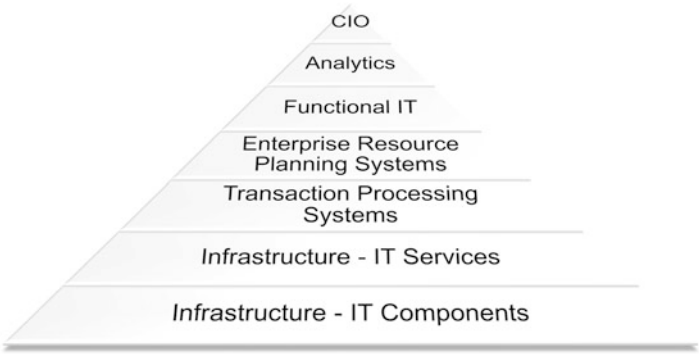


Fig. 6.1 Building blocks of the IT organization

from software developers (if customization is needed) or bought off-the-shelves (if standard configurations are sufficient).

At the next level resides operational software which is by definition cross-functional in that it enables managing the day-to-day activities along the traditional value chain (see the first row of Table 1.7 in Chap. 1). These systems are called transaction processing systems because they mainly focuse on real-time capture of transaction data (such as orders placed through a Web site or at a point-of-sale). Right above transactional data systems, enterprise resource planning (ERP) systems use transactional data to fulfill management and analysis tasks. ERPs help manage accounting, finance, production, logistics, marketing, human resources, and other functions. They add to real-time data the analytical component necessary for prediction and long-term planning. Other cross-functional software used by the entire enterprise deals with office automation such as office productivity tools, email management, groupware for communication, etc. At higher levels of the pyramid, decision support, data mining, and business intelligence systems are used for operational, tactical, and strategic decision-making.

Another way to view the enterprise IT is not by components and organizational levels, but by processes that are managed by the enterprise IT department. This process-based view enables organizations of any size to follow a comprehensive model that delivers value to internal and external clients. For IT to be a driver of enterprise success, this process-based view facilitates moving from a reactive IT planning cycle to a proactive planning system that receives input from internal and external stakeholders' demands. Because of its focus on collecting and prioritizing stakeholders' requests, the first process in the chain is called demand management (see Fig. 6.2).

The guiding principle of the IT functioning model represented in Fig. 6.2 is that of delivering value to clients starting from the clients' explicit and implicit needs and defining solutions that meet business demands. **Demand management** is the first process that elicits clients' needs. It is comprised of demand identification ((1), in the figure) and IT planning and budget sub-processes (2). Demand identification receive inputs from internal users who may provide specific requests for software or hardware upgrades that they need to better complete their work. It receives further

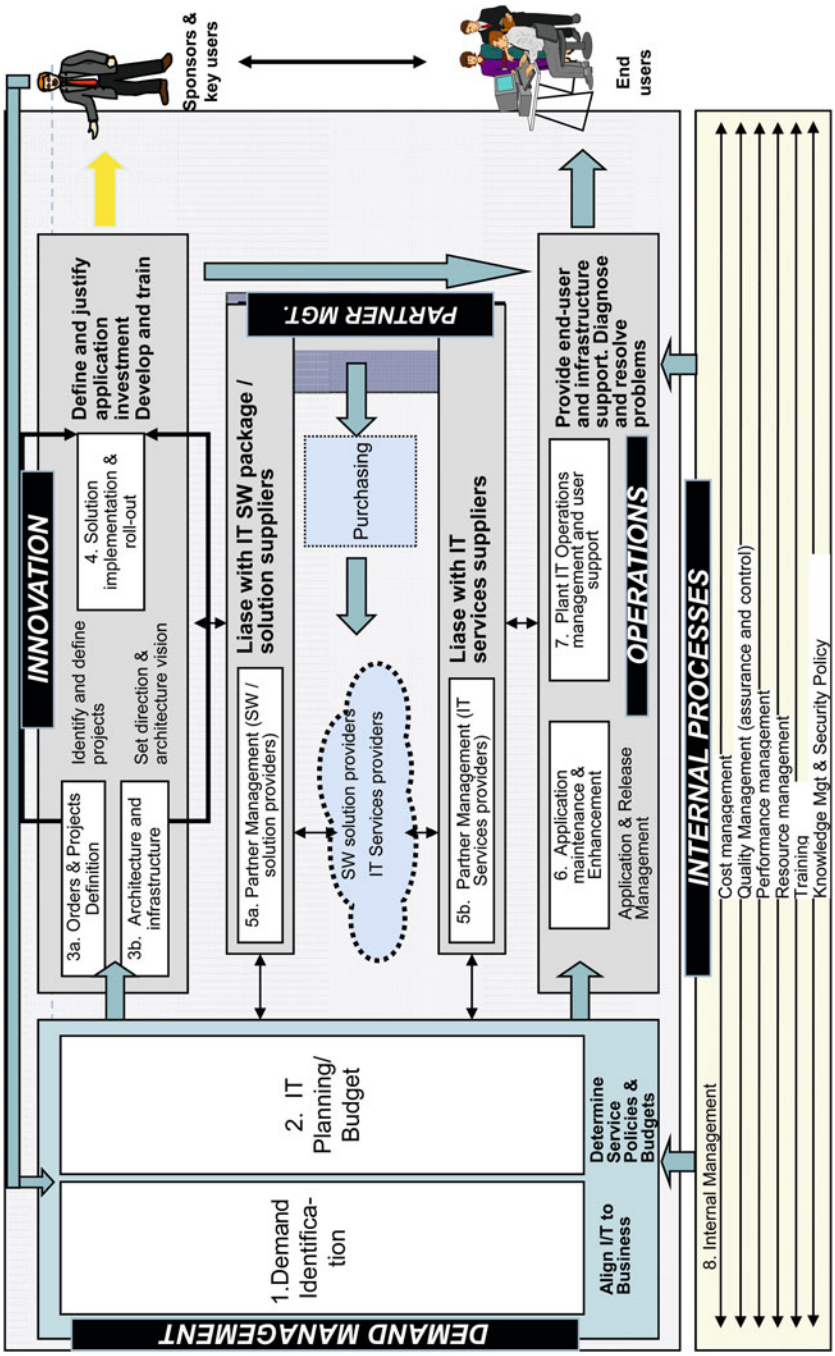


Fig. 6.2 Process-based view of the IT organization

input from external stakeholders such as clients of the enterprise needing additional capabilities or requesting changes to current service offering. Finally, the demand identification process takes into account market dynamics that may make current systems obsolete. Additional savings can be generated if newer and more flexible systems are implemented. The demand identification process naturally ends with **IT planning and budgeting** because its output is a list of short, medium, and long-term IT investments that need to be priced and financed. In this phase, preliminary requests for quotes (RFQs) or proposals (RFPs) will provide input for determining the right budget.

One key process for competitive advantage is **IT innovation**. While demand identification may in fact determine which projects are strategic, tactical, and operational and their priorities, it is in the innovation process that the actual projects are laid out and implemented. For a good IT investment to pay off, the quality of the implementation will need careful management. Innovation includes identifying the actual project timelines (3a), defining the architectural choices (which platforms to use and maintain (3b)) and rolling out the developed solutions (4) so that it is quickly accepted and used by any employee. The more integrated this cycle is, the more likely that positive returns on investments will be obtained.

Parallel to the innovation cycle, IT must manage current operations and the business or technical partners that provide IT services (for SMEs in particular the number of external providers can be significant). The **partner management** process entails managing purchasing software (5a) and hardware solutions, or renting them per-use (5b), and overseeing that service levels agreements are met. The more IT services are outsourced, the more important are the activities in this layer.

The **operations process** (6) is concerned with servicing existing applications and small upgrades (maintaining rather than large incremental changes). If the enterprise manages a production facility, such as a manufacturing facility of any type, IT systems for plant operations and management will also need to be supported (7). Generally, this process is concerned with providing end-user support and troubleshooting issues and incidents.

Finally, the evaluation and management of **internal processes** (8) includes human resources management tasks such as training employees to use rapidly evolving technology. It covers security and quality management through the use of performance evaluation models that track efficiency and effectiveness. Customer satisfaction surveys and IT balanced—scorecards forms are used as input. Defining security and privacy policies establishes boundaries for the management of internal and client data. The existence of such a policy is essential to prevent data breaches, as well as lower liability and damage claims. Finally, the establishment of knowledge management helps develop a culture of continuous learning and knowledge creation.

6.1.1 IT for SMEs

While IT configurations and processes will eventually resemble the models presented in the previous section, the start-up phase of a small business will not be extremely

Table 6.1 SMEs IT adoption cycle. (Source: adapted from [2])

Adoption cycle	Description	Type of technology used
Communication (basic)	Generally start-up, starting the business phase	Fixed line and mobile phones/fax
Info tech (basic)	Basic office productivity tools for business management	Basic software, mostly open source, and hardware with printing/fax capabilities
Advanced communications	Sustaining employees connectivity with the enterprise	Email, internet, basic video, file sharing and VoIP (Voice over IP)
Advanced info tech	Adoption and utilization of integrated-software for enterprise management	Databases, enterprise resource planning, inventory management, and customer relationship management (CRM)

sophisticated nor process-driven. Research shows that the cycle of IT adoption by start-up enterprises (see Table 6.1) starts with basic technologies, generally focused on communications, and then moves to more sophisticated enterprise management systems.

As the needs of the enterprise grow, so do the IT requirements. When SMEs move from basic to advanced technologies, their internal (or externally provided, fee-based) IT management practices align with the information and data transfer needs of larger enterprises. SMEs slowly become spread along the same pyramid as larger organizations, although the scope and extent of their system is narrower (Fig. 6.1). SMEs IT implementation creates multiple benefits along the value chain activities described in Chap. 1 [2].

- Suppliers and inbound logistics
  - Faster communication and cost savings by connecting directly to vendors and customers systems.
- Production/operations (manufacturing and services)
  - Improved management of inventory
  - Rapid prototyping with design software
  - Manufacturing software and ERP applications for production management
- Marketing and sales, distribution (outbound logistics)
  - Enabling eCommerce
  - Electronic and social marketing
  - Web site and search engine optimization
- Customer support, post-sales
  - Careful tracking of customer interaction with multiple communication channels
- Internal management
  - Better financial management

- Improved planning
- Better collaboration and learning
- Higher integration
- Improved knowledge management

While SMEs are usually characterized by a more informal management style, implementing an explicit IT plan or strategy enables them to make sound decisions about technology adoption, well beyond the personal attitudes and perceptions of the firm's owner. By structuring their IT strategy around core IT processes SMEs can essentially increase their productivity, as various studies have shown. In particular, an analysis of over 1,700 Spanish SMEs conducted by Dans [3] shows a strikingly significant relationship between SMEs IT investment and productivity gains.

6.1.2 Managing SME IT Resources

The reasons for the slow pace of SME IT adoption have been researched by many authors. Some of these reasons include limited understanding of IT by SMEs; limited understanding of technology by SME employees; and the traditionally high costs of IT systems. We have discussed in earlier chapters lower-cost broadband-driven models, which have pushed costs down and made technology adoption easier. An aspect that needs further discussion relates to the skills and career development opportunities for SMEs employees.

Another side-benefit of broadband implementation is the availability and portability of learning and training materials over Web and mobile phones (mobile learning). Training material is now available on-line from simple "how to" to more sophisticated theoretical matters. Remote training experiences, Webinars, and virtual conferences are available to support learning IT skills. The urgency of training SME employees in IT management is supported by understanding how IT training impacts the bottom line. IDC research [4] shows that whenever more time or resources where spent on training employees, projects were more likely to succeed and push for the development of long term skills. For example, projects where over 7% of the project IT budget was spent on training were more successful than projects were only 4% of the IT budget was used for training.

In a survey of 377 IT managers, IDC analysts report that of the top five project factors that most impact project success, skills of the project team is the highest, followed by dedication of the team, technology performance (based on expectations), clarity and effectiveness of communications, and, in fifth position, quality of the project plan. Their conclusions led to three basic principles of IT training:

1. Train consistently
2. Train practically
3. Train everyone.

Srivastava [5] discusses who should be trained in IT based on the level occupied in the organization (top, or frontline personnel). He suggests adjusting the training

Table 6.2 Organizational roles and IT training focus and scope

	IT training focus & scope		
	Attitude	Knowledge	Skills
Role			
Top	1	2	3
Middle	2	2	2
Frontline	3	2	1

1 = High; *2* = Medium; *3* = Low

based on organizational roles (Table 6.2). Middle management training should focus both on strategy and practical skills as SME middle managers are often tasked with implementation. Frontline workers need IT skills and hands-on training to actually use operational technologies. Top management needs to focus on building attitudes that favor incorporating IT in the enterprise activities in order to optimize returns (strategy-based training).

Particularly at the managerial levels, working on building positive attitudes towards IT is the first stage in a SME IT lifecycle that begins with awareness → consideration → adoption → and, finally, innovation [6].

6.2 The Changing Enterprise IT Department: Commoditization of IT and IT in the Mobile Enterprise

While the hierarchical (pyramid) and process-based view of the enterprise IT organization cover the key aspects of how an information technology division would look like in any type of enterprise, with differences mostly driven by the industry sector, these models do not fully take into account the changing role of IT driven by the broadband explosion and the advent of cloud computing. In a cloud-based world, the most important element of IT is the center of Fig. 6.2, that is the partner management process. With IT services becoming more and more commoditized so that they can be sourced from anywhere at any time, the focus of IT shifts from implementation to managing vendors, as well as monitoring and controlling service levels. Infrastructure-as-a-service gives access to computing resources, usually through large data center providers. Software can be sourced by systems developers that offer Web-based access options (SaaS) or by value-added resellers that package multiple applications for a discount.

The advent of broadband over smart devices has also opened a new model of sourcing, that is sourcing from the crowds (as discussed in Chap. 3) or from anywhere innovation may be created, as it is the case with the growth of mobile application development (MAD).

6.2.1 Mobile Application Development ("MAD"ness)

The advent of mobile phones has significantly changed traditional IT development. In-house development remains significant for those organizations that need proprietary IT systems because such systems represent the core basis of their competitive position. Outsourced (near-shore and off-shore) development has relatively matured for many enterprises, including small enterprises, with its pros and cons. However, with the emergence of mobile technologies a new type of software design, development, and distribution model is emerging: mobile application development (MAD).

We ironically refer to this type of development as "mad-ness" because of its incredibly high reach and low entry barriers. Individual developers situated anywhere in the world can participate in this model by taking advantage of infrastructure and development platforms opened up by companies such as Apple (with the iPhone SDK-software development kit) and Google (with the open source Android development platform). For example, the Apple iTunes store provides the ideal outlet for mobile apps distribution. For a nascent developer, being accepted as a provider in the iTunes store can be a "make it or break it" deal as approved applications will immediately tap into a global customer base.

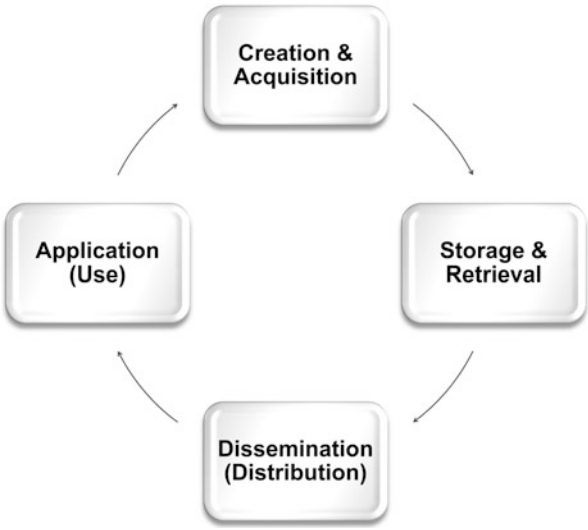
The Apple Store model has substantially changed the nature of software development and maintenance through the provision of low-cost applications that are easily downloadable on mobile phones. As predicted by Carr [7], the commoditization of IT has extended from infrastructure to software, significantly changing the IT labor market. Mobile apps developers often work as free-lancers, without contracts and benefits, constantly competing in an open market, with low entry barriers. The MAD model leverages the creative forces of the "bazaar" [8] or, to use a more recent term, sources innovation from the crowds (crowdsourcing). This means that many competitive, cheaper, and less resource—intensive applications are now available to SMEs, a segment traditionally excluded from the software vendors' attention.

6.3 Knowledge Management (KM) in SMEs: Does It Matter?

Compared to the extensive literature on knowledge management (KM) in large organizations, there are relatively fewer studies of KM in SMEs [9]. However, good KM practices are even more essential in small organizations than larger ones. Enterprises that depend on few employees covering multiple roles are particularly affected by human resources turnover. Unless KM processes are established, essential employees will walk away with a substantially non-replaceable set of skills and customer relationships. This is particularly difficult if the competitiveness of SMEs is tied to their unique knowledge and its application to organizational processes [9].

Understanding and implementing KM in SMEs is particularly important when these enterprises source specific skills through short-term contracts. Once the consultant leaves the organization, the know-how walks away with him/her or locks the

Fig. 6.3 KM cycle



SMEs into purchasing additional services. Often times, SMEs do not implement KM because of a lack of understanding of what KM really is and how it can benefit the organization [10].

6.3.1 SMEs' KM Advantages Compared to Larger Enterprises

The fact that large organizations have invested heavily in KM has provided SMEs with the opportunity to exploit many of the lessons learned from corporate implementation, particularly, the notion of scoping and incremental approach to KM. SMEs can leverage techniques and tools that have become increasingly available as open-source software (OSS), such as Alfresco software for content management. Their smaller size enables them to use these smaller OSS and accomplish significant progress in managing communications, collaboration, and content.

Along the traditional KM processes (see Fig. 6.3) that include acquisition/creation, storage and retrieval, dissemination, and application [11], SMEs enjoy various size-based advantages.

- **Knowledge creation and acquisition**—This is facilitated by the close proximity to clients. Generally SMEs have closer interactions with their customers and can capture their feedback face-to-face. While large organizations have optimized the customer contact channels, they are mostly focused on capturing codified or explicit feedback. Using the personal contact channel, SMEs are able to capture much of the tacit knowledge which would be otherwise difficult to identify. Knowledge about product performance (or need for product improvement) can be captured from customers, while new knowledge can quickly be created through

hiring and external searchers. These aspects supplement the traditional acquisition channels of access to experts, study of knowledge embedded in products, alignment with knowledge of other firms (i.e., through filed patents).

- **Knowledge storage and retrieval**—These processes are generally less sophisticated in SMEs than larger organizations. However, the proximity of project teams to the company owner enables quicker, more frequent, and less formalized knowledge storage and retrieval. While large organizations may need complex KM systems to organize their repositories and develop large taxonomies to represent the entirety of the organization's know-how, SMEs generally have fewer k-assets that are easier to manage.
- **Knowledge dissemination**—The same factors that facilitate the previous processes are in place for knowledge dissemination, which generally occurs through direct contacts. To the extent that SMEs intend to speed up knowledge distribution, they can use groupware technologies and applications that support collaborative work.
- **Knowledge application**—This may be the most difficult process to implement in SMEs as it is highly dependent on changing the focus from operational processes (operating the business) to capturing what the organization learned from other projects, and trying to apply this know-how to other projects to avoid duplication or reinventing the wheel. Ways to stimulate knowledge application range from enhanced dissemination (through knowledge-fairs and project marketplaces) to setting up incentive mechanisms that reward reuse.

Of the processes listed in Fig. 6.3, the first one (knowledge creation/acquisition) contributes the most to organizational performance in SMEs [9] even though other studies have also found that knowledge application plays a significant role [12].

6.3.2 Starting KM in SME Businesses

SMEs tend to do little knowledge management and bear the risks of obsolescence and knowledge dissipation. Should the knowledge workers choose to move on to other opportunities such enterprises would also suffer from a "brain drain." The emerging and mobile technologies discussed in this book are ideally positioned to follow the dynamic and mobile SME employee by facilitating his/her knowledge capture efforts during the regular workday. However, as we have learned through the experience, and failures, of large organizations, managing knowledge assets is a complex proposition. It requires integrating a mix of interventions: policy changes, culture changes, new technology adoption, and modification of incentives schemes that promote knowledge sharing rather than knowledge hoarding. The implementation of KM in SMEs requires a thorough evaluation of the environmental conditions which will eventually drive the viability of the transformation (see Fig. 6.4 for a sample implementation).

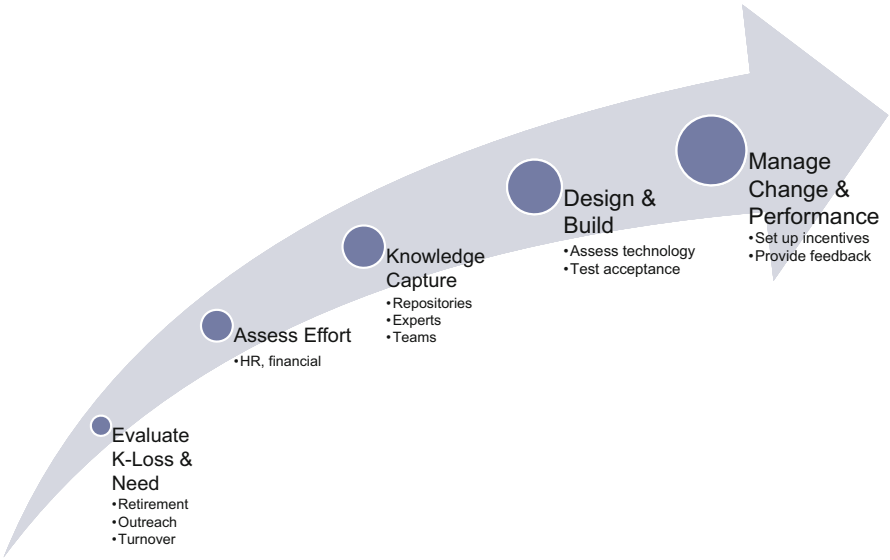


Fig. 6.4 Sample Implementation Steps of KM Program

To identify whether a KM system is needed in an organization, SMEs will need to assess their environment to understand and evaluate the knowledge-loss assessing the factors that would increase such a loss:

- Whether core knowledge will be lost through retirement, transfer, or voluntary resignation
- Whether the knowledge to be captured is needed across the locations where the enterprise operates
- Whether documenting know-how and procedures about a particular issue will lead to the resolution of future problems
- Whether irreplaceable knowledge is currently being dissipated.

With each bullet, technical, economic and behavioral considerations associated with implementing a KM system will drive the scope and the size of the project. For example, SMEs may focus first on employees with essential know-how that are expected to retire. Additionally, they can "require" their most dynamic employees to document work-practices especially if the risk of resignation (i.e., new job offers) is high.

The next step has to do with a thorough effort assessment. The failures of KM projects in large organizations are related to a lack of understanding of the complexities embedded in a knowledge-based transformation. The installation of an IT system is the easier aspect of the project. The difficulty starts with incentivizing its application. Significant motivated resources will need to be dedicated to the promotion of new procedures and new software.

The actual knowledge capture efforts range from creating repositories, developing taxonomies to better organizing knowledge assets. Other effort-intensive approaches include capturing knowledge from enterprise experts either through storytelling or structured project/templates forms. Finally, much knowledge resides in project teams. Setting up mechanisms to document and summarize team interactions (structured team report forms, minutes, logs) will decrease knowledge dissipation, especially after the team has completed the project and moved on to other assignments.

For SMEs, the KM design and build phase are likely to be supported by outside resources. However, much of the organization and the structuring of knowledge assets require involving internal members (who are the knowledge owners). Preliminary acceptance of the new reporting and documentation processes is also carried out at this stage.

Finally, the enterprise reward system must be tied to knowledge sharing. Documenting lessons learned, helping co-workers, brainstorming and innovation efforts should be incentivized in the same way as task completion. Such new documentation can be also used as a baseline for performance evaluation, which should be focused on how the employee contributes to increasing organizational knowledge assets.

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Chapter 7
Cases on SMEs Digital Innovations

Abstract To help explain some of the concepts addressed throughout the book, in this chapter, we present four case studies. Each case concerns a small entrepreneurial company that has innovatively used information technology (IT) to achieve success. These cases were all developed as one part of a collaborative research project between the International Council of Small Business (ICSB) and Dell, Inc. While the four companies are quite different, representing a variety of industries, they have important commonalities in the way they used IT for innovation.

The countries and companies represented by these cases include:

- United States—Transport Designs
- Italy—Tecnomodel
- Canada—Fifth P Solutions
- United Kingdom—Wiggly Wigglers.

Each of the companies was a national winner of the 2008 "Dell Small Business Excellence Award." Wiggly Wigglers was the overall world winner.

7.1 Commonalities and Differences Across Cases

Each firm, and each IT application, was the brainchild of one person, a founder who was the driver of change and innovation in the organization. The founder typically did not have a formal business plan for starting up the company. What characterized these founders was a vision. That vision involved delivering a product or service that the founder saw meeting a specialized need. Most of the founders had experience in the respective industry and, in some cases, across multiple industries. They also placed high value on the functionality and skill sets of their teams, while emphasizing flexibility needed to adapt to change. Finally, they all placed great value not only on adaptability as an organization, but also on having an innovation system and "winning formula" that extended throughout the value chain, from suppliers, designers, manufacturers, and clients to various kinds of other external collaborators that compose the business ecosystem.

The innovative IT applications of these firms differ depending on the nature of their industry and business model. Two of the companies, Transport Designs and Tecnomodel, had a much "harder" scientific and more empirical edge to their applications of IT as their work involved highly technical and skill-intensive processes.

K. Passerini et al., *Information Technology for Small Business,*
DOI 10.1007/978-1-4614-3040-7_7, © Springer Science+Business Media, LLC 2012

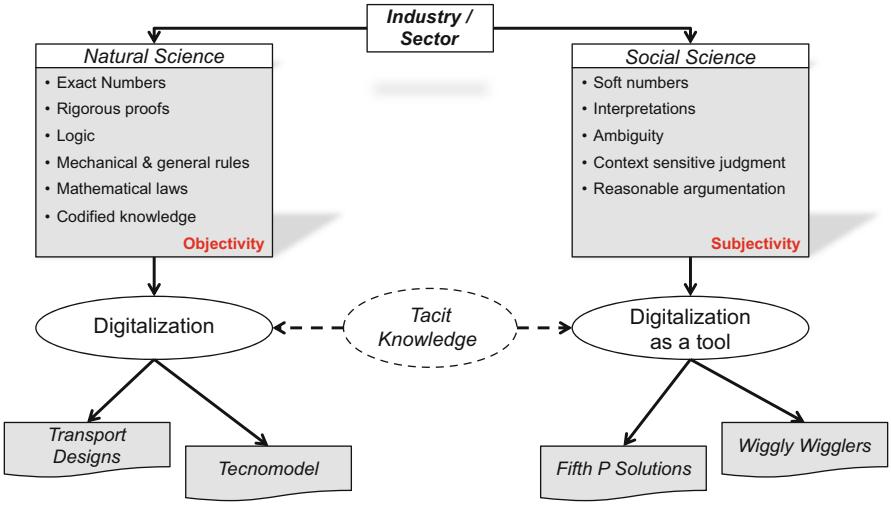

Fig. 7.1 Level of digitalization across cases

As a result, IT represents a fundamental element of their business functionality. The other two companies, Fifth P Solutions and Wiggly Wigglers, had a "softer" and more social science edge to their applications. Regardless of whether a firm was using a harder or softer approach, the integration of IT played a crucial strategic role.

None of these companies based its success on a scientific breakthrough, on "star-trek" number crunching, or on rule-based logic. Rather, their success was due, in large part, to a much more "human" way of using IT. Although their approaches all involved IT as an important support tool in their businesses, IT and their IT innovations were seen by these entrepreneurs more as useful "hands-on methods" than as necessary business functions. In theory, these SMEs could function without IT—their products and services could be produced or delivered without IT. However, actually doing so would make efficiency much more difficult to achieve and their overall success much less likely.

Humanizing IT needs some explanation. The two dimensions presented in Fig. 7.1 can set the appropriate frame of mind for the SME owner. The first is "Digitalization" and the second is "Digitalization as a tool." Their common link is tacit knowledge, or knowledge that cannot be easily codified or explained. Tacit knowledge helps develop and create better market-based strategies and superior customer service. The effective use of tacit knowledge is an especially difficult aspect of knowledge management, which was examined in Chap. 6.

Of course, each of the four companies has its own way of managing and using tacit knowledge to combine intangible factors. This might be a combination of the vision of the founder, an unwritten mission statement, a strategic plan, or the skill set of the entrepreneurial team. These factors help bring each company's winning formula together with the practical business processes of the firm. Having appropriate

knowledge that cannot be easily conveyed is a competitive advantage. It also helps give a unique brand and niche identity to each company. This, along with excellent customer service, made these companies marketplace winners, as well as technology and innovation winners.

In the next sections, we present a snapshot case of each of these four Dell Small Business Excellence Award winners [1]. Their unique stories give SMEs a glimpse of how they used IT to revolutionize their customers' experience and achieve business success.

7.2 Case: Transport Designs

7.2.1 Introduction

Transport Designs (TD) set out in 1988 to do what its name implies—design unique and customized transports. This might range from hulled trailers and custom motor homes to any kind of assortment of motor coaches and trailers. TD is the reincarnation of a company that nearly failed. Steve Mattie, an engineer who had worked in the automotive industry for five years, took up the reins of this business and created a new company, one that would weather three economic downturns and would develop a reputation of effectively using technology to accommodate most of the customer's request. That is why TD's client list includes the American military, movie companies, and Hollywood stars.

Steve's transition of this company, from a failing firm to a fledgling and distinguished enterprise, involved a slow, but steady, turnaround in a difficult and highly skill-intensive industry. Success was greatly facilitated by exceptional customer service and the innovative use of information technology.

7.2.2 Background

TD was founded in 1988, as a new beginning for a failing company in the same industry. This led Steve Mattie, the new CEO and owner, to slowly break off from what had once been his father's company. After trying to survive on the initial business developed by the previous owners, and with a lack of direction and funds, Steve decided to reinvent the company. Rather than sell cheaper and inferior products like its competitors, TD would focus on a higher quality product than the competition at slightly higher prices. Initially TD's trailers were made of higher quality materials, but were more or less standardized according to industry and customer standards. Products were, initially, based on "cookie cutter" designs, however, this would radically change.

7.2.3 Business Model

By 1992–1993, the "weekend warrior" trend had taken hold in the U.S. Within this phenomenon, ordinary folks go out for recreational motor sports, riding motorcycles, jet skis, three- or four-wheel off-road vehicles, and other motorized vehicles. They used MPVs (multi-purpose vehicles) and trailers to haul their sports equipment. Because of the variety of motorized sport equipment, customer orders for trailers were often complex and required customized design. Even more challenging was the increased demand for RV's or recreational vehicles, self-powered motor homes, and towed trailers designed as "homes away from home." TD responded well to this new demand, while competitors were slow to pick up on the opportunity it offered. TD's response was in large part the result of the company's need for business and an unwillingness to turn down any requests. However, the firm's small size and lack of technology know-how to conduct customized design made its strategy of accepting all orders very difficult.

7.2.4 Technology and Innovation to Grow Business

TD didn't start with much digital technology, until the mid-1990s, the only use of a computer was for payroll. Steve drafted the vehicle plans himself. Manufacturing was done using subjective guesswork based on his blueprints. Drafting of course became much more complicated with the new and more complex customer orders. During the early to late 1990s, TD's business consisted largely of standardized trailers with 25 parts. However, by the early to mid 2000s, that number increased to more than 1,500 parts needed to build a customized motor home. Further, more complex and customized designs meant more coordination necessary with the customer. The only way for customers to explain what they wanted or to give feedback on the designs proposed was by mail, telephone, or fax—all slow and costly methods. Compounding the design challenges with communications obstacles with the client, it was obvious that TD had some serious obstacles to overcome or the profit margins would be affected. Steve soon found himself having to embrace new technology in order to adapt to the new business demands.

7.2.5 Computer-Aided-Design Software and Broadband IT

Despite these issues, TD neither had the money nor perceived the need to invest in drafting computer programs. Instead, TD's use of CAD (computer-aided-design) occurred by accident. Within a month, during the mid-1990s, two debtors to Transport Designs offered computer equipment and advanced drafting software in payment of their debts. Steve accepted and the result was a much more accurate and efficient way of drafting. He no longer needed to compensate for his imprecise drafting skills,

plus any customer changes could be done relatively easily. Apparently it took some time for his workers on the factory floor to get used to objective precision as opposed to Steve's drawings, since the very first model made from the CAD program was incorrectly assembled!

Even at this point, customers were still mailed or faxed a plotted version of the plans, as there was no Internet connectivity to accommodate them. As e-mail use expanded in 2005, customers could receive digital versions of the drafts, but differences between the design file formats and the programs needed to open them discouraged many customers. It was not until Adobe released the Portable Document Format (.pdf) in 2007 that customers had a standardized format to view drafting plans. Today TD's customers are updated digitally on their order's progress. They can often see their designs being built by inspecting successive .pdf documents. Steve attributes success and the ability of TD to compete in international markets to the .pdf service that, he believes, helped build a high level of trust and comfort, especially with customers outside the U.S. The ability for the customer to get a .pdf file of the vehicle's design progress and to provide his or her own comments as well as digital sketches not only helped reduce financial and design risk, but also provided a crucial "anytime, anywhere" attitude. The technology gave Steve an avenue for success on the international level that would once been impossible for a company the size of Transport Designs [Dell Small Business Excellence Award] [2].

7.2.6 Continuous Evolution—Wireless Broadband!

The company's latest innovation is using wireless Ethernet to transfer draft drawings from the design office's computer to the factory floor's computer. In the past, plans had to be drawn or printed out and then carried to the factory, which was a cumbersome process and risked damage to the drawings. Now this process is digitized, allowing the factory floor to use Wi-Fi to receive the online vehicle plans without printing hard copies on a plotter. WiFi Ethernet effectively allows a seamless transition and interface between the design and the factory.

Transport Designs recognizes that the firm's relatively small size has allowed them to stay flexible enough to meet both the demands of their customers and the changing technological realities of design and manufacturing. TD prides itself as much on manufacturing and design of complex products as it does on being open to customer service and support, wherever and whenever needed. TD's 20–25% annual growth in the last few years can be seen as a testament to this.

7.2.7 Key Points and Questions

Flexibility Steve's market strategy, product quality plus customization to customer order, is a product differentiation strategy. TD's products are different from those of competitors—higher in quality and designed to customer specifications. How

important is flexibility to a company's success? Would the importance of flexibility vary depending on the industry, business model, or economic market dominance?

Business Process Streamlining Before it had computers or utilized email, Transport Designs not only did drafting by hand, but also physically transported designs between the workshop, the office, and the customer in an expensive and cumbersome fashion. Now, these processes are completed instantly using broadband technology. This saves on costs and provides better coordination. How else has technology changed the way customer service and internal communication is handled at TD? In today's market, what organizations would survive if they don't use such technologies? What other industries or companies would benefit from investing more in these technologies?

Trust The well-designed coordination between business and customer has helped to create a "hedge" against various risks for the customer. It also gives TD a personal and attentive customer service edge that is a hallmark of successful SMEs. Steve attributes TD's success against much larger competitors, especially in the international market, to an effective small business touch for customer service. How has the use of broadband technology augmented this touch for SMEs? Are there lessons that large corporations can take from it?

7.3 Case: Tecnomodel

7.3.1 Introduction

Even though poorer and lower wage countries are now getting the lion's share of the apparel manufacturing business, entrepreneurial opportunities still exist in "rich" countries like Italy. While the manufacture of all kinds of apparel has been outsourced to third-world nations, there is not, within these countries, sufficient knowledge, technological capability, or artistic clout needed to research and design clothing. This is particularly true for one of the most complex articles—women's dress shoes. Thus, in spite of rapid decline in the national industry along with rising competition, an Italian firm named Tecnomodel used its expertise and technological leverage to continue to differentiate itself in the women's dress shoe value chain.

Tecnomodel had the advantage of extensive experience in footwear on the part of Daniele Scotucci and Daniela Funari, an Italian couple who married in 2000. Their combined years of experience led them to agree that there was a critical need for technological innovation in the Italian designer shoe industry [3].

Computer-aided-design (CAD) and computer-aided-manufacturing (CAM) arrived late in the fashion world. While the benefits were appreciated, the nature of shoe design and manufacturing, in terms of measurement, made implementation very difficult. Bridging the gap between the development of a women's dress shoes model and its actual manufacturing remained a great challenge. Scotucci's technology background and continued tinkering enabled him to do some reverse engineering

of computerized sewing machines. This resulted in substantial progress toward resolving the problems involved in applying CAD/CAM to the women's dress shoes manufacturing process. His success meant that Tecnomodel could offer revolutionary services in the co-design and co-development of these shoes using the power of computers instead of relying solely on the traditional Italian way which was based on designer labour to make prototypes. The arduous task of the designer taking raw material and then forming it into prototypes was a messy process that sometimes resulted in one-of-a-kind look that was extremely difficult to reverse engineer and operationalize into production. Tecnomodel created a new kind of value chain that would challenge the traditional Italian fashion industry methods of women's dress shoes design and manufacturing.

7.3.2 Background

The traditional way that Italian women's "designer" dress shoes are initially conceived and then prepared for manufacturing is an arduous process requiring months of trial and error effort. Introducing CAD/CAM technology increased the complexity of the task. Applying a standard and codified method to engineer shoe design and manufacturing requires both creative thinking and advanced programming skill. Artistic visions must be translated into binary code that can be inputted into digitally-controlled sewing machines. The code then becomes the score of a symphony of sorts, in which sewing machines zig and zag across the raw material to create the shape of the shoe. Ultimately, this cutting and sewing, guided by a computer program, produces a shoe that perfectly matches the vision of the designer. With all the measurements coded, these codes can be translated into production processes and streamlined into a production line operation.

Daniela and Daniele's vision and unique technical skills enabled them to modify the programming codes of Brother-branded sewing machines, automatic machines meant to be used for clothes, to store shoe production data. After many months of experimentation, they were able to integrate sewing and cutting into, what can be thought of as, a new art form. They were able to introduce design art and its implementation, sewing a red ribbon on a shoe, for example, into a computer program. Despite this artistic and technological triumph, the Scotuccis turned down several lucrative business offers to divulge their technology secrets. By the early 2000s, with changing industry dynamics, Daniele and Daniela decided to go into business for themselves.

7.3.3 Tecnomodel's Model

Recognizing the intense competition in their town of Porto S. Elpidio, the hub of shoe manufacturing in Italy, Daniele and Daniela quickly realized that they would need to innovate and leverage their technical knowledge to be competitive and successful. The changing competitive landscape of the shoe industry presented unique

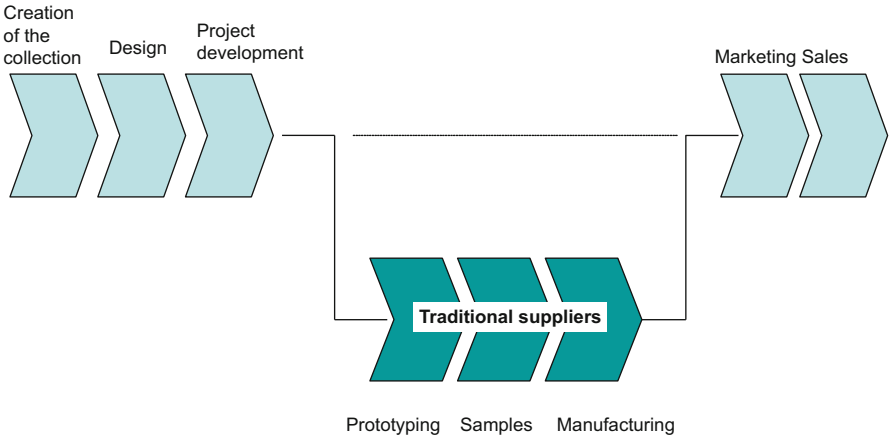

Fig. 7.2 Traditional industry value chain

opportunities. This was a time when independent footwear designers and stylists were appearing. Moreover, international competition from low-cost countries was taking market share from once-dominant players in higher-cost countries. Normally, brand holders and stylists commissioned local factories to produce prototypes and samples of their products for evaluation. Brand holders' costs for producing these prototypes and samples were set relatively low, but after production decisions were made, the factories getting the contracts received much more money. However, competition from low-cost nations in Eastern Europe and Asia was leading to more and more production outside Italy. Production operations, and the value chain as a whole, became increasingly segmented. Daniele and Daniela recognized an opportunity to construct a new kind of value chain. Figure 7.2 shows the traditional value chain for the shoe industry. Manufacturing is disconnected from project development, with little coordination between any of its distinct phases.

Tecnomodel would continue to provide services to high-end technology-oriented brand holders and stylists, producing prototypes and samples for them. But the firm would also prepare and provide technical "guide-cards," digital files containing instructions and information on production, materials, and costs. These guide-cards could easily be transferred to any manufacturer anywhere in the world. Prototyping and sample production were in this way detached from the rest of the manufacturing process, allowing brand holders and stylists to get more competitive production pricing outside Italy. They would not have to worry about contractual lock-in from local and uncompetitive manufacturers. Manufacturers in low-cost nations could be given vital codified knowledge from a centralized server location at any time. Figure 7.3 shows Tecnomodel's vision of the shoe industry new value chain. Tecnomodel would help design and develop the shoe model, and then conduct small scale manufacturing of the shoes for prototyping and sampling. Along the way, they would document technical information for mass production manufacturers to use later.

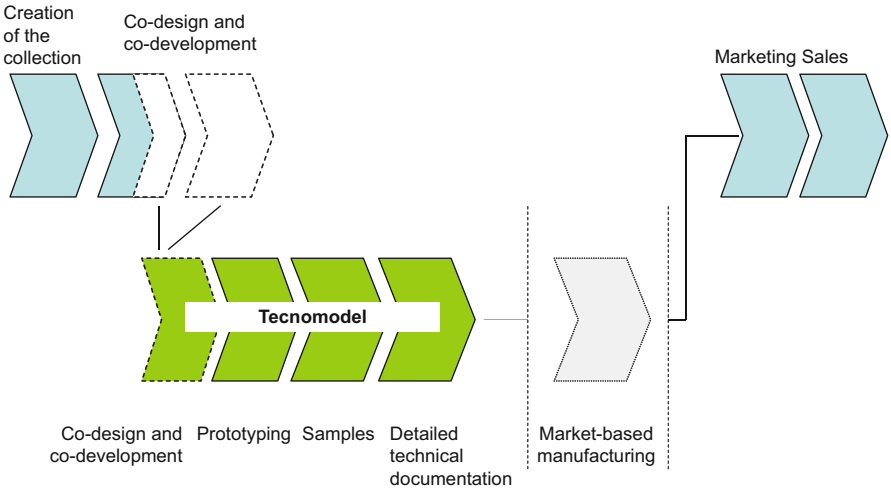

Fig. 7.3 Tecnomodel's vision of industry value chain

By reinventing the value chain in this manner, the company has picked up on the opportunity to be a partner in the process, acting as an interface between brand holders and the manufacturers that service them, instead of being a manufacturing subcontractor. Developing and leveraging its IT base in this way has paid off, allowing Tecnomodel to grow and profit. This is evidenced by the high investment of their net assets, about € 200,000, in IT as of 2008. For its efforts in helping to change industry dynamics and fostering technological development, Tecnomodel was awarded the 2008 Dell Small Business Excellence Award for Italy [2].

Despite Tecnomodel's growing success, with revenue of about € 1.3 million in 2009, by developing a niche that combines IT with specialized skills to secure a position in a highly competitive market, Daniele and Daniela are finding that their competitive advantage may be tenuous. Competitors from abroad learn fast; not only are they copying Tecnomodel's value chain model, they are offering it at a lower price, all while raising their quality standards. The result is that Tecnomodel's share of the potential market has been reduced. The firm's work is now centred on highly complex designs that competitors can't produce. It seems if Tecnomodel does not want to become a traditional subcontractor again, it will need to innovate further.

7.3.4 Future Steps: Additional Services to Offer to Existing Clients

Tecnomodel recognizes that at present it must focus most of its efforts on defending its market share. Even so, it must plan for the future amid ever-changing industry dynamics. Tecnomodel has considered offering further services to brand holders, including logistics, so that the brand holders could focus more on what they do

best—sales, marketing, and brand management, all functions at the very end of the value chain.

7.3.5 Future Steps: International Expansion

This proposal of expanding from Italy into major footwear producing hubs elsewhere in the world (such as Tunisia, Brazil, China, and Eastern Europe) could help reduce cost pressure from Tecnomodel as well as act as a springboard for the company to expand internationally. A risk here is that Tecnomodel may not understand the market and economic environments well enough to carve out a niche. Another potential pitfall might be a lack of skill at managing a multinational company. For example, Tecnomodel opened a branch in Mexico, but the manager's limited foreign business experience led to its failure.

7.3.6 Future Steps: Vertical Integration

Finally, Tecnomodel has considered acquiring a shoe brand of its own. This could reinvigorate the company, with fast growth. Scotucci and Funari feel that the way to succeed in this regard would be to acquire a "rising" brand headed by a potential "guru" fashion designer. There would, of course, be no guarantee of success. The judgment of the company, and its leaders, would be crucial, but they might not have enough experience to make the required accurate judgments.

7.3.7 Conclusion

Ultimately, Tecnomodel must make decisions and take actions that will increase its chances for long term survival in the designer shoe industry. Unless it can continue to innovate, Tecnomodel risks becoming obsolete in a fast-changing and cutthroat industry.

7.3.8 Key Points and Questions

New Technology in Existing Markets New technology, such as CAD/CAM, can reinvigorate a stagnant industry by shaking up the status quo. Can other technologies be introduced into industries like high-end shoe wear design? What are the pros and cons of such a move?

Focus on Integration vs. Core Competencies Should a company focus on a core competency, like software development, or expand into another area of its value chain?

Constant Adaptation in a Rapidly Changing Industry How does a company continue to innovate knowing that competitors in lower-cost nations such as China, India, and others will quickly copy their innovations?

7.4 Case: Fifth P Solutions

7.4.1 Introduction

Anyone familiar with the "Four Ps" of marketing might be a little confused about a potential "fifth p" of the marketing process. To the founder of this company, the fifth p stands for "people." Without the people, marketing, as it is known today, would just be a concept on a paper. Thus, Michael Mattalo, after many years of changing fortunes and ups/downs, created a consulting company that would eventually be named "Fifth P Solutions." The firm is based on the concept of educating and advising companies on how important people are to sales and marketing (S&M) and how an understanding of this important focus on people can be leveraged to the benefit of the organization.

Michael Mattalo [4] had been working for a few years in retail sales and marketing for a major goods packaging company. His company had promoted creative thinking and corporate entrepreneurship, and he had thrived in this environment. But after a major merger, Michael soon found that the new company was much less flexible and was unable to accommodate enterprising ideas. Because of this failure to appreciative creative thinking, he left the company and, with his best friend, founded a start-up based on sales and marketing consulting. In doing so he relied on his experience in the retail sales field along with his understanding of shifting marketing dynamics. After a long period of ups and downs, fortunes and misfortunes, Michael decided that he needed to differentiate and re-imagine his consultancy. After recognizing the paradigm shift from mass marketing to relationship and customer-based marketing, Michael concluded that an organization's "people" would become integral to the marketing process. Thus he decided to tailor his services specifically for this fifth p-people.

7.4.2 Background

The forerunner of Fifth P Solutions (FPS) was founded in 1989 as a consultancy for companies marketing their products through retail store channels. Starting out with a partner, who was his best friend, a Dell computer, a telephone, and a small free plot of office space, they commenced operations. Both of the partners felt they had specialized knowledge in business-to-business retail store marketing, and believed they possessed insights in how the dynamics of this discipline was changing. After many sales calls and attempts to generate leads through their limited business network, with continual follow-up, the business began to pick up.

Michael believed that they could carve out a niche, rather a "blue ocean," in consulting aimed at helping sales and marketing departments in organizations. Packaging sales in Canada relied mostly on a copycat strategy among competitors. Michael believed he could show corporations the changes that were taking place in customer dynamics and marketing, which would help the corporations figure out how to better meet new demands. At this time, in the 1990s, mass product marketing was slowly giving way to relationship, or customer-based, marketing. A focus on mass sales was shifting to getting individual customers what they wanted and delivering on a company's brand promise.

In retail, for instance, salespeople in a department store would no longer try to "sell" customers on their highest margin products. Instead, they would focus on finding out what the customer wanted to buy and fulfilling that desire. As a result, the customer would feel and appreciate the company's brand promise, which promoted customer brand loyalty to a much greater extent than when retail sales were focused on pushing high-margin product [5]. Michael determined this shift was fundamental enough to warrant an implementation of "sales skill development," the aim of which is to design custom sales solutions for corporations. He decided to incorporate "behavioral change learning interventions" in conjunction with instructional design principles based on andragogy, the science of how adults learn, these large marketing-driven organizations could change significantly. Of course, relationship marketing was slow to develop, and this tiny firm, FPS, although it had little competition, found it necessary to seek both technological and financial leverage in order to survive. This set in motion a volatile ride for the company in ownership, equity stakes, and direction.

7.4.3 Making Tough Choices

Michael soon found his firm's equity being partially bought by a group of fellow entrepreneurs. On the positive side, they provided not only financing but access to some new clients. However, these investors wanted Michael's partner out of the picture, as they believed he was indecisive and holding up progress. From a business perspective, Michael knew that they were right, but on a personal level he felt that it was not the right thing to do. Even so, for the sake of pushing the enterprise forward, he parted ways with his founding partner, now his *former* best friend. Although he did not regret it from a business standpoint, breaking up the partnership was still devastating to Michael personally. Eventually, after some changes in the investor group, Michael bought out their stake.

After some further ownership shuffles the company, then known as "Sales Performance Group," continued to grow. But in 1999, it was acquired by a corporation founded by the very same previous group of investors. Michael then rebranded the company as a corporate segment, known as "Mosaic Perform." Being a part of a large and rapidly growing corporation led Michael to see the advantages of financial leverage. As the parent corporation continued to make mergers and acquisitions,

Michael scouted out the possibility of doing the same thing. However, before he could implement this plan, the stock market crashed, the economy plunged into recession, and capital dried up. Mosaic Perform declared bankruptcy in 2002 and, after a power struggle, Michael bought out the "Perform" segment and once again had full control of his company, as well as a new partner.

7.4.4 The Value of People

After rethinking his business model, Michael realized that marketing was indeed getting closer and closer to the customer. It was becoming less about mass advertising and TV spots and more about promotional and field marketing, less about selling the product and more about winning and retaining customer loyalty with a brand promise. At this point, Michael had the insight that marketing was only as good as a company's *people* make it. That is, it is the company's people who can best interact with the customer to give a solid representation of the product. Michael took this a step further and argued that people could no longer just represent a product, they had to actually *be* the brand. In this way he reinvented his company, with the aim of helping corporate salespeople and marketing departments to become one with their brand promise, and thus be the "fifth p" of the product marketing mix. This was the beginning of Fifth P Solutions (FPS), the current incarnation of Michael's consultancy.

7.4.5 Marketing to the Customer Anywhere

Fifth P Solutions is based on the concept that the brand promise must be delivered anywhere that a person, whether employee or customer, is in the value chain. Michael now sees that everyone, in nearly every industry, is beginning to understand this, which is helping business tremendously. For instance, a restaurant brand now has to understand that it is not just about selling food. Instead, the company, and its brand, is about selling an entertaining and memorable brand experience that happens to involve food. The practical issues that emerge with this realization include: What should a host, a bartender, or a waiter say to guests, and how? What are the key "nodes" of interaction ("moments of truth") with guests? What is the brand promise meant to accomplish, and where and when should that be done? These issues not only cut across business lines, they are relevant across industry lines as well.

7.4.6 Using eLearning Technologies in Employees Onboarding

The FPS strategy, especially when working with corporations that have widespread locations across the country, is to begin at the point of entry for new employees. At

that point and from then on, e-learning is the main tool used to impart knowledge, as well as skill training and employee testing. FPS uses multi-layered scenarios to help trainees work through realistic customer interactions and develop and improve their skills by receiving comprehensive feedback. Fifth P's proprietary application "DNA Dashboard" allows employers to monitor their progress in real time, using the Internet for feedback and certification. The "Know How" application allows employees to obtain training using various methods of their own choosing. One might, for example, elect to take a full course or, alternatively, select only certain materials. A new employee would then put these newly-learned behaviors and skills to use on the job, under the control and coaching supervision of both managers and other employees. Fifth P's extensive IT network makes it easy to scale and modify offerings. As a result, it does not need to cater exclusively to firms of a particular size, but can scale down to small firms or up to very large corporations. This is described by Fifth P as allowing it to have "large firm capabilities" with a "small agency touch." The result has made Fifth P a prominent player in a fledgling but rapidly growing consulting field, giving it access to large and influential clients like Montana Cookhouse, FritoLay, Labatt, and Direct Energy.

7.4.7 Challenging Traditional Education and Training Models

In 2008, as a result of its pioneering efforts, FPS won the 2008 Dell Small Business Excellence Award for Canada [2]. And though they had once thought about growing their business to a considerable degree, FPS no longer sees the need, or benefit, for their kind of business to scale up. Michael sees the company as much more in tune with providing excellent and tailored services to its customers—something he feels a large size company would make more difficult. He also wants to see the firm's innovations continue to blossom. FPS has a particular leg up on technological utilization as a big proponent of e-learning and of the connectivity that broadband and online technology allows. Michael sees traditional models of learning, such as lectures given in large university auditoriums on the basis of standardized texts, as increasingly obsolete in a multi-tasking and always-connected world. While the current economic crisis may provide distractions, Michael believes that e-learning and Internet connectivity are spreading rapidly and that the most exciting part is yet to come.

7.4.8 Key Points and Questions

Paradigm Shifts as Opportunities Paradigm shifts involve far more than changes in technology used in a particular industry. A paradigm shift takes place across the business world and changes the fundamental way business is done. The Internet has produced a paradigm shift in terms of instant worldwide connectivity. It has

made possible customer-based marketing which may itself represent a paradigm shift across the marketing domain. How can companies benefit from and take advantage of such paradigm shifts? Would this vary based on a firm's place in its supply and value chains?

A Volatile Ride Recent studies have shown that businesses, as well as individuals' lives, don't follow a simple linear path. Rather, there are back and forth as well as up and down shifts, and these shifts take place continuously. Michael's company, FPS, is a good example of this phenomenon and of the ebb and flow of business success in general. In what ways can technological developments help companies weather business cycle storms and the demands of change in general? Does being an early adopter of new technologies and ideas soften the impact of such changes?

Learning is Technology eLearning is a fundamental pillar of the Fifth P strategy. But even further than that, Michael's vision of eLearning for the present and the future seems consistent with the idea of relationship-based marketing. Instead of mass lectures from a standardized text, he envisions customized and individualized learning experiences, learning that is tailored to the individual and his or her unique learning preferences and needs. Can this form of e-learning be beneficial not just for businesses, but in academic settings? What are some of the pros and cons? Where might standardized learning be more appropriate?

7.5 Case: Wiggly Wigglers

7.5.1 Introduction

Who would name a company Wiggly Wigglers and be taken seriously? Well, the 28 year old founder, Heather Gorringe, had an inspiration to start a worm composite business in a small town in the UK called *Blakemere* (population 53). Heather came from a family business that fostered entrepreneurial thinking. Her creative artistic spirit led her to start her own t-shirt design firm and then move on to bigger idea, which would culminate in Wiggly Wigglers. But in overcoming initial skepticism, her enthusiasm was tempered by the realities of making an unproven enterprise work. She had an unusual and untested product—worm composting kits for the home.

Wiggly Wigglers (WW) was supposed to be a catalog business of gardening products and services. WW strayed accidentally, but strategically, into becoming an international entertainment business that also sells gardening products and services. Heather's adoption and strategic use of social media, even before the term social media was coined began in the 1980s when she started a radio station to promote the business. She wanted to capture more market share using alternative methods to the typical (and expensive) mail order catalog. Her radio station never worked out, but morphed into podcasts, blogs, and tweets. IT terms that go well with the name Wiggly Wigglers!

7.5.2 Background

Wiggly Wigglers was founded on two ideas, each of which focused on a narrow niche market: selling worm compost to gardeners; and selling worms for fishing bait to fisherman. Heather initially wanted to do both. Obviously, Heather needed both compost waste and worms. However, she quickly realized that she couldn't produce both in equal quantities. She would have to choose one or the other, or do something else. Eventually, she had an eureka moment in which she decided she would take a middle ground and use both of them in a completely different product. "I thought to myself, 'Why can't I just put together a kit that you can use to compost worms at home? Instead of me selling you an end product [worms or compost], I could sell you a kit to do [it].'"

7.5.3 Starting and Growing the Business

Based on her do-it-yourself homemade worm compost kit, Heather put down a stake in a rather unusual market. Although she thought she would have a very large business, as evidenced by a highly ambitious business plan, she quickly faced both operational impracticalities and external competition. For instance, she sent a company in Devon one of her kits. They then turned around and created a competing kit called *The Original Wormery*! Nevertheless, competition, Heather felt, helped to open the doors to the market. It made her realize that she couldn't have created the market herself, but at the same time, she could play herself as an alternative to large mainstream competitors.

7.5.4 Using Technology to Attract Customers

Whether they would take a company named Wiggly Wigglers seriously or not, the local and national press loved to hear about it. The company sent out many press releases and newspapers were quick to pick up on the story. This was one of WW's first attempts at free riding on media, as the company did not have the money needed for heavy advertising. WW's story was interesting and entertaining and this would become the centerpiece of the company's market strategy and an integral part of efforts to create a viable market niche. WW would not be just another company selling gardening products; it would become a source of alternative entertainment that just happened to sell gardening products. And using social media would be the central marketing approach.

But why not offer wholesale products to retail organizations such as garden centers? Heather felt that major gardening centers were very impersonal and tended to supplement their offerings with products that have nothing to do with gardening. Furthermore, if she sold her unusual products to them, her profit margins would be

too low. She probably would have to wait a longer time to get paid than by selling directly to final customers. WW could not afford a narrow profit margin or a long wait for payments from big-box garden retailers. As a result, Wiggly Wigglers initially embraced a direct mail order catalogue model. Leads and prospective customers would be given catalogues or sent copies by the Royal Mail. Customers could then order products directly from WW. By marketing directly and personally to customers who were interested in gardening, and by focusing on gardening-related products, Heather felt she could create a niche.

Being an early adopter of promising technology would soon become a modus operandi for Wiggly Wigglers. The company purchased computers in the early 1990s. Soon after, it was using databases. By 1996, it had a Website, which, by 2001, was enabled with eCommerce and credit cards. These early technological adoptions were partially motivated by necessity, but also partially by the fact that WW saw promising developments in these technologies. Since the company was based in a remote location, having a physical brick and mortar store was not financially or practically viable. The Internet complimented a traditional catalogue model as a promising way of doing business. All of this set the stage for the company's foray into technology-enabled social media, which would help make WW an internationally-known company.

7.5.5 Web 2.0 as a Cost Effective Marketing Strategy

Heather eventually found that spending 10% of gross on marketing was not cost effective. This is when Wiggly Wigglers began to use social media, not as an adjunct, but as an alternative to traditional, expensive, forms of marketing such as newspaper ads and catalogues. The company first tried to advertise on TV and radio, but that failed. These mainstream advertising channels are not inexpensive and, most important, are saturated. In terms of free riding, while gardening may be popular it is not "primetime medium" activity. In fact, most TV and radio viewers don't seem to care to hear about it all that often! As such, any attempt to explain such a niche market was edited or made irrelevant in order to be more main-stream, and thus appeal to a wider audience. After failing to have impact through radio or TV broadcasting, WW turned to a then-fledgling and new technological application—Apple Podcasts.

Wiggly Wigglers found its advertising niche in cutting-edge social media. Much more economical and more accessible than radio broadcasting, WW found it was possible to create its own independent radio programming, what we now call a "podcast." This offered a way to market directly to customers on a user-guided platform, that is, a situation in which users can select for themselves what content to listen to and when to listen. This new social medium platform made dissemination easy. It also cut marketing costs dramatically. The effect of WW's podcast was to transform the company into an international entertainment business focused on gardening. The potential of such technology is tremendous. Whether one is selling something as

strange as worm composting or as boring as paycheck processing, podcasts represent a huge step forward and need no longer relegate a firm's advertising to 4:00 a.m. TV or radio spots that no one wants to hear. With podcasts, as with social media, someone is *always* listening.

7.5.6 The Effect of Entertainment as a Marketing Strategy

WW thus decided to delve into an entertainment-focused social media marketing approach to promote the company and its products. Surprisingly enough, the podcast was a hit and became #34 on the national Apple iTunes chart. After this breakthrough, Wiggly Wigglers put its entire marketing budget into social media and podcasting and continues to do so to this day. Marketing costs are now half of the former advertising budget (once up to £100,000), while the IT-based marketing strategy is much more cost effective than past efforts. Today the company is overflowing with social media. It has over 70 H worth of free social media in the form of podcasts, blog entries, Facebook pages, group pages, a wiki-enabled paper catalogue, and a videocast. The podcast broadcasts have remained popular, with an average of over 50,000 monthly downloads. Even if Heather still can't directly measure the impact of social media on WW's bottom line, she recognizes that it is the use of social media (her innovative IT application) that has given WW and its products widespread exposure. And in 2008, Wiggly Wigglers won Dell Small Business Excellence Award [2] for both the UK and "Global," clearly indicating that her vision for business technology utilization has paid off. Such is the power of the "always on" nature of broadband.

7.5.7 A Better Mousetrap

From the beginning, Wiggly Wigglers learned fast to use an alternative marketing approach rather than using traditional selling channels. While Heather does not try to predict the future, influence or improve on available information technology, or take advice from corporate-oriented consultants, she believes that WW has been good at taking other's ideas and using them. For Wiggly Wigglers, it is all about making a better mousetrap and finding new ways to tell the world about it, rather than trying to reinvent the wheel. While gardening may be a niche subject and "better" gardening even more so, with broadband-enabled technology and social media, WW has developed some innovative ways to cultivate a following for its offbeat and unique product offerings. And for those who have been drawn to its products and believe in the firm, "Wiggly Wigglers" might not be such a silly name after all.

7.5.8 Key Points and Questions

Think Big but Realistically Aiming for the moon is fine, but it is equally important to have one's feet on the ground. Opportunities abound and niches are, after all, the

entrepreneur's playground. When is it important for a company to put delivering quality service and finding a niche ahead of plans for high growth and profits? Is the opposite ever the case?

Identify or Create a New Marketing Approach? With new technologies, entrepreneurs and businesses can actually create new types of customers and markets. Wiggly Wigglers has done this well by using social media on a niche subject while playing itself as an alternative to larger companies. Is going for the niche option always the best option for small businesses? Is direct competition against much larger and more powerful companies ever a viable option?

Using Social Media as a Marketing Strategy Connecting and actually using social media to market products and services has been proven effective. This is how Wiggly Wigglers is having more success than ever while spending much less than it used to in marketing efforts. Is social media an effective alternative to mass marketing, particularly for larger companies? Does a company need to be popular, well known, or "viral" for social media to work?

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Chapter 8
The IT Entrepreneur in SMEs

Abstract Throughout the book, we have referred to the leaders of SMEs without actually saying much about such individuals. There is, of course, much more to understanding leadership in SMEs who engage in IT innovation. In this conclusion, we explore the key characteristics of IT entrepreneurs who have created successful SMEs. For example, entrepreneurs usually have a high need for achievement as well as a great deal of self-confidence. Successful entrepreneurs are also quite knowledgeable with regard to the technical content of their organization's product or service. But entrepreneurs whose organizations are successful over the long run also share a set of characteristics that define exceptional organizational leaders. *So what sort of person is the "IT entrepreneur?"*

Many assume that the aim of entrepreneurs is wealth, but this is not really the case. Entrepreneurs often aim for profit as a way of measuring their success as entrepreneurs, rather than solely to accumulate personal wealth. What's more, some entrepreneurs derive primary satisfaction from creating successful ventures, rather than from leading those ventures over the long term. Such individuals often sell a successful firm and then repeat the process of creating a successful new venture. There are, however, entrepreneurs who go on to become successful organizational leaders, as well as successful entrepreneurs.

First we will look at the fundamentals of entrepreneurship. Then we explore the key characteristics of successful IT entrepreneurs. Finally, we look briefly at where IT entrepreneurship may go in the twenty-first century.

8.1 What Is Entrepreneurship?

Entrepreneurs have been with us ever since the modern economic system replaced feudalism. The first formal documentation of this may be in the work of Richard Cantillon, written about 1730, but not published until 1755 [1]. Cantillon, an Englishman born in Ireland who lived most of his life in France, wrote *An Essay on the Nature of Commerce in General* (in French). This work is often cited as the first exposition of economics, providing a foundation for monetary theory and the concept of how markets function as well as the nature of entrepreneurship. Cantillon described entrepreneurship as the use of accumulated or borrowed capital by an "undertaker" to create a new business (an undertaking) of a sort that had not previously existed and was, therefore, innovative [1].

K. Passerini et al., *Information Technology for Small Business,*
DOI 10.1007/978-1-4614-3040-7_8, © Springer Science+Business Media, LLC 2012

Perhaps because so many undertakings were innovative, Cantillon did not focus on innovation per se. However, we now know that innovation is key to successful entrepreneurship. A person does not become an entrepreneur just by starting a business (for example, a dry cleaning company). The venture must have an innovative element.

In the 1930s, the great Austrian economist Schumpeter defined entrepreneurship as the establishment of an innovation that results in the "creative destruction" of existing industries, products, or processes [2]. This drives economic development and results in an increase in wealth.

Everett Rogers [3] defined five characteristics of successful innovations. A successful innovation:

- Has a relative advantage over what is currently in use
- Is compatible with adopters' values and beliefs
- Is not too complicated for adopters to understand
- Can be "tried out" so that one can go back to what was being used previously if necessary
- Is visible in use so that others can see that someone who adopts it is using it.

Note that for both Schumpeter and Rogers, the role of the individual entrepreneur is not emphasized. In fact, the entrepreneur is a crucial factor in the success of all firms that are based on innovations. This applies as well to IT entrepreneurs.

8.2 Characteristics of IT Entrepreneurs

Earlier chapters should have made clear the changing nature of our world. Information technology has made globalization possible by enabling instant communication between persons or groups anywhere in the world. Today's world is made possible through applications of IT.

IT entrepreneurs assume that the world is characterized by instant connectivity, information accessibility, and zero degrees of separation. They are not necessarily conscious of these assumptions or that they are made possible by the factors we have explored in depth in this book.

However, successful IT entrepreneurs, like those described in Chap. 7, are aware, at some level, of three keys to success:

1. They understand how to base their business not only on "atoms," but on "bits" of information as well [4]
2. They know how to move beyond evolution of products/processes to link their business activities to revolution in products/ processes
3. They, not only reach their market, they also enrich the experience of their customers.

Let's look at these three keys to success in more detail.

8.2.1 Atoms and Bits

Another way of putting this is "bricks and bandwidth." The successful IT entrepreneur is aware of the need to use both, probably with an emphasis on the latter. A firm that uses IT just to operate a bricks and mortar-based business is likely to be neither innovative nor successful [5]. Borders, a national bookstore chain that had been quite successful, failed, and went bankrupt because it failed to recognize this principle and relied solely on its physical stores at a time when the industry was changing dramatically due to broadband IT. In direct contrast, the Wiggly Wigglers case provides an excellent example of a start-up SME that has been successful because of the entrepreneur-founder's ability to organize the physical operation while basing the firm on innovative IT.

8.2.2 Evolution and Revolution

Another way to phrase this is "quality improvement and qualitative change." TQM and 6 sigma, for example, are necessary, but not sufficient for success; they only reduce variability. Entrepreneurship requires innovation as well, which means "revolution," what Schumpeter called "creative destruction." Quality improvement must be combined with qualitative change, which often calls for increased rather than decreased variability, in order to create new (innovative) and better products and processes.

Organizations that strive to improve existing products without giving attention to the creating of revolutionary new products are likely to fail in the long run [6]. Polaroid experienced dramatic success with a revolutionary new innovation, the instant picture camera. But the firm ignored the next revolution, digital cameras, and ultimately went out of business. In contrast, Transport Designs was willing to eliminate the paper drafts that had been improved by IT and go to direct wireless digital files sent from the designers' computers directly to the factory floor, incorporating the revolutionary wireless (vs. delivery of hard copy) process and the digital (vs. paper) design plan.

8.2.3 Reaching and Enriching

This might be stated as "marketing and relationship-building." Traditional marketing is physical—mail, print, etc. This has morphed into e-marketing, from the obvious (TV, Internet) to the subtle (e.g., product placement). But e-marketing is limited if it only aims to reach an audience in a different manner. IT entrepreneurs recognize the need to not only reach customers and clients but to build lasting relationships that add value from the customers' perspective. This is done, for example by creating two-way links, by establishing "intelligent" automations that answer questions and give advice, and by building partnerships with clients and customers. A common

approach to Internet marketing is to design a home page that incorporates terms that rank high on the "list" of keywords picked up by search engines. But this may only increase the firm's exposure to persons who are uninterested in its service or product. Using IT to create two-way relationships with customers was a crucial part of the strategy used by Wiggly Wigglers. This included personalized advice in response to customer questions and downloadable videos showing customers how to use products or solve particular problems. The basic business of Fifth P Solutions is teaching a firm's employees how to develop rich, two-way relationships with customers.

8.3 The Twenty-first Century IT Entrepreneur

The IT entrepreneur not only provides products or services that meet the needs of customers and clients, but adds value in a social or societal sense (e.g., Segway, and wheelchairs based on the same principle).

IT entrepreneurship will drive the economic development of the twenty-first century, just as entrepreneurship drove economic progress in the twentyth century. In the early part of the last century, the auto industry creatively destroyed the horse-and-buggy industry. In mid-century, air travel creatively destroyed rail travel. And in the latter part of the century, IT creatively destroyed the office machine manufacturing industry. The fundamental innovations in each case—the internal combustion engine, the airfoil, and the digital processor—resulted in immense wealth creation that benefited not only entrepreneurs and their firms, but the population in general.

We are now seeing IT innovations being used to creatively destroy moribund societal structures. This began with the demise of the Soviet Union, brought on as much by information that made those in "Soviet Block" nations aware of the far better conditions of life in Western societies, as by the ultimate failure of socialist or communist economies. Democratic revolutions in Africa continued this process, as has the "Arab Spring" that has toppled three dictators (as of this writing). In the latter case, the process of revolutionary change was based on IT innovations such as picture-taking cell phones and social media like Facebook and Twitter.

Also increasing is the application of innovative IT entrepreneurism to address social problems. Such "social entrepreneurship" is entrepreneurship that is not only profitable, but also results in "good works." More than ever in the past, in the twenty-first century, an IT entrepreneur does well by doing good.

Successful social entrepreneurship often depends on the use of IT innovations. One of the best-known examples of social entrepreneurship is Nobel Prize-winner Muhammad Yunus' Grameen Bank, which makes tiny loans called "micro-credit." The women who receive these loans use the funds to buy raw materials that they then use to make various products—clothing, jewelry, food, etc.,—or to purchase things such as vegetables or bottled water for resale. This enables them to avoid paying such high interest rates for loans that they can never save enough to pay. It also allows some to expand their operations or to plan for their future. Although innovative IT is not a crucial factor in the success of this project, with almost 1500 branches that

cover most of Bangladesh and its villages, IT is an important resource. IT has also facilitated the spread of the microfinance model around the world.

A more clear-cut example of social entrepreneurship based on innovative IT is that of Mobile and Immersive Learning for Literacy in Emerging Economies (MILLEE), a non-profit organization that uses mobile phone games to improve literacy skills in emerging countries [7]. Founded in 2004, MILLEE develops language learning mobile games, which are modeled after the traditional games children play in the community. In India, MILLEE uses games to teach English literacy skills to public school children. MILLEE mobile phones are used to facilitate out-of-school learning and field projects, which are being documented for their effectiveness [7].

We believe that the principles and guidelines presented in the previous chapters can serve to aid individuals and organizations in the process of establishing successful IT-based firms. Even so and despite the examples and experiences presented, exactly what the future holds for the further development of innovative IT in SMEs, let alone in a global context, is impossible to predict. Simple extrapolation has a remarkably poor record of accuracy with long-term predictions. What we can say is that future IT innovations by SMEs, is certain. With awareness of the importance and effects of such innovations, there is reasonable hope that entrepreneurs and SMEs, as well as the broad and widespread public will benefit from these developments. It is with such a hope that we conclude this book.

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The Team

Authors Biographies

Dr. Katia Passerini

Dr. Passerini is Associate Professor and the Hurlburt Chair of Management Information Systems at the School of Management of the New Jersey Institute of Technology (NJIT) where she teaches courses in MIS, knowledge management, and IT strategy.

She has published in refereed journals and proceedings (*Communications of the ACM, Communications of AIS, Society and Business Review, Journal of Knowledge Management, Computers & Education, Journal of Educational Hypermedia and Multimedia, IEEE Internet Computing*) and professional journals (*Project Management Network, Cutter IT Journal, Cutter Benchmark Review*), particularly in the area of computer-mediated learning, IT productivity, and knowledge management.

Dr. Passerini's professional background includes multi-industry projects at Booz Allen Hamilton (now Booz & Co.) and the World Bank where she focused on information technology projects in Europe, North America, and the South Pacific. Katia is a certified project management professional (PMP®) and worked on various projects in the automotive and telecommunications industries and higher education. Some of her projects included business process management, balanced scorecard definition, business needs analyses and gaps assessment, benchmarking, evaluation of IT investments feasibility and outcomes.

Dr. Passerini earned an MBA in International Business and a Ph.D. degree in Information Systems from the George Washington University. She completed a Certificate in Business Project Management from New York University.

Dr. Ayman El Tarabishy

Dr. El Tarabishy is a research professor of management at the George Washington University's School of Business, where he teaches entrepreneurship and leadership. He developed the first social entrepreneurship course offered to MBA students through the School of Business.

Dr. El Tarabishy is also the Executive Director of the International Council for Small Business (ICSB), the oldest and largest non-profit organization across the globe devoted to advancing small business research and practices. He created and manages the Global Entrepreneurship Research and Policy Conference (ICSBGW) that is hosted each year at the George Washington University with ICSB as a partner. The

K. Passerini et al., *Information Technology for Small Business,*
DOI 10.1007/978-1-4614-3040-7, © Springer Science+Business Media, LLC 2012

ICSBGW conference connects the latest and most cutting edge of entrepreneurship research to the most pressing and important national and international policy to promote entrepreneurship and SMEs.

Dr. El Tarabishy worked at the World Bank in the Corporate Strategy Group. He helped develop and manage their technology strategy for the Development Marketplace Program. The program's mission was to identify and support creative cutting-edge solutions to the most pressing world social and economic concerns. To date, the Global Development Marketplace competition has disbursed over US$ 65 million in awards to 400 winning proposals.

Dr. El Tarabishy's research is on innovation, social entrepreneurship, and entrepreneurial leadership. He has presented his work at national and international conferences around the world. He has published research articles in the *International Journal of Entrepreneurship Education, Journal of Private Equity*, and the *Southern Business Review.* He consults and conducts executive training for several national and international organizations, including the International Finance Corporation (IFC), the World Bank, and the National Federation of Independent Businesses (NFIB).

Dr. Karen P. Patten

Dr. Patten is an Assistant Professor in the Integrated Information Technology Program at the University of South Carolina, Columbia SC. She teaches technology project management, networking, and telecommunications. Dr. Patten has also taught MIS, IT management, and telecommunications at the New Jersey Institute of Technology and the National Technological University.

She is the author of *Data Networking Made Easy* (Aegis Publishing Group, 2000) and has published articles in *Communications of the Association for Computing Machinery, Communications of the Association for Information Systems, Cutter IT Journal*, and the *International Journal of Computers, Systems and Signals.* Her research areas include IT executive management, IT curriculum development, and wireless and mobile telecommunications.

Dr. Patten's professional background includes fifteen years as an IT Manager and network engineer for AT&T Bell Laboratories and AT&T. Among her IT positions, Dr. Patten managed initial pre-bleeding-edge technology roll-outs within Bell Labs locations throughout the U.S. She also managed the internal IT planning and implementation projects group located in New Jersey. Dr. Patten also worked in innovative technical traffic control sales and marketing with the 3 M Company, and in consulting and construction management. She is also a member of the Board of Directors for the Project Management Institute (PMI, Inc), SC Midlands chapter. She is also a charter member of the Society for Information Management, Charlotte NC chapter, and a senior member of the Society of Women Engineers.

Dr. Patten has a B in Honors Economics from Purdue University, an M in Civil Engineering from the University of Minnesota, and a Ph.D. in Information Systems from the New Jersey Institute of Technology. She also earned a Certificate in Strategic Planning in Indiana's Executive Management Program.

Research Assistants

Gilbert Gatchalian

Gilbert Gatchalian's professional background spans technology roles across various industries including manufacturing (Siemens Fire Safety), legal (Cleary Gottlieb Steen and Hamilton), media and entertainment (Sony Music Entertainment), and finance (NYSE Euronext and Bank of America).

His technology roles across various industries provided real-world experience in global technology teams. Leading geographically diverse organizations in NYSE Euronext, Sony Music Entertainment, and Bank of America, he has first-hand experience in participating and managing a remote workforce.

His subject matter expertise spans multiple technology disciplines as well. He has architected and deployed various Web-hosting platforms for NYSE Euronext (i.e., nyse.com) and eCommerce and marketing sites for Sony Music Entertainment (i.e., myplaydirect.com, michaeljackson.com). Some of the Web hosting platforms he architected and deployed are fully hosted in an Infrastructure-as-a-Service or Cloud Hosting platform using cutting edge technologies by Amazon Web Services, Rightscale, Rackspace, and other hosting and software service providers. He has technology certifications in Red Hat (Certified Engineer/RHCE), Oracle Database (OCP), and IT Service Management Foundation (based on ITIL).

He has a B in Computer Science and an M in Management of Technology from the New Jersey Institute of Technology (NJIT). He was selected for membership in Beta Gamma Sigma, the international honor society for collegiate schools of business, for high scholastic achievement. He continues to actively participate in academics and is current a teaching assistant for an online Knowledge Management class at NJIT.

Michael Bull

Michael Bull is a Math & Business Tutor for his own independent practice, Campus Tutoring Services, and also a Research Assistant (RA) at The New Jersey Institute of Technology. As a RA, Michael worked on various projects, including the information technology management for small and medium enterprises project and cognitive mapping techniques in higher education, an international research project.

Michael started his tutoring business to provide wider learning opportunities to students in need. His expertise is in the subject areas of Accounting, Economics, Finance, Mathematics, Financial Risk Management, and International Business & Investment.

Michael has a B in Management from NJIT and graduated in three years, Summa Cum Laude, with a 4.00 GPA and concentrations in Accounting, Finance, and Marketing. While at NJIT, he tutored for the on-campus CAPE tutoring service, wrote for The Vector student newspaper and The Nucleus yearbook committee, and served as one of 3 Student Senators for the NJIT School of Management. Michael also holds

an A in Business Administration from Bergen Community College, where he served as Advertising Manager and staff writer for The Torch student newspaper.

Michael Bull is a member of three academic honor societies, the N.J. Collegiate Business Administration Honor Society, and Beta Gamma Sigma, which honor superior academic performance in business schools, and Phi Theta Kappa, the national honor society for 2-year colleges.