2 Resourcing an e-business project

Successfully conducting an e-business project requires hundreds of decisions be correctly made throughout each project phase. This in turn requires considerable specialist input from staff members who must plan, design, test, build, integrate and implement the many complex technologies required during the project. Therefore, one of the most critical elements in the success of an e-business project is the quality and skill level of staff members involved.

However, correctly resourcing an e-business project is complicated due to a number of factors, including the current skills shortages within the e-business industry, the rapid pace of change in the technology sector, and the complexity and variety of technologies involved. In addition, the cost of e-business project resourcing is an important factor in the budget as it typically exceeds the hardware and software costs of the project.

Therefore, it is important to understand the types of staff required and their aptitudes and abilities, when to deploy them, and how to source them in order to obtain the correct number of skilled staff appropriate to the project while managing costs and project risks.

2.1 Selecting project staff

Information technology staff can be classified into two general categories, including project staff, and operational staff. Project-based staff are dedicated to the implementation of new technology systems, and are frequently sourced from outside the company. In contrast, operational staff members are dedicated to supporting and maintaining existing company business systems and

infrastructure, and are frequently sourced internally. Therefore, when conducting an e-business implementation project it is important to utilize specialist project-based staff who are experienced in new technologies to design and build the solution, and existing operational staff to support and maintain the final solution.

However, selecting the appropriate project and operational staff for each project phase is complicated due to existing hiring and human resources practices, which often utilize stereotypical criteria to select staff members. Such criteria are often not suitable for e-business staff members, who typically defy normal selection criteria.

For example, many of the most successful and influential people in the information technology industry have non-stereotypical backgrounds. Bill Gates co-founded Microsoft after dropping out of university, while Shawn Fanning founded the ground-breaking Napster music sharing business at the age of 19. Bob Metcalfe was an academic who left the Xerox PARC research centre after creating Ethernet networking and founded the 3COM network company, and Jerry Yang and David Filo founded Yahoo while still at university.

Therefore, staff selection necessitates analysing a candidate's skill level without recourse to traditional stereotypes such as age, qualifications, experience, appearance, cultural fit and length of time in projects to determine suitability.

Typically, skilled e-business staff can be distinguished by their tendency to create optimal solutions by balancing risks and rewards to achieve the best possible solution for the task at hand. Such people typically demonstrate rapid delivery of projects in short timeframes, have up-to-date skills, are able to make fast and accurate decisions, and are able to learn new skills quickly. Frequently such staff members are also highly creative and dynamic, have strong problem-solving ability, and are able to create a fast and accurate solution from the business problem at hand. They are usually team players, as their motivation is derived from improving their knowledge and skills, not from competing with their own team members.

In contrast, staff who have spent years delivering a single project with large amounts of staff are typically indicative of a project that has run over time and budget, and should be avoided. Such staff members frequently come from highly structured environments within hierarchical organizations, with a focus on delegation of responsibility through hierarchical management processes, rather than making the fast and complex decisions necessary in successful e-business projects.

Therefore when making staffing decisions careful selection should be utilized to ensure the staff selected are well suited to fast moving implementation projects and have the broad skills necessary for successful e-business implementation.

When assembling an e-business project team, the most critical roles are typically the e-business technical architect, the project manager and the lead developer. Selecting these individuals requires an understanding of the aptitudes and abilities appropriate to each role.

The e-business technical architect

The e-business technical architect is the technical design authority for the project and is responsible for the design, selection and management of the implementation of the solution according to their detailed design. As this input constitutes the core of the project solution, the e-business technical architect is one of the most important roles within the project team.

To ensure project success it is therefore important to hire the services of an expert e-business technical architect with outstanding technical vision. This individual should demonstrate an in-depth and expert knowledge of all aspects of e-business solution selection, design and implementation including technology products, platforms, security, applications, networking, infrastructure and integration. They should also be able to evaluate these issues to achieve a solution that offers the best functionality and value for money for the company.

Therefore, the e-business technical architect should demonstrate a very technical and hands-on approach. This requires they be capable of implementing the systems they design such as installing servers and coding software, rather than just designing systems on paper for others to implement. Typically, they will have implemented complex e-business projects across different parts of the e-business lifecycle, and can work at a rapid pace to deliver projects in less than 12 months, with teams of fewer than 20 staff.

The e-business technical architect must also demonstrate understanding of the business issues facing a company, and the appropriate business uses for technology solutions. They should be used to having their designs externally audited, produce excellent documentation, have a passion for e-business and project success, and be comfortable mentoring other team members. They should also provide excellent references for past work.

As well as the skills listed above, an e-business technical architect should also possess a range of personal qualities to enable them to be highly effective in their role. These include being able to achieve goals on time and in accordance with their stated deliverables, being non-competitive and non-hierarchical, being able to admit mistakes, and being able to create a productive and honest culture. Other personal qualities include reliability, having excellent time management skills, being honest and a good communicator, and being prepared to accept responsibility and put themselves on the line for their decisions. Finally, they should possess high energy levels, have high intelligence and problem-solving ability, the ability to get on with others and work as part of a team, as well as demonstrating strong leadership to technical staff.

The project manager

The project manager also has a critical position within an e-business project. This role focuses on the organization and delivery of the project, and typically includes budget management responsibility for the project. The project manager must work closely with the technical architect and stakeholders from the company to ensure the project is on target for delivery.

To ensure project success the project manager must possess good technical ability and broad knowledge of e-business technologies and platforms, including a strong understanding of e-business concepts and terminology. The more technical the project manager and the more passionate they are about e-business, the greater the likelihood of project success.

The project manager must also understand project management techniques suited to e-business gained through delivery of previous projects with fewer than 20 staff within a 12-month period. They should also have experience with change management and risk management within these projects, and understand how to create a project offering value for money. As they work closely with technical staff, it is also vital that the project manager has a strong understanding of how to fit technology to business requirements and understands the requirements and motivations of technical people. They should therefore be able to follow the instructions of the e-business technical architect to support and resource the

technical staff in the course of their work. These skills should be supported with excellent references for their previous work.

A project manager should also possess specific personal qualities related to their position. These include being able to achieve goals on time, delivering on their stated intentions, and being reliable and punctual with excellent time management skills. They should also be non-competitive, flexible, non-hierarchical, and be a good communicator who gets on well with others. The project manager should foster an open non-blaming culture, and project honesty, leadership, and a focus on being a team player. They should therefore be able to admit mistakes and be prepared to put themselves on the line for their decisions. Finally, they should have high intelligence and strong ability to solve problems as they occur, and have a high energy level to drive the project to completion.

The lead developer

The lead developer is also a critical role in the e-business project. This role is responsible for providing specific technical expertise during the build and subsequent phases of the project, and for programming the solution designed by the technical architect. They typically lead other development staff and work closely with the technical architect.

To ensure project success, the lead developer should possess expert knowledge of all aspects of programming in the relevant development languages selected for the project. They must also be very technical, hands on, and understand multiple technology platforms and development technologies. Typically they will have broad experience gained through working on multiple e-business development projects, have worked in different industries, be used to working with fewer than 20 staff, and be accustomed to fast delivery of projects in under 12 months. They should be capable of producing excellent documentation and adhering to source code and change control procedures, and be able to demonstrate a passion for e-business development. Finally, they should be able to supply excellent references in support of their previous work.

A lead developer should also possess a range of relevant personal qualities, including being able to deliver work on time, delivering on what they say, and

being reliable and punctual with excellent time management. Other personal attributes include being honest and able to admit mistakes, being focused on their work, non-competitive, non-hierarchical and receptive to suggestions from others. The lead developer must be capable of working as part of a team, get on well with others in a non-blame-centred culture, and mentor other developers. They should also be prepared to put themselves on the line for their work, and have high energy levels, high intelligence, and good all-round problem-solving ability.

2.2 When to deploy project staff

Resourcing appropriate staff for an e-business project requires correct planning and timing for when to hire project and operational staff. This issue is critical to project success, as projects frequently run over time and budget through delays in hiring staff onto a project, hiring staff before they are required, or by hiring staff with inadequate skills during the project. In addition, hiring too many staff onto a project may also negatively impact the project through increased management overhead and an increased risk of hiring inexperienced or poor staff. This may also in turn increase pressure and conflict for expert skilled staff, who must monitor inexperienced staff to locate and rectify mistakes in their work.

E-business projects therefore benefit from smaller numbers of highly skilled staff, frequently restricted to no more than 20 staff members at each stage. However, some projects may require additional staff numbers, such as large content-based projects requiring additional content developers, or large-scale projects with considerable custom development that require additional developers. Staffing numbers can be maintained at appropriate levels by avoiding duplication of resources in the same role, especially duplication of the e-business technical architect, project manager, and lead developer. Instead, productivity should be increased by obtaining the best resource for each role, by avoiding hierarchy and political conflict in the project, and through the use of correct process and due diligence throughout the project.

In addition, staff levels can be managed by employing specific staff members only when needed for specific project phases, and by reducing staff levels as phases complete. This is depicted in Table 2.1.

Table 2.1 Typical project lifecycle staff matrix

Project phase	Internal operational staff	External project staff
Project planning	CTO/CIO Marketing director E-business director Operational director Project manager Other key stakeholders	E-business technical architect
Business and technical requirements	CTO/CIO Marketing director E-business director Operational director Project manager Business analysts Other key stakeholders	E-business technical architect Business analysts (if not available from within the company)
Solution research phase	Project manager Key stakeholders	E-business technical architect
High-level design	Project manager Key stakeholders	E-business technical architect
Audit	Internal auditor	External auditor
Detailed design	Project manager Key stakeholders	E-business technical architect
Build phase	Project manager Support staff Content publishers Key stakeholders	E-business technical architect Lead developer Application developers Product specialists Testing staff Graphic designer Web developers Usability expert Installation staff Technical project manager if required Integration specialists if required
Pilot installation and testing	Project manager Support staff Content publishers Key stakeholders	E-business technical architect Lead developer Application developers Product specialists Test staff Graphic designer Web developers Usability expert Installation staff Technical project manager if required Integration Specialists if required
Implementation	Project manager Support staff Content publishers Key stakeholders	E-business technical architect Lead developer Application developers Test staff Graphic designer Usability expert Infrastructure staff Installation staff Technical project manager if required Integration specialists if required
Handover	CTO/CIO Marketing director E-business director Project manager Operational director Support staff Content publisher Other key stakeholders	E-business technical architect Lead developer Installation staff

As new staff members are deployed into each project phase, it is recommended that they be assessed to determine if they have the aptitudes and abilities required for their role and function within the project environment and team. This trial assessment period should cover one to two weeks, with each team member required to deliver a set of outputs appropriate to their role. For example, the e-business technical architect should begin research and analysis of solutions early in the initial project planning phase, and produce preliminary versions of technical documentation. Similarly, the project manager should start work on the project plan, project scope and risk register as soon as they start.

In addition, trial assessment of outputs should include performance by staff members on tasks appropriate to their role, such as the installation and configuration of systems. If team members cannot perform such tasks, take a long time to deliver such tasks, or avoid making decisions around such tasks, they may have insufficient skills to deliver their elements of the project. This may in turn compromise the project through poor decision-making, lengthened timeframes, and increased costs. If staff cannot deliver appropriate outcomes, they should be retrained or removed, and new staff recruited.

2.3 Obtaining project staff

Operational and project-based staff can be resourced from three sources, including internally within the company, from self-employed contractors, or from external consultancy firms. Alternatively, projects may assemble a composite team from a combination of these three sources.

Internal staff members are typically recruited from existing internal divisions within the company, often via human resources departments. Self-employed contractors can be obtained via external agencies or through major online IT job sites. In addition, a wide range of consultancies can be used to resource a project through project outsourcing or by providing specific project member resources.

Consultancies are available in a broad range of sizes, including very large international firms, medium-sized firms, small firms often operating at a national level, and micro consultancies with a handful of staff. Consultancies frequently work together on projects to mitigate industry skill shortages and reduce the costs of maintaining large amounts of project-based consultants who need to have specific expertise. However, when working with all consultancies, a range of strategies should be employed to maximize the value obtained to ensure greater likelihood of successful project delivery.

Consultancies should be selected to ensure best fit with the project requirements, according to a number of criteria. Due to the complexity and high failure rates in e-business projects, it is important to hire a consultancy specializing in e-business projects and project staff. They should also demonstrate experience conducting similar projects successfully, and be prepared to provide contacts within previous clients to discuss their previous work.

The consultancy should also be dedicated to project-based work rather than operational support and be able to provide skilled consultants at the top of their field. It is advisable to check the quality of staff assigned to the project which may require meeting essential project team members and ensuring they will be dedicated full time to the project. It is also recommended that minimal amounts of administrative and non-technical staff be utilized on the project to avoid bureaucracy and diversion of resources into a delegation-type structure.

Companies should avoid consultancies that focus on coding and development and create poor quality high-level and detailed designs. This approach typically results in the creation of completely customized solutions with minimal use of commercial off-the-shelf technology, which in turn results in vendor lock-in for support contracts to maintain the ongoing viability of the solution. Such development-focused consultancies should therefore be avoided.

It is also recommended that where possible, only one consultancy be engaged to work on a project at a time. Projects utilizing multiple consultancies frequently incur considerable management overhead, and lead to political conflict and lack of accountability for project roles, responsibilities and deliverables. They also frequently lead to the selection and deployment of incompatible technology solutions, or solutions with high maintenance and support requirements, and may therefore seriously jeopardize project success.

Finally, the selection of a consultancy should be geared towards firms willing to create a strong and lasting working relationship that is beneficial to both parties. This ensures better results during the course of the project, and simplifies working together on future projects.

Companies should be prepared to pay a fair price for e-business resourcing services, as inexpensive bids or low hourly rates for staff are typically indicative of low levels of skill. Selecting such consultancies or consultants will typically lead to less competent staff being hired onto the project resulting in delayed projects, failure to achieve project objectives, and cost overruns.

Once a consultancy has been selected, a detailed understanding of project deliverables should be created and agreed by both parties before contracts are signed. It is recommended that a company hire a consultancy on a stage-by-stage basis, with the consultancy committed to single phases at one time. Each stage should then be successfully completed before giving signed approval for successive stages to ensure ongoing control over the project.

The agreement should also allow the company to maintain some control over the technical direction of the project to manage their risk and exposure to the consultancy. This may include conducting some preliminary technical work before engaging the consultancy, such as creating an audited design, to provide a detailed specification of project deliverables. In addition, the company should provide some project members who have an understanding of the business and technical requirements, such as their own project manager and e-business technical architect. This allows the company to reduce project risk by monitoring the progress of the consultancy and ensuring successful delivery against the requirements and design.

However, dividing project responsibility among in-house staff and a consultancy requires a strong degree of collaboration between all parties to prevent the project from failing due to political conflict. Therefore, special attention should be paid to the skill and personal attributes of such staff members involved in interacting with the consultancy.

Once a consultancy has been selected, contracts should be drawn up and signed by both parties. These should be simple, short and in plain English to enable all project staff to clearly understand the project terms and conditions. Penalties should be included if the actions of the consultancy cause the project to run over time and budget. However, contracts should be equitable for both parties to foster a beneficial working relationship. Payment should be made at the end of each project phase or set of deliverables, as this typically leads to better pricing from the consultancy.

Finally, the ongoing operation of the project requires regular meetings between the consultancy and senior stakeholders and technical staff. These are typically weekly and cover ongoing administration, technical planning and management. However, attention in such meetings should not be solely dedicated to problem resolution, as this may foster a negative focus on the working relationship between both parties.

Part Two E-business technology phases

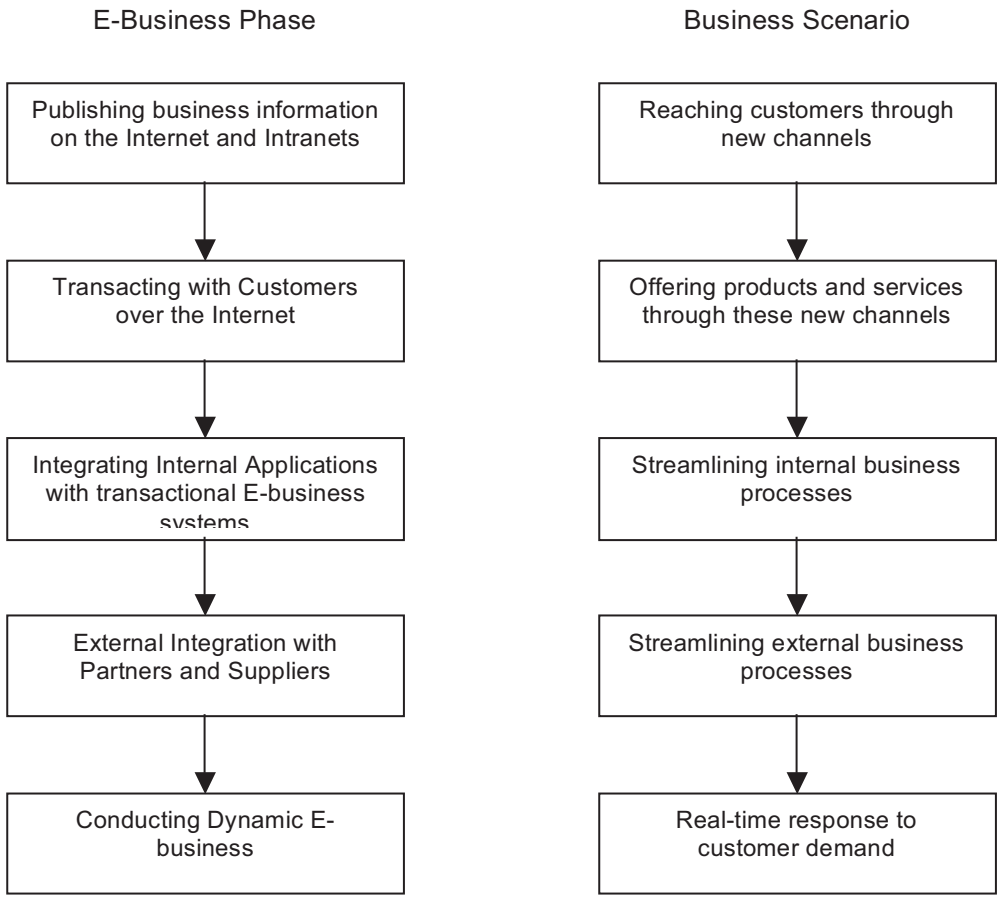
3 The five phases of e-business adoption

Successful e-business implementation requires a detailed understanding of the technology solutions appropriate to different business scenarios. This enables an e-business technical architect to research and select appropriate e-business solutions and designs for an e-business initiative.

A recent study by IBM (Seeley, 2001) surveyed 21,000 companies across the world to determine the extent of their adoption of e-business technologies. Results from this survey showed that companies adopted common sets of e-business solutions corresponding to a range of business scenarios.

The study classified e-business solutions into five phases, comprising an e-business lifecycle. This lifecycle follows a company's progression from adopting e-business technology to reach more customers in a more efficient manner through to the final goal of optimizing all internal and external systems and processes to respond in real time to the changing demands of customers (Seeley, 2001). This progression through the five phases of e-business adoption is depicted in Figure 3.1.

Figure 3.1 The e-business lifecycle



The e-business lifecycle starts with Internet publishing, where the company gains a presence on the Internet through publication of marketing and corporate materials, and uses internal Intranets to publish corporate information to staff. Internet publishing also includes the use of corporate portals to simplify publishing and includes information from corporate applications, and the use of content management systems to create and manage large volumes of rapidly changing content for distribution to multiple channels. This phase allows a company to realize new channels to communicate with customers and their own internal staff, and achieve considerable savings from shifting the presentation and distribution of information from paper-based forms to Internet-based content.

As a company gains more experience and understanding of the benefits of

e-business technologies to reach new channels, they progress to using these channels for transacting business directly with their customers. These transactions typically take the form of providing existing and new products and services.

The transaction phase is then extended to the internal application integration phase. This phase focuses on deploying Internet technology further into the business to realize efficiency gains within existing internal processes. Disparate corporate systems are integrated to automate transactional processes required for online transactions, such as account settlement and invoicing. Integration is also pursued to improve the speed and efficiency of internal processes to make the company more efficient and productive, and hence more competitive. Internal integration is also used to integrate companies during corporate acquisitions and mergers.

The fourth phase focuses on integrating internal corporate systems with external partners and suppliers to achieve further efficiencies in areas such as order processing, invoicing and fulfilment. This phase seeks to realize greater corporate efficiencies and savings through refinements to internal processes and external interactions with partners and suppliers.

Ultimately, the company seeks to become completely responsive to customer demand through the ability to conduct dynamic e-business. The aim of this fifth phase is to achieve a tight focus on the needs of the customer by synchronizing changing customer demand with internal processes and external partner and suppliers to better meet changing customer needs.

However, IBM discovered that over 80 per cent of the 21 000 companies surveyed were still in the first two phases of e-business. In addition, EAI Journal (Editorial, 2001) reported the results of a survey by Hurwitz of 600 enterprises, which found that only 10 per cent had integrated their most mission-critical business processes, and 45 per cent had not started an integration strategy. The results from these surveys indicate there is still considerable scope for the adoption of advanced e-business technologies within business.

The following sections discuss these five phases of e-business adoption. Each section introduces the set of interrelated issues required for implementing e-business at each stage of the e-business lifecycle. These issues include the business background motivating adoption of each e-business phase, the benefits

of adopting each phase, the critical technologies comprising each phase and the features and functions required when selecting products for each phase. The discussion of each phase also includes high-level designs pattens, the key benefits and limitations of the technologies, and finally, common vendors offering products suitable for deployment in e-business projects in each phase.

4 Phase 1: Internet-based e-business publishing

Internet-based publishing is the first phase of the e-business lifecycle. This phase involves a company providing corporate and marketing information to customers over the public Internet and through Intranets to their own staff on private internal corporate networks.

The benefits of Internet and Intranet-based e-business publishing include providing companies with a simple and inexpensive mechanism for information distribution to their target audience of customers, partners and suppliers, and internal staff. In contrast to most traditional channels Internet and Intranet e-business publishing has the ability to reach a widespread audience, and allows information to be created and published online considerably quicker than traditional means. It can also reach a much larger audience for less cost, and removes the high cost of creation and distribution of paper-based publishing methods.

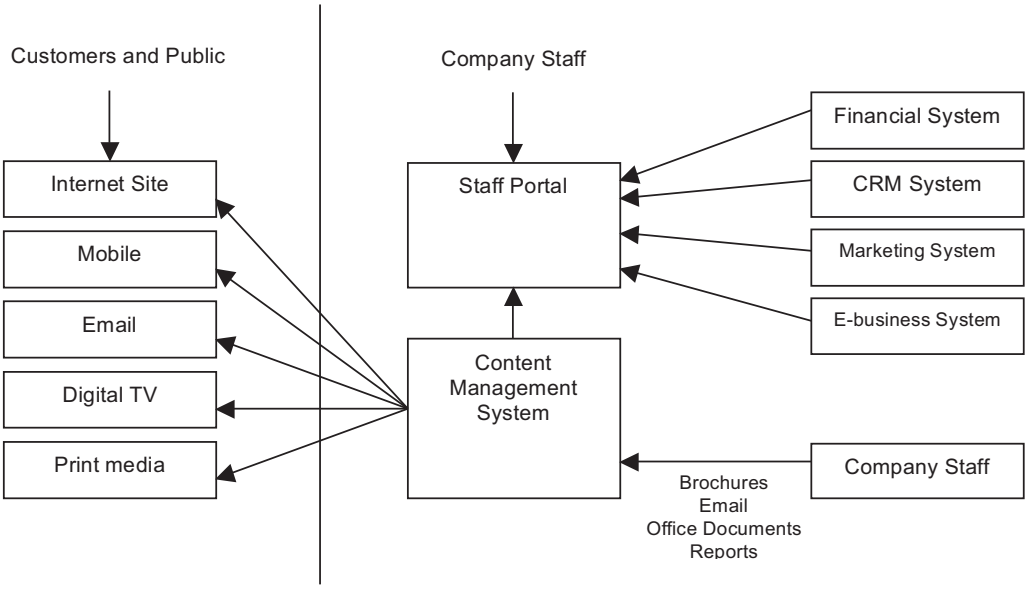
Content published online can be targeted to reach multiple audiences through different channels such as mobile phone or digital TV with minimal changes. It can also simultaneously reach audiences locally, nationally and internationally. Additional functionality can be added to published information to provide business benefits beyond traditional media, such as searchable telephone lists, or online training systems. Correcting and updating Internet-based publications is also quicker, simpler and much more affordable than traditional publishing mechanisms.

Internet and Intranet publishing can also be used to augment existing manual publishing processes. For example, paper-based company reports are required by regulatory authorities to be sent to shareholders. Such documents can be

published on Intranets and Internet sites in addition to their printed form, thus reaching a much wider target audience. Additional financial statements or environmental compliance reports can also be made available to groups who would not normally receive such information but who may have an interest in it. This then assists a company in maintaining a public presence and brand.

For example, a company publishes large volumes of information to customers via multiple channels, including mobile, email, an Internet site, print and digital TV, on new products and services. Internal staff require access to this information, as well as staff-specific internal content such as product development plans, company newsletters, staff phone directories, and customer service information from across the business. This information must be accessible from financial systems, marketing systems, CRM systems, and e-business systems. This publishing process is depicted in Figure 4.1.

Figure 4.1 Internet-based e-business publishing



In the preceding example, the company utilizes a content management system to provide customers with changing content across all channels. An internal portal system provides employees with this content from the content management

system, and customer and other business information from multiple internal sources. This provides customers with the content they require and staff with information required for their jobs from all areas of the business.

4.1 Key technologies used

In order to publish content online, companies require a solution capable of creating, managing, and delivering content in multiple formats to internal staff and externally to customers and suppliers.

Internet – and Intranet-based publishing involves assembling information from different sources, transforming it into Internet-ready content, transmitting it to users, and displaying the content. This process is depicted in Figure 4.2.

Figure 4.2 Online publishing process

Each step in this process relies on a set of common, freely available standards and technology components that define the Internet.

The Internet was initially developed in the 1960s to connect researchers between universities in the USA, with participation and sponsorship from the Defense Advanced Projects Research Agency (DARPA) now called ARPA. This early system consisted of multiple interconnected networks running different data transport protocols. As networks expanded and multiplied, a common protocol was required to ensure all participants could communicate using the systems available at that time, including email, shared files, and remote computing resources access systems. This led to the evolution of the TCP/IP networking standard, and its widespread adoption in the 1980s.

Defining the standards responsible for the fundamental infrastructure of the Internet occurs through submission of proposals to the Internet Engineering

Task Force, a non-profit body responsible for network and infrastructure standards on the Internet. This group votes to accept new standards based on technical merit, with standards published through freely available RFC (Request for Comment) documents.

Through this process, researchers gradually added additional services on top of the TCP/IP transport protocol, such as the World Wide Web system invented in the early 1990s by Tim Berners-Lee at the CERN-institute in Switzerland. This system described a simple mechanism for the transport and display of information across TCP/IP network, using the Hypertext Transport Protocol (HTTP).

The HTTP protocol was designed to transport 'Hypertext' documents, written in the HTML display language. HTML, derived from the high-end SGML language (Standard Generalized Mark-up Language) provided simple 'tags', or annotations within documents to describe how document content should be displayed. Special tags pointed to other related documents, creating an interconnected 'web' of documents, hence the name World Wide Web. The web browser, a software application dedicated to rendering HTML content on screen, then handled display of the document content. Transport of HTML documents to web browsers utilised the services of simple web server applications, dedicated to serving pages via the HTTP protocol.

In contrast to other content display and transport systems, the HTML/Hypertext system was designed to be independent of underlying operating systems and platforms, and accessible from any connected network. This resulted in a simple and affordable system for providing information, and led to the rapid uptake of Internet technologies by business following popularization of the Netscape Web browser by Netscape Communications Corporation in 1994.

HTML documents also offer the ability to include non-textual content within the document, such as images and sound. Common image formats include the GIF (Graphics Interchange Format) and JPEG (Joint Photographic Experts Group) formats. Common audio formats include MP3 (Motion Pictures Expert Group Audio Layer 3), and video formats include the MPEG 2 and 4 (Motion Pictures Expert Group Layers 2 and 4) formats, AVI and Windows media, and Apple QuickTime formats.

Subsequent developments of content standards are overseen by the World Wide Web Consortium (W3C). In a similar process to that used by the IETF, this group assesses and approves recommendations for new Internet content standards. Once approved, these new standards are made available to individuals or companies free of royalty payments. Vendors can then implement these standards

within their products, resulting in a broad base of compatible products from many vendors. This results in increased competition within the industry and the delivery of higher quality products. It also ensures consistency and compatibility between competing products.

In addition to these standards and applications, Internet-based publishing relies on the content searching function provided by search engines. Search engines allow users to locate content either in Intranet systems, on Internet sites. The search engine locates and classifies the content, and creates a summarized index of all content attributes such as date created, author, type of document, size and location, contents of document. Users enter search queries into the search engine, which searches through the index for all occurrences of the search query and returns the relevant page and its link.

4.2 Types of publishing systems

Three different technology solutions have evolved to provide online publishing functionality, with each solution targeting different publishing requirements. These include custom Internet and Intranet publishing systems, corporate portals, and enterprise content management systems. Each system is differentiated by the mechanisms they employ to manage different forms of content, which include static and dynamic application-based content. Static content typically includes largely unchanging written content or images presented as a series of pages. Dynamic application-based content consists of information sourced from data stored and maintained within enterprise applications.

Custom Internet and Intranet systems were the first online publishing systems used. They systems are assembled from web servers, tools to create and manage HTML content, and manual processes required to publish content. Such systems provide simple functionality for creating, managing and displaying static content. Custom Internet and Intranet systems are generally suitable for businesses with small amounts of static page-based content that changes infrequently. These solutions are generally unsuitable for the display of application-based content, as this requires considerable additional customisation to integrate with enterprise applications, and is more suited to a commercially available portal product.

Portal systems evolved to address some of the limitations of early custom Internet and Intranet solutions, such as heavy reliance on error prone manual site publishing processes. Portals automate these processes within a single product, and allow a company to efficiently aggregate and display large volumes of static

and application-based corporate information. This information is displayed to Internet and Intranet – users as customizable elements within a web browser interface. Portal systems are suitable for businesses where employees require Intranet access to large volumes of application-based corporate information, and large volumes of static page-based information that undergoes a moderate degree of change. They are also suitable for Internet sites where customers require large amounts of static page-based content and some application-based content with a moderate degree of change. If this content is undergoing rapid addition, deletion or modification, the portal system should be integrated with a dedicated enterprise content management system.

Enterprise content management systems address a different set of publishing requirements, centred on storing and displaying huge volumes of rapidly changing content. These systems evolved from early document management systems that were designed to scan, store and manage documents, removing the need for paper-based business processes. They were then extended to support multiple document types and manage rapidly changing content within Intranets and Internet sites.

Content management systems are suitable for custom Intranets and Internet sites where employees and customers require access to large amounts of rapidly changing of static page-based content, but no application-based content. They are also suitable for integration with portal systems to support large volumes of rapidly changing static and application-based content. If large volumes of transactional e-business or very high volumes of application-based content are required on an Internet site, integration is typically required with enterprise application integration technologies.

4.3 Custom Internet and Intranet publishing systems

Internet sites are comprised of linked HTML pages of related content, such as descriptions of a company's products and services, and public company information. Internet systems allow companies to reach their customers and suppliers with relevant information in an affordable and simple manner. They also provide a convenient central point for information distribution and management, allowing a company to maintain a consistent public image and brand.

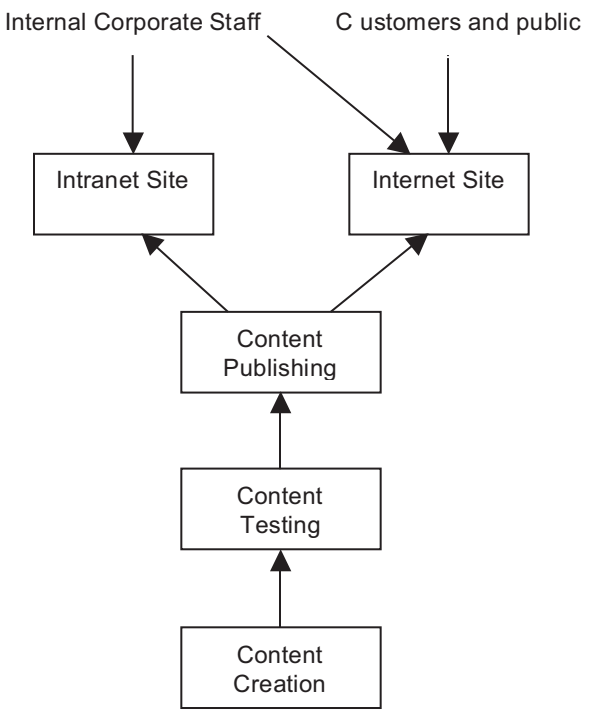
In contrast, Intranet sites consist of a similar system, but with content specific to the needs of internal staff. Intranet sites are available to staff within the company over their internal private networks, and provide a centralized

source of corporate information.

Custom Internet and Intranet systems are designed to satisfy the online publishing requirements of small – to medium-sized volumes of content, or for companies wishing to experiment with this medium on a small budget. They provide a quick entry into e-business publishing and are very affordable and simple to create with the skills required to create such systems and publish content readily available. Content can be published to either system depending on the nature of the content and its intended audience. Typically companies restrict Intranet content to internal use only, while public content is for Internet use.

For example, a company maintains an Internet site for customers and an Intranet site for staff. Content is authored using a number of tools, tested to ensure it is correct and displays correctly, then published to the appropriate Internet or Intranet site. Users connect to either site and browse content by following links, or alternatively by searching for content. This process is depicted below in Figure 4.3.

Figure 4.3 Internet and Intranet publishing process



In the preceding example, content is created from corporate information sources such as internal reports, and authored into Internet formats and linked into a series of content pages. The content is then tested to determine that it will display properly, and published to the appropriate Internet or Intranet site. Internal staff can view either site, while customers and members of the public are restricted to the Internet site.

4.3.1 Key technologies used

Custom Internet and Intranet sites utilize core Internet components including web servers designed to service HTTP requests for HTML content, web browsers for content display, and sets of tools to publish content in the different Internet content formats, such as HTML editors to create and manage pages. Sites should also include search engines to allow users to search for relevant content.

What to look for in online publishing products

Online publishing products require support for a structured site creation process. This includes steps for the creation of site content, content testing, site management, and site publishing.

Creation of Internet and Intranet sites progresses from an initial site layout template. The template details the major categories of content to be displayed on the site, and is structured as a hierarchical layer of pages grouped by topic. The home page, represents the first page on the site a visitor will encounter, and must therefore display all the content areas in a simple and readily accessible form. Often this page will include frequently changing topical content to maintain user interest and encourage repeat viewing. Successive layers of the site structure guide site visitors to different areas of content, with cross-links to other site areas. This allows users to browse content in an efficient and fast manner.

It is recommended that a site usability expert should be employed to create the site layout template and website content. This role involves guiding development of the site to ensure that content is manageable and easy to find for users, and that customers have a positive experience when visiting the site and are therefore more likely to return.

The site layout is populated with content using content creation tools. These include HTML editors, with the ability to create site pages, embed images in pages, and create links to audio and video content. Images, audio and video require initial formatting into the correct Internet standard formats using image, sound or video manipulation tools. This process also ensures that the files are optimized so they load quickly into a user's browser.

The HTML editor should include site management functionality, to facilitate maintenance of the site layout. This tool maintains a database of the site structure, page content and assets (including images, audio and video files), and the links between pages. If a page is moved within the site, the site management system restructures each page to accommodate the change. This dramatically reduces the amount of manual changes required when alterations are made to the site, and minimizes errors in content. Advanced products will also assist in managing the complete website production process, including providing team-based collaboration and communication, and file management facilities.

Once all pages are complete, the site is published to an Intranet or Internet web server using file transport systems such as the File Transfer Protocol (FTP) or WebDAV (Distributed Authoring and Versioning). Publishing to a web server may be supported by additional functions such as site management engines, and integrated search engines. In addition, delivery of video content may be provided through specialist web servers supporting real-time delivery, or streaming, of video and audio.

Web servers may also include support for scripting languages, which are used to provide interactive functions in the sites. These typically include functionality such as serving content in multiple languages to users from different countries. Site scripting systems also allow sites to be connected to database back-ends to provide a simplified, structured mechanism to store site assets and content. This also allows for simplification of the publishing process. As page links are contained as references within the database, and not encoded within each page, changes to site structure do not require manual changes within each page. Common dynamic scripting languages include the simple PHP (Personal Home Page) system designed for websites, PERL (Practical Extraction and Reporting Language), a highly advanced scripting language ideally suited for processing textual information, and the JSP (Java Server Pages) and ASP (Microsoft Active Server Pages) scripting systems.

Web servers can also be extended through the addition of software written to support web server-programming interfaces. These interfaces allow web servers

to provide additional automated functionality, such as online forms to solicit customer feedback. Common web server programming interfaces include the advanced Java Servlet standard, or proprietary programming languages such as the ISAPI (Internet Information Server Application Programming Interface) and NSAPI (Netscape Application Programming Interface) standards.

Internet and Intranet systems must also include management and administration functions to enable the capture and reporting of site usage statistics. These typically involve additional applications that read web sever log files and generate reports on the nature of user accesses to the sites. This information is invaluable in determining the usage patterns of customers, and hence optimize a site to better suit their needs.

Finally, Internet and Intranet search engines, available as part of the web server or as standalone servers, should provide the ability to search all content types on the site, including HTML pages and downloadable content such as Adobe PDF or Microsoft Word files.

4.3.2 High-level designs of Internet and Intranet systems

Designs for Internet and Intranet systems must provide availability and scalability to ensure continual content provision, and to support content creation and management processes.

Availability and scalability are provided using one – or two-tier web architectures. One-tier architectures feature deployments of single web servers, with reliability features such as RAID 5 storage systems to preserve operation of the system in event of disk failure, and error correcting memory to minimize system downtime resulting from memory failure. Scalability is provided by a combination of multi-threaded web servers and multi-processor server hardware.

Two-tier architectures extend the previous one-tier design to include a back-end database for reliable and scalable storage and generation of site content. Additional availability and scalability features include the use of database clustering for higher performance and fail-over support.

The scalability and reliability of either architecture can be extended using network load balancing of multiple web servers. This requires extension of content publishing to all servers simultaneously, with identical content stored on each server.

High-level designs must support the e-business content publishing process, from authoring to testing to deployment. Once site developers have authored content, it is placed into a development environment, which is a copy of the live Internet or Intranet system used for developing new content and features.

Content is previewed in the development environment to ensure it functions correctly, and then migrated to a staging environment. This environment is identical to the development environment, but used by business staff responsible for the sites for viewing, testing and approving Internet and Intranet content. This enforces a change control process to ensure that only correctly functioning and approved content is made available to end users. It also allows for separate development of advanced functionality, such as online forms, to minimize potential impacts on live systems.

Once content has been approved, it is migrated to the production environment to become 'live'. Users then access the production server to view the new content. Access to development and staging servers is prevented for casual users to maintain the security of unapproved content.

Limited security can be enforced within the design using access control lists (ACLs) on the web server. These restrict user access to regulated content by prompting users for their username and password. Security of content in transit between a user and a web server can be assured using SSL technology to encrypt all communication.

All designs require an understanding of hardware, network and DNS design issues, and network, host and application layer security. For a detailed discussion of these issues, see part three.

The following designs depict online publishing systems for one-tier corporate Internet and Intranet sites, and two-tier database driven Internet and Intranet sites. Each design includes the ability to support extension through additional functionality, including facilities such as automatic content migration, search engines, and advanced dynamic content types such as online forms.

High-level design for one-tier Internet and Intranet publishing solution

A standard design for a combined corporate Internet and Intranet site is depicted in Figure 4.4. This design is suitable for small to medium sized static page-based content requirements, and is capable of supporting web server and

search engine software from different vendors.

This design incorporates development and test servers within the corporate network, an internal Intranet server, and an Internet server within the De Militarized Zone (DMZ) for secured public access. The DMZ restricts external user access by allowing access to the production web server while denying access to internal corporate systems.

Content is created on development servers and migrated to staging servers for testing. Once approved, content is migrated to the production Internet or Intranet web servers. Migration to the Internet site may require additional network ports opened on the firewall to allow one-way traffic between the Internal and DMZ networks from the staging to live servers.

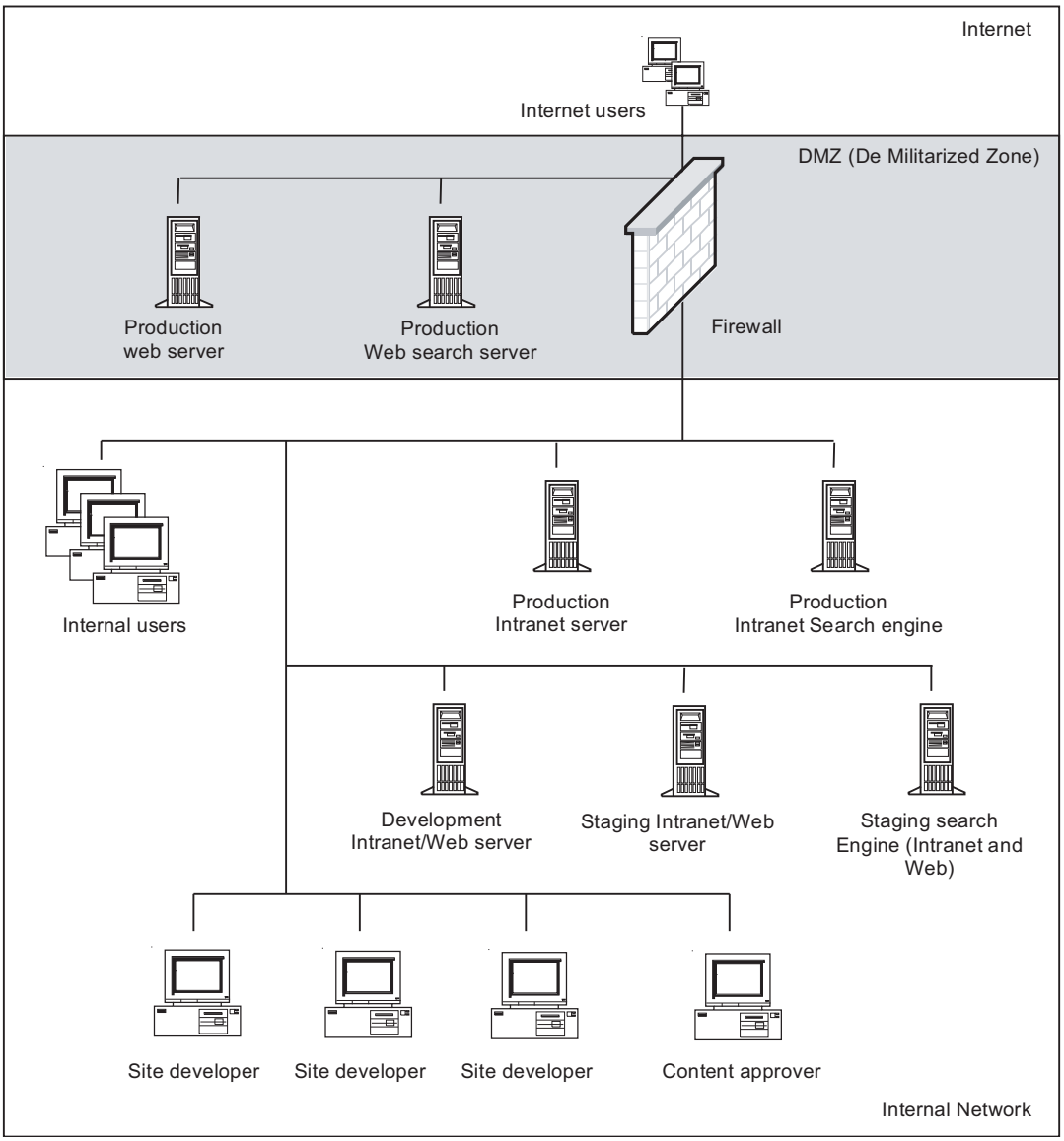
An Internet search engine for indexing and searching the Internet site is located on the DMZ, with a similar Intranet search engine located on the internal corporate network. A single staging search engine is required for staging Internet and Intranet sites hosted on the corporate internal network. A development search engine is not required, as site developers rarely require this functionality. It is recommended that live web servers be deployed with live search engines on separate hardware, as search engine content indexing can seriously impact web server performance.

All Intranet servers are located within the corporate network behind the firewall. Although these servers are not exposed to the public Internet, they should be configured with standard high security features in the event that they are shared with partners and suppliers through a private Extranet. In such circumstances, the servers participating in the Extranet should be placed within a separate DMZ network.

Note that development and staging servers can incorporate both the Intranet and Internet sites on the same hardware through a process known as multi-homing. Multi-homing is supported by all major Internet server software products, and allows for consolidation of sites and the elimination of redundant hardware. When deploying multi-homed sites, it is recommended that each site utilize the same server IP address, to minimize waste of IP addresses. This also simplifies DNS records and DNS management, and permits simple future migration of sites to new server technologies.

The combined Internet and Intranet design is depicted in Figure 4.4.

Figure 4.4 High-level design for combined Internet and Intranet one-tier e-business publishing system



High level design for two-tier Internet and Intranet publishing solution

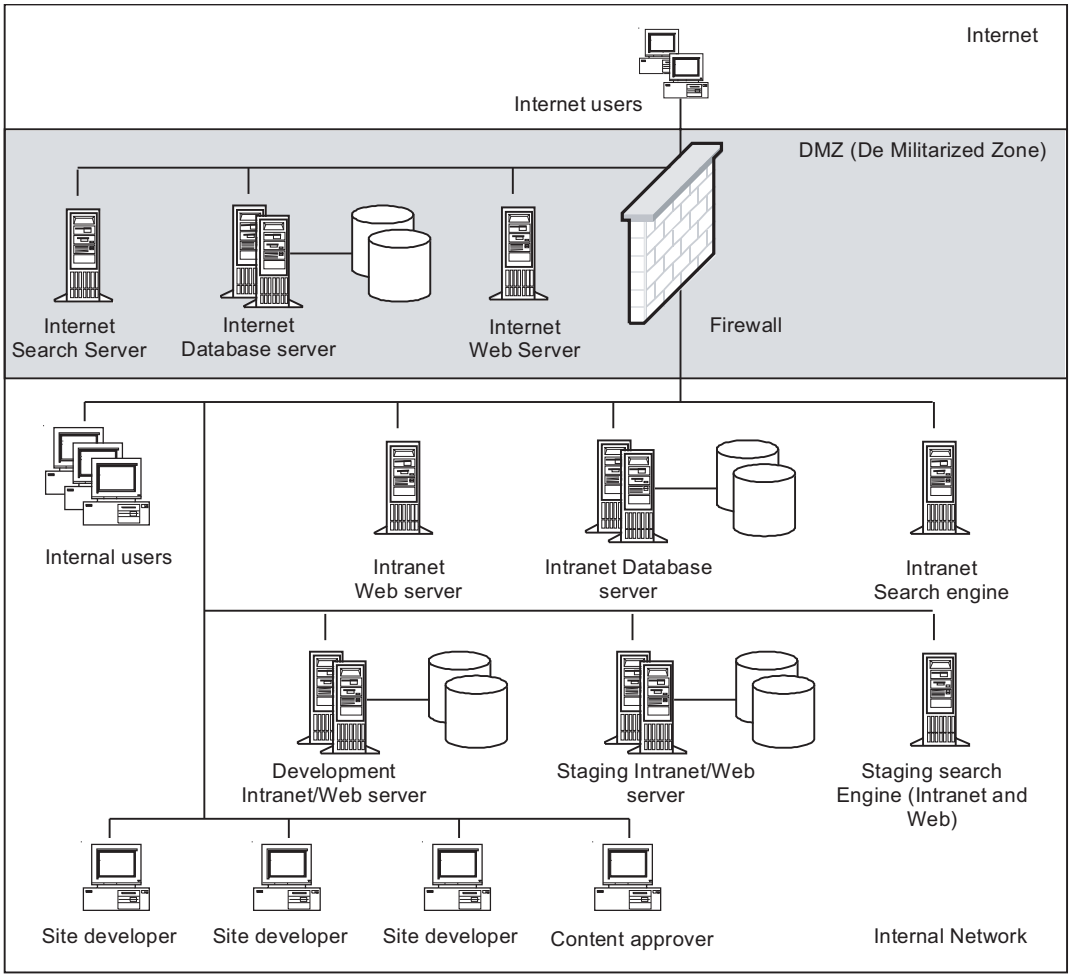
This design extends the one-tier Internet and Intranet design depicted above

using a two-tier web architecture for Internet and Intranet sites. This design includes an additional tier used to store site content within a database for retrieval in response to user requests.

As with the preceding designs, this configuration utilizes multi-homing to locate development and staging Internet and Intranet sites on the same systems. In addition, development and staging environments consolidate the content database within the same server to minimize unnecessary infrastructure, as they do not typically experience high-performance demands compared to the live systems.

The two-tier Internet and Intranet design is depicted in Figure 4.5.

Figure 4.5 Dynamic Internet and Intranet online-publishing e-business system



4.3.3 Benefits and limitations of Internet and Intranet publishing solutions

Custom Internet and Intranet publishing systems offer affordable and simple technology to create and publish static content. They typically have minimal hardware and software requirements, and can be extended to support advanced functionality, such as search engines or online forms.

However, these systems suffer from a number of limitations such as lack of control over content, including lack of document versioning, automated authoring and approval workflow processes, and the ability to automatically convert documents into multiple publishing formats. Therefore, as the volume of content, its rate of change, and site complexity increase, the manual site creation and maintenance processes create a bottleneck for publishing and maintenance.

Using site management tools may alleviate some of this bottleneck, but as content volumes increase the costs and features of advanced software such as portal systems and enterprise content management systems typically outweigh these limitations. Portal and content management systems also dramatically reduce the number of errors in the content production process.

In addition, larger companies typically require that staff from several divisions publish content online. Using custom Internet and Intranet systems limits the ability to distribute this publishing function throughout the company, due to the need for specialist online publishing skills. This function is normally held within a specialist-publishing unit with the required expertise, which can become a bottleneck for large volumes of rapidly changing content.

Custom Internet and Intranet systems also frequently prove inadequate for accessing and displaying application-based content. This typically requires considerable customized development effort to extend Internet and Intranet software, using proprietary web server development interfaces such as NSAPI, ISAPI or Apache modules. This approach results in 'fragile' systems that must be manually altered to compensate for changes to internal enterprise applications. In contrast, vendors typically maintain their portal products to remain current with enterprise application integration solutions and enterprise applications such as CRM or ERP systems.

4.3.4 Vendors of Internet and Intranet software

Table 4.1 lists software products used in Internet and Intranet e-business publishing systems. It should be noted that due to the large number and complexity of vendors available, this list is not exhaustive and should be used as a guide only before detailed product research is undertaken.

Table 4.1 Vendors of Internet and Intranet publishing products

Vendor	Internet and Intranet publishing products
HTML editors	
Adobe	GoLive
Macromedia	Dreamweaver MX
Microsoft	FrontPage
Image editors	
Adobe	Photoshop, Photoshop Elements
Corel	CorelDraw Graphics Suite
Macromedia	Fireworks
Open Source	GIMP (GNU Image Manipulation Program)
Site management	
Adobe	GoLive
Macromedia	Dreamweaver MX
Browsers	
Netscape	Netscape Communicator
Microsoft	Internet Explorer
Omni Group	OmniWeb
Opera	Opera
Web servers	
Apache Group	Apache Web Server
iPlanet	iPlanet Enterprise Server
Microsoft	Internet Information Server (IIS)
Search engines	
AltaVista	AltaVista Enterprise Search
Autonomy	Autonomy
Inktomi	Inktomi Search Engine
Verity	Verity Search Engine

4.4 Portal systems

Portal systems are integrated online publishing solutions, which typically contain most of the functionality required for publishing static and application-based content