Developing Effective Corporate Business Web sites

By

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September 2000
Abstract

With the explosive growth of the Internet, electronic business stands poised to change the way the world does business. To survive and thrive in the new economy, businesses both large and small need to have a presence on the Web. However, it is no longer enough to just have a presence on the Web, one must make sure that the Web site is working. To design effectively working Web sites, Web designers must take advantage of the most efficient and effective technologies that are revolutionizing the Internet. This paper discusses the various ways web technology can be used within large companies to improve communication between organizations and their employees, customers, and suppliers. In addition, a description of the technologies that have evolved in response to web design in the short period (HTTP, HTML, CGI, JavaScript, XML, XHTML) will be provided, including the latest trends in e-business and e-commerce as benefactors of Web design. Finally, a brief description of my organization’s Web site will be presented.
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Introduction

A small software development center had decided to rely heavily on its Web site for the launch of its business software process improvement (BSPI) initiatives. The organization selected one of its best designers to execute the site from the ground up. The site looked terrific from a design perspective, so the manager of the center was happy. But the quality and test manager was not convinced that the site was doing what it was supposed to do, so he convinced the development manager of the center to conduct an analysis of the site. The development manager commissioned the quality and test manager, an experienced professional to spearhead the effort as coordinator of business software process improvement. When the quality and test manager took over the BSPI activities, one of his first tasks was to analyze the effectiveness of the BSPI Web site. Although it appeared that the site was generating a good number of hits, it seemed that people were spending very little time on the site.

The quality and test manager wondered why, so he took a closer look at the site from every angle. It didn’t take him long to figure out the problem – the site was very rich graphically and crowded with images. Large, sophisticated graphics took a long time to load. Above all, the site was difficult to navigate. The worst aspect of it was, when the quality and test manager found out what the center had spent for the Web site, he nearly fainted.

The quality and test manager made the obvious but painful decision, he trashed the whole BSPI site and started over again, this time with usability objectives in mind. He took it upon himself to design a clean and simple site with modular graphics that would load quickly. Graphic links were kept to a minimum, with text links predominating. Offers to download best practice templates and procedures were very prominent on the home page.
The impact has been enormous. Not only has traffic increased, but also visitors are staying on the site an average of three to six times longer than before. The Web site has quickly become a major medium for the remote software development center to advertise its capabilities to the rest of the company’s business units. The quality of the software engineers’ use of best practices is improving monthly, and the redesign of the site cost a mere fraction of what the original fancy design had cost.

Although the short scenario described above (which by the way is a true story) had a happy ending, it is a lesson for those who design Web sites first and then ask tough marketing questions later. The main draw of the Web is the way in which the information is presented. The best Web sites integrate graphics, hypertext links, and even video and audio. They make finding the information interesting, fun, and intuitive. Because its hypermedia presentation style can overwhelm its content if done poorly, the Web is a real challenge to developers. But when done well, the results are fantastic.

In this paper, I will discuss briefly the history of the World Wide Web, the evolution that has occurred in Web design from plain static web pages to dynamic web pages. The paper will further discuss the various ways web technology can be used within large companies to improve communication between organizations and their employees, customers, and suppliers. In addition, a description of the technologies that have evolved in response to web design (HTTP, HTML, CGI, JavaScript, XML, XHTML) will be provided. And finally, a discussion of my organization’s business software process improvement Web site will be provided.

Throughout this paper, the convention that will be used is that the first letter of the word "Web" is capitalized only when referring to the World Wide Web. Webs on private networks are referred to as "webs," with a lowercase "w".
Although one does not need to know every term that’s used to describe the Internet to be able to understand and develop on the Web, an understanding of a few key terms will be helpful to better understand business Web design issues.

**Definition of Terms**

**Internet**

*Internet* (interconnected networks) is the worldwide network of computers connected by TCP/IP (the suite of protocols that provides the infrastructure of the Internet) and other internetworking protocols (Webopedia, 2000). This definition deserves some explanation so let me expatiate on the definition. In the mid-1970s, the various branches of the defense establishment – Army, Navy, and Air Force were on the ARPAnet, the forerunner of the Internet. However, each of the government agencies was running on its own network developed for their project by the lowest bidder. For example, Digital Equipment Corporation (DEC) developed the Army’s system, the International Business Machine (IBM) built the Air Force’s system and Unisys built the Navy’s system. All of these networks were capable but they could not communicate because they all spoke different languages. To make them talk to each other, what was needed was a set of networking protocols that would tie the disparate networks together to enable them communicate with each other.

In a paper titled “A Protocol for Packet Network Internetworking” published in 1974 by Vinton Cerf and Bob Kahn, the authors described a design that would solve the problem. So in 1982, the solution proposed by Cerf and Kahn was implemented as *TCP/IP*. The TCP portion (Transmission Control Protocol) of the TCP/IP is responsible for verifying data transmission between client and server. It ensures that data is not lost. If data is lost or scrambled, it retransmits the data until the errors are corrected. The IP portion (Internet Protocol) of the TCP/IP handles the
movement of data from one node to another. It is responsible for decoding addresses and the routing of data to specified destinations. The IP is what creates the network of networks or Internet by linking systems at different levels (Brown et al., 1996).

**Intranet**

One definition of *Intranet* is “as a network connecting an affiliated set of clients using standard Internet protocols, especially TCP/IP and HTTP” (Internet.com, 1999). In other words, when a server is setup to run a Web site over a local area network (LAN) or corporate wide area network (WAN) without connecting it to the outside world at all, we say that we have an Intranet. In this scenario, only those connected directly to the LAN/WAN are able to access the pages on the server.

Intranets (IP-based network of nodes) may be placed behind a firewall, or behind several firewalls connected by secure, possibly virtual, networks. An internal web comprises all HTTP nodes on a private network, such as an organization's LAN or WAN. If the organization is a corporation, the internal web is also a corporate web. These internals are only logically "internal" to an organization. Physically they can span the globe, as long as access is limited to a defined community of users.

**World Wide Web**

The *World Wide Web* (WWW) or the Web for short, is the portion of the Internet that consists of linked HyperText Markup Language (HTML) pages. The WWW uses three new technologies – a markup language (such as HTML, XML, XHTML, and others) used to write Web pages, a Web server computer that uses HTTP (hypertext transfer protocol) to transmit those pages, and a Web browser client program which receives the data, interprets it, and displays the results (Brown et al., 1996).
A Web site is a server computer that makes documents available on the World Wide Web. Each Web site is identified by a hostname, which is the unique name that identifies each Internet site, e.g. www.yahoo.com. Another way to look at a Web site is as a site (or location) on the World Wide Web that contains a home page, which is the first document users see when they enter the site. The site might also contain additional documents and files. Each Web site is owned and managed by an individual, company or organization.

Overview of the World Wide Web

History of the Web

To help understand the Web, it might be helpful to present a little history of the World Wide Web. The genealogy of the Web probably dates back to 1945 when the concept of interactive conferencing was first proposed in an article titled “As we may think” in the Atlantic Monthly. In that paper, Vannevar Bush who was then the science adviser to President Roosevelt, wrote about the Memex, a device (based on microfilm) for storing vast amounts of documents in a single desk, with mechanical aids for finding, organizing and adding to the repository.

At the height of the cold war in the late 1950s, the Department of Defense (DOD) began worrying about what would happen to the nation’s communications system in the event of an atomic war. President Dwight D. Eisenhower became convinced about the need for the Advanced Research Projects Agency (ARPA) after the Soviet Union’s 1957 launch of Sputnik. ARPA brought together some of America's most brilliant people, who developed the United States' first successful
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satellite in 18 months. Several years later ARPA began to focus on computer networking and communications technology (Gromov, 2000).

Progress continued in 1962 when Paul Baran, a researcher at the RAND think tank proposed a solution to the problem of the nation’s communications system being knocked out in an all-out nuclear war. His solution was to build a nationwide system of computers connected together in a decentralized network so that even if one or more major nodes were destroyed, the remaining nodes could dynamically adjust their connections to maintain communications (Brown et al., 1996). That same year, Douglas Englebart built his "NLS" system, which used digital computers and provided hypertext email and documentation sharing, and in 1968, Ted Nelson coined the word "HyperText”.

In 1969, ARPA funded the first packet switching (a method of breaking up data files into small chunks called packets, which can then be transmitted to another location) network called ARPAnet, leading to the Internet. Initially, only four research facilities were linked to ARPAnet – the University of California at Los Angeles (UCLA), the Stanford Research Institute (SRI), the University of California at Santa Barbara (UCSB), and the University of Utah (Brown et al., 1996).

Although ARPAnet was originally conceived to connect research centers for data exchange, it was later adopted for military purposes. Its main characteristic was the automatic routing of information packets, circumventing the problem of network vulnerability through failure of single transmission nodes (Cailliau, 1995). As ARPAnet was decentralized, it was easy for computer administrators to add their machines to the network using just a telephone line, a little hardware and free network control protocol (NCP) software. As Brown and his colleagues noted, “within just a few years, over a hundred mainframe computers were connected to ARPAnet.
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including some overseas” (Brown et al., 1996, p.11). In 1979 Charles Goldfarb invented SGML, the forerunner of HTML. This new language separates content structure from presentation. Thus the same document can be rendered and interpreted in different ways by different interpreters. HTML, the markup language of the Web, is an SGML application.

In 1982, a protocol for packet network internetworking was implemented as TCP/IP. With the advent of TCP/IP, the term Internet entered the language. The DOD quickly declared the TCP/IP suite the standard protocol for internetworking of military computers. TCP/IP is still the protocol set that provides the infrastructure for the Internet today. In 1983, ARPAnet was split into two – ARPAnet and MILnet. MILnet soon became integrated into the Defense Data Network which was created in 1982, and ARPAnet’s role as the network backbone was transferred to the National Science Foundation NETwork (NSFNET) created in 1986 by NASA and the Department of Energy. ARPAnet was finally decommissioned in 1990.

In 1987 The European High-Energy Particle Physics Lab, the Conseil Européenne pour la Recherche Nucleaire (CERN) and the US laboratories connected to the Internet as the main means of exchanging data between the laboratories. By 1990, CERN had become the largest Internet site in Europe and was the driving force in getting the rest of Europe connected to the Internet. In 1992, Tim Berners-Lee created the World Wide Web as a way to promote and facilitate the concept of distributed computing via the Internet. Inspired by the work of Ted Nelson on Xanadu (a networked, worldwide system for publication, including collection of royalties and inclusion of existing material), and the hypertext concept, the World Wide Web incorporated graphics, typographic text styles and hypertext links.

In 1993, the National Science Foundation (NSF) created the Internet Network Information Center (InterNIC) to provide information, a directory, and database, and registration services to the
Internet community. Its sole purpose is to handle organizational and “bookkeeping” functions, such as assigning Internet address or domain names. By mid-1993, there were 130 sites on the World Wide Web. According to NetFactual.com, a Web site that provides Internet facts published by DomainGo Inc., from June 1999 to June 2000, the number of registered domains almost tripled in one year from 6,657,635 to 18,978,101. Today, there are over 22 million domains with 46% (or over 1 million Web sites) active, that is the number of responding Web servers that return content. And the number of domain registration continues to grow at the rate of 380,000 per week (DomainGo, 2000).

**How the Web Works**

The World Wide Web is designed as a client/server system. What this means is that a client program, the Web browser (such as Netscape Navigator or Microsoft Internet Explorer) running on a user’s computer makes a request for information from a server program running on another computer connected to the Internet. That server could be anywhere in the world as long as it is connected to the Internet. The server receives the request and retrieves the requested Web page from its site. The server then transmits the requested page back to the requesting client via the Internet. The requesting client (Web browser) receives the Web page and displays its own interpretation of the page. To a large extent, the Web is what the Web browser makes it. Since Web pages are subject to interpretation, the Web browser profoundly affects the appearance of Web pages and consequently, ones impression of the World Wide Web.

**Use of Web Technology for Corporate Applications**

Anybody that has been surfing the Web lately understands how easy it is to retrieve various kinds of information over public networks. Some of the potential uses of web technology in a corporate environment include online referencing, interdepartmental communications, collaborative
workgroups, information management systems, interactive communications, customer support, and training (Bernard, 1998).

**Online References**

Many companies today make use of their Intranets to provide online references for various types of documents and instructions. For example, Kodak engineers use browsers to search for and locate templates, procedures and instructions for best of best practices for developing software. Manufacturing engineers and workers also use browsers to rapidly locate and view up-to-date ISO9000 work instructions, MSDS, or maintenance procedures.

Sales reps in the field use a menu system to view the latest product pricing, promotions, discounts, and rebates, or to read more details on specific customers, suppliers, or company policies. Many companies are also providing benefit programs, company policies and procedures for employees to view at will, anytime, anywhere.

**Collaborative Workgroups and Interdepartmental Communication**

With the Internet literally changing the way the world works, from north to south, east to west, main streets to wall street, primary schools to universities, research labs to development labs, it definitely qualifies as a true paradigm shift. Because of the virtual nature of the web, today, being a remote site from the parent company is no longer a disadvantage. Planners, designers, engineers, or marketing people collaborate interactively in designing or reengineering a product – posting ideas, sketches, and other material online for group access. It is now possible for a programmer to view a list of toolkit components used to design software. Component libraries and docs are downloaded automatically (Silverstein, 1998).
Almost every department in a company has a “home page” that employees can browse to learn about department mission, staff biographies, current projects, and contacts.

**Interactive Communication**

The Web’s instant interactivity serves as a perfect feedback loop to conveniently solicit employees and customer’s advice. Many companies use their Web sites to automatically distribute surveys to employees, customers, or suppliers nationwide, and gather the results automatically, storing them in a database for analysis. In addition to getting critical feedback from the employees and customers, companies use the Web to make a statement that says, “we want to hear from you. We are going through the trouble of setting this site up, administering, maintaining, and promoting it, in order for us to hear what you have to say. You the customer or employee, are important to us.” (Chase & Hanger, 1998, p.77).

Some companies even use their Web sites as a medium for announcement of the company picnic by putting it online. Employees use the system to sign up for the various sporting teams in the corporate tournaments. Other interactive uses include information on United Way program goals and progress placed online, with employees enabled to send in their pledges by filling out an online form.

Many companies now combine the forces of e-mail and Intranets to advertise their products to their own employees. It is not uncommon to hear employees of a company complain about not knowing some of the products offered by their company. Using electronic newsletter that is delivered monthly via e-mail to each employee of the company, not only will employees become acquainted with the products offerings of their company, they will also become potential users of the products. By so doing, the company can kill two birds with one stone – advertising its products and at the same time, maintaining communication with its workforce.
Training

When a company maintains a widely distributed workforce, bringing them to a central location to house, feed, and of course, train them could be a very costly proposition. Many companies now use Intranets to distribute educational materials across an enterprise. For example, an employee studies a training lesson on fundamentals of digital imaging with online quiz and automatic grading providing instant feedback to the student. A medical student studies a training lesson that includes a moving picture of a fetal ultrasound scan and the sound of the child's abnormally beating heart.

Corporate Intranets are increasingly being used for employee orientation. A new employee clicks through an online orientation seminar, including a multimedia presentation on the company. An online quiz is completed, with the results automatically graded and forwarded to the employee's electronic file in Human Resources. All of these are examples of companies using Intranets for training and distance learning.

Trimming Travel Costs

The travel industry is one of the fastest growing industries on the Internet. As airline seats are considered to be “vanishing commodities” (Chase & Hanger, 1998), some think it is sinful to let an airline seat fly empty. Since airlines never recoup the cost of transporting an empty seat, they would rather offer 30 to 50 percent discount for an empty seat, and there is always a potential customer who would be delighted to the seat for a discount.

For this reason, there has been a proliferation of travel Web sites on the Internet. Many companies have taken advantage of this growth by entering into affiliate relationships with these travel center sites. This puts employees in control of their travel planning. These sites are designed to provide comprehensive air, car and hotel bookings. While employees are enabled to make travel
arrangements, administrators are also allowed to book travel for other employees. The booking process can be streamlined by creating and storing profiles for all travelers and enable creation of user-defined reports summarizing company travel and expenses.

**Customer Support**

The remarkable property of information to increase in value the more it is used, leads to more surprising changes. Many businesses have shown that customers are not only lower-cost providers of many activities we think of today as “customer service,” but customers perceive and realize added benefit from doing these tasks themselves (Downes & Mui, 1999). In 1995, Federal Express built a simple interface into its package-tracking database and made it available to any customer with access to the Internet. Customer response was overwhelming. Instead of calling its 800 number and having a human do it, customers had instant access to detailed history of their package’s travel on their own computers, thus saving FedEx $3.00 or more each time someone uses the Web to track a package (Chase & Hanger, 1998).

Most organizations are already familiar with the concept of outsourcing as the Internet makes the market more efficient. Companies can and indeed do turn over uneconomical functions including customer support and other office management tasks, to stay competitive. Customer service functions can now be outsourced, not to other firms, but directly to the customer. A help desk operator can view a centralized menu that provides direct, single-point, clickable online access to all of the company's printed documentation. An interface to the same information could be provided to the customer who in most cases, likes to take on these tasks willingly.

Many companies are already using Internet technologies to implement similar applications. For example, customer service representative views detailed customer and supplier information while on the phone, retrieves invoices or POs from an imaging database, and views quick reference
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guides or written procedures for specialized orders – all through a single menu. An authorized
customer uses an Internet or dial-up connection for a “virtual visit” to a company. After entering an
account number and password, the visitor browses through a pre-designed pathway to visit various
departments, and view exhibits, obtain sales materials, view online catalogs, view video
presentations, and order products at the click of a button.

At the rate information is being converted to web delivery, it’s only a matter of time before
most business communication and transactions will be delivered online through this type of system.

**Designing Dynamic Web Sites**

Corporate Web sites are reaching a level of importance in the organization that a Web site
design project can no longer be undertaken haphazardly. Although the vast majority of Web sites
are, first and foremost, marketing and sales sites, the Web site is rapidly and steadily becoming the
repository for all corporate information. Above all, the Web site is now the conduit for getting
information out to an organization’s audiences – not just prospects and customers, but employees,
and prospective employees, investors, analysts, business partners, suppliers, and the press. For all
these reasons, it is more important today for organizations to design and maintain interactive and
dynamic Web sites. In this section, I will briefly discuss some of the tools and the impact of the
paradigm shift that is making all of this possible. In addition, the characteristics of an effective Web
site will be presented.

**Impact of the New Paradigm**

The impact of the Internet on practically every industry is enormous. It has caused
networking, telecommunications, hardware, and software companies to completely re-engineer
themselves. All other businesses are following suit by re-orienting their business operations and
information systems for the electronic future. Organizations are feverishly building Intranets and extranets (private use Web sites) and depending more and more on the Internet for their entire networking infrastructure. As a testament to this change and the influence of Internet even in the Information Technology media, in late 1997, CommunicationsWeek which has been a major computer industry publication, changed its name to InternetWeek (Silverstein, 1998).

The Internet has the potential to be truly the first, cost-effective, widespread global marketing medium. Since the Internet technology has its roots in the worldwide networking and enabled by simple telephone or television access, any marketer in theory could reach any online consumer anywhere in the world at any time. More over, very little on the Internet is regulated in terms of international markets, therefore, the Internet represents a kind of world wide electronic free trade zone.

Electronic mail (e-mail), the first major application developed for use on the ARPAnet, began innocently enough as a convenient electronic means of communication between researchers connected to the Net. But such companies as America Online (AOL), CompuServe, and Prodigy popularized the notion of e-mail communication outside the boundaries of corporate networks. E-mail has since proven its value over time and has remained one of the major uses of the Net. Today, e-mail is now handled internally by the various World Wide Web browsers, such as Netscape Navigator, and Internet Explorer, so a separate e-mail program is not required. Web sites and e-mail newsletters are for the most part free. This makes the term “paradigm shift” seem almost inconsequential.

The World Wide Web is truly an intimate and personal “playspace” for adults. It is increasingly becoming “playspace” for and kids and young adults as well. If used effectively, the Web can deliver personalized content to each and every visitor. For that reason, a marketer can
initiate a one-to-one relationship via e-mail and the Web with a prospective, customer, or business partner.

The Internet is quickly changing the economics of marketing. The cost implications of electronic marketing are partly responsible for the Internet’s unprecedented growth. It is not only cost-effective, it is cheap when compared to other media. According to the Yankee Group, Internet direct marketing is estimated to be 60 to 65% cheaper than traditional direct mail marketing (Bane, 1998). A marketer can build and host a Web site and reach a worldwide audience at a cost far less than the cost of one national television commercial.

The Internet has penetrated the business community at an unprecedented pace. With its roots implanted in science and business, business-to-business usage of this tool continues to lead the Internet. Even as consumers embrace the Internet at a dizzying rate, business-to-business usage has virtually exploded, thanks to Intranets and Extranets. Perhaps the single most important differentiator of the Internet is its leveling effect on business. It levels the playing field and makes it possible for a small business to compete with the big corporations. It can make a very small business look larger than it is. That means that even a one-person, garage-based operation can compete, at least electronically, with organizations many times its size. No other technology in history has had such a profound effect on business.

Even when a company does not aggressively use the Internet as a means of marketing itself, that organization can still benefit from using the Internet as a competitive research and business learning tool. There is no question about how much information companies post about themselves on their Web sites, including what used to be considered sensitive information. And thanks to improvements in the tools of the trade, it is now easy to post information faster, smarter and
cheaper. And for those who conduct competitive market research and other types of business researches, what used to take weeks of work now takes minutes with a few clicks of the mouse.

Tools of the Trade

As I stated earlier, the Web basically uses three technologies – a hypertext language for writing Web pages, a Web server which uses HTTP to transmit those pages, and a Web browser client program that receives and interprets and displays the data. In the beginning, HTML was the language of the Web, but as the Internet world matures and shifts its focus from HTML to XML and other related technologies, HTML is quickly becoming a legacy technology. Everywhere you go, products are being converted and implemented using XML. In this section, I will briefly discuss some of these tools, including HTML itself that enable the World Wide Web.

HTML

The HyperText Markup Language or HTML as it is popularly known, is the bricks and mortar of the Web. Although still popularly used for creating Web pages, it is fast being replaced by other related technologies. The reason for this trend to replace HTML lies in its simplicity and the static nature of the language. HTML is relatively simple in both concept and execution. Almost everything created in HTML relies on marks, or tags. For example, if you want text to appear on a Web page in italics, you mark it thus: <I>this text is in italics</>.

But as Peter Fischer noted, “HTML began as a simple markup language for formatting data. It quickly evolved into a monster used to display data, and is now composed of many proprietary tags that aren’t supported by every browser. Extraneous visual elements, like the <font> tag, only add to HTML’s bloat.” (Fischer, 2000, p.51). As technology improves and newer devices such as handheld computers and mobile phones whose displays are not visually oriented, HTML is no longer adequate to handle the new challenges of Internet and Web-based computing. What this
means is that many organizations are now left with a legacy of HTML-based information that can’t evolve to support new computing platforms and paradigms.

**HTTP**

HyperText Transfer Protocol (HTTP) is the client/server protocol for moving hypertext (i.e. text containing links that when chosen by a user, jumps to another block of text either within the same document or in another) files on the Internet. HTTP was designed to be quick, simple, and nonintrusive.

An HTTP connection is said to be stateless. What that means is that permanent connect is not maintained between the server and the client. In other words, a request is made and the connection is broken. Then a response is sent back, and the connection broken again. This process repeats for every request and even for parts of a request. It is for this reason that when accessing a Web page, the browser seems to be saying “waiting for reply…” over and over again, in its status display line.

HTTP is a TCP/IP protocol. However, it can be implemented on top of any other protocol implementation that can communicate over the Internet. Again this implementation of HTTP goes back to the original requirement by the defense department to build a system that can survive nuclear war. By breaking requests in packets and not maintaining permanent connection when transmitting them, it becomes possible to still send messages even when major nodes are down. Since the protocol always has to re-establish connection each time it sends a packet, a message can take different routes to its final destination.

**CGI**

The Common Gateway Interface (CGI) provides a common environment and a set of protocols for external applications to use while interfacing with the Web server. CGI was a way to solve the flaw with the simple client/server relationship that exists between a browser and a Web
server. Without the CGI, the Web server cannot handle information from databases or other applications that require more work than simply transmitting a static page. With CGI, any application engineer can allow an application to interface with the server.

The code written for CGI (popularly known as CGI Scripts) act as a link between whatever application is needed and the server, while the server is responsible for receiving information from, and sending data back to the client. For example, when a user connected to the Internet enters a search request at any of the search engines, the browser makes a request to the server to execute a CGI script. The browser also passes the information that was contained in the online form including the current environment to the server. The server then passes the information to the script, which provides an interface with the database archive. The script retrieves the requested information if it exists, and then passes it on to the server which then feeds it back to the requesting browser as a list of matches to the user’s query.

**JAVASCRIPT**

Javascrip is a scripting language that was jointly developed by Sun Microsystems and Netscape Communications. It was created to extend the capabilities of the Web by allowing programs to be embedded with Web pages that can run on a Web client computer when the page is accessed. Javascript was a solution to CGI script shortcomings. One of the problems with CGI scripts is that they are executed by the Web server, which creates additional workload on the server causing it to slow down.

Javascript solves the problem of overburdened Web servers. Instead of writing CGI programs that must be executed by the server, Web designers now write and transmit Javascript programs with the HTML page, which the client browser executes instead of the server.
XML

XML (eXtensible Markup Language) is the latest tool proposed to be the lingua franca for data transfer in the online business-to-business arena. Inspired by the shortcomings of HTML, XML is not a single, predefined markup language like HTML. Instead, XML is a specification that allows the Web designer to create customized markup languages for different classes of document and data. It was originally designed to replace HTML and tame the tag wars of HTML.

XML is one of those rare technologies since the inception of the Web that makes all of the other tools we use work more effectively. No single type of Web site is best suited to use XML. It is platform independent, in other words, XML can be used with Unix, Linux, or NT operating systems. It works equally well with Web servers such as the Internet Information Server (IIS) and the Apache Web server. XML documents can also coexist with other data formats including HTML and PDF files. For this reason, many companies have already started the migration of their Web applications from HTML to XML. (Floyd, 2000).

XHTML

XHTML (eXtensible HyperText Markup Language) combines the best aspects of HTML and XML into a single technology consistent with its predecessors. XHTML is a presentation language built from the XML specification, and very similar to HTML. It was created to address the non-dynamic nature of HTML and solve the tag problems. Because it was designed to be similar to HTML, it is much easier to migrate the existing legacy HTML documents to XHTML than migrating directly to XML, which requires a tear-down, and restructuring of the documents.

To convert existing HTML documents to XHTML requires that the documents conform to certain standards defined by XHTML. Since HTML was not directly derived from XML, to get the content into XHTML requires that the following set of rules be followed.
XHTML is case-sensitive, therefore all the XHTML elements and attributes must be written in lowercase. For example, constructs like `<P ALIGN="RIGHT">` tag must now be written as `<p align="right">`.

Strict enforcement of opening and closing of elements must be observed. XHTML requires that the most recently opened tag be closed first, followed by others in succession. Although HTML has the same rule, it is not enforced. With XHTML, the rule is always checked.

In XHTML, all nonempty elements must be closed explicitly or implicitly. Whereas developers used to get away with constructs such as `<p> to begin a paragraph without the corresponding closing `</p>`, XHTML now forces application developers to observe these rules. In the same manner, all empty elements must be terminated. In HTML, constructs like `<hr>` and `<br>` are valid, while their corresponding valid constructs in XHTML are `<hr />` and `<br />` respectively.

Making these minor changes to ones HTML documents ensures that the repository of files can be displayed not only by HTML browsers, but can also be processed by any XML-enabled software. XHTML in a way, is the way out for the millions of legacy HTML documents that are in existence today, and bring them into the next generation of Internet computing.

**The Content**

When Avalon Consulting Company, Inc. spent several months and several thousands of dollars developing its corporate web site, it expected great things to happen when it goes live. After the launching of the site, there were no surprises when the Web site statistics were reported at the end of the month -- 200,000 hits! Everybody agreed their efforts were successful, or so they thought. After six months the average monthly hits to their web site declined to 6,000. What happened? Although Avalon Consulting Company’s Web site looked very good, the company had actually developed a very static web site and never gave anyone a reason to visit again.
Contrary to what some people believe, visitors to a Web site do pay attention. When the content of a corporate web site does not change over a period of time, visitors may feel that the company is stagnating. As our society becomes more web-savvy and dependent on the Internet for news and general information, a static Web site could be detrimental to the life of a company. If the company has new products, stories, recipes, offers, or whatever, the world needs to know about it. A simple photograph of the new product, a brief synopsis of the story, or highlighting of the offer right on the home page could be enough. Alternatively, having a featured product section in full view for all to see and weekly or monthly update of that page is what it takes. If visitors know they will find something new each time they visit, they will come back.

Some companies update their web site's overall look and feel on a regular basis. One company, Quark, Inc., was well known for changing the entire architecture (both information and graphics) of their web site on a monthly basis. While most companies do not have the resources to do this, there are some definite advantages: -- People return to see what the company is up to, and it helps the company to develop a brand that works.

Characteristics of an Effective Web Site

When planning a Web site, there are really two issues one needs to – content and presentation. As the Web is such a visual medium, the way in which information is presented makes a difference. As Billy Crystal’s Fernando character on Saturday Night Live used to say, “As we all know, it is better to look good than to feel good ... and you look mahvelous!” The sad thing is that many Web developers have the same attitude when it comes to designing Web pages. They believe that it is more important for Web pages to look good than to be actually good.

It is not uncommon to find plenty of sites on the Web that are loaded with colorful graphics and a multitude of links to click, but lack good, solid content. Good looks might draw people into a
site, but good content will keep them coming back. The flip side of this is that if a site has excellent content but is not visually appealing, people will not stay around long enough to find out just how good it is. There needs to be a balance and that’s why there are some rules of thumb for designing effective Web sites that anybody planning to create a Web site needs to be aware of.

**Well-Designed Home Page**

An effective Web site should start with a compelling, well-designed home page. It should be interesting, attractive, and intriguing to the viewer. Key content areas should be highlighted so that visitors can quickly and easily locate what they are looking for. It is essential for Web sites to be nonlinear so that each visitor can have immediate access to the majority of the information on a site. As the home page serves as the gateway into the entire site, it should embody the personality of the company and immediately convey a distinct message. It is generally recommended that the home page have a look and feel that complements the corporate or promotional identity of the corporation.

**Focused Content**

A Web site should focus on a single topic or at most, a cluster of closely related topics. Having a generalized Web site will not attract too many people and those that visit will not stay around too long. The reason is in most cases, people surfing the Internet are interested in something and would rather spend less time to find the information they need than navigate the Web, therefore, the more focused and tighter the topic, the better. There may be thousands of sites devoted to software engineering. The odds of drawing many crowds with such a generic topic are slim. However, if a site is focused on something specific, such as Java development, the site is sure to pull in a devoted following of true Java developers.
Timely Updates

One of the appealing characteristics of the Web is its capability to deliver new information almost instantly. Whenever there is breaking news, it’s almost certain that the Web will have the information first. If an organization can keep the information on its site up-to-the-minute current, that organization is sure to attract loyal viewers. The point here is to not let your site lag behind. A Web site needs to be kept up-to-date. One easy way is to establish a prominent “What’s New” area so as to localize information that needs frequent updating. This area can then be changed periodically. The look of the home page should be refreshed at least once a year.

Intuitive Navigational Flow

As discussed earlier, the Web is nonlinear and for that reason, it requires a navigational system that is structured to offer visitors maximum flexibility and freedom to move around. Most navigational systems use buttons, icons, or images in conjunction with words or phrases that identify major areas of a Web site. Continuously improving Web technology is making navigational systems more useful. The increasing use of new technologies such as “dynamic HTML”, Javascript, and Java applets is making navigational systems even better. The key point here is to make navigating a Web site easy, intuitive, and “idiot-proof.”

High-value Content

An effective Web site is not only compelling and attractive, but it must also have good content. Most Web experts agree that “content is king.” Effective sites go beyond simply providing product details – they also include product benefits and high-value information that visitors can use. The rationale for this is because if customers or prospects learn something from a Web site, they will come back for more.
Response Time

The most annoying thing for Internet users is having to wait a long time for Web pages to load. If a Web site incorporates too many graphics and images, especially large-sized images, it would undoubtedly be slow to load. And a slow loading site is a sure way of loosing visitors. Web developers can design a fast-loading Web site by cutting down on the number of graphics and images per page. The rule of thumb is to load images and graphics that are less than 2K bytes and documents should not be more than 30K bytes.

Respect for Privacy

Internet privacy issues are now an imperative that Web sites can no longer ignore. It is recommended that an organization post a privacy policy on its Web site. Children’s privacy is not an option anymore. Besides the threat of being charged with deceptive practices, Web sites now must ensure that their privacy practices adhere to federal law (Murphy, 1999).

Privacy advocates contend that a site’s privacy policy should be easy for users to find and understand. A Web site’s privacy policy should not only give people a say on how the information should be used, but should give them ways to easily correct information as well as ensure the security of any data that is collected.

Make Yourself Known

Creating the best Web site without anybody noticing is as good as not having a Web site at all. One of the reasons for creating a Web page in the first place is to exchange information, therefore the creator of a Web page would like to encourage other people to visit the page. The best way to bring people to a Web site is to make the job of finding it as easy as possible. That means, advertise the site.

In order to be found and noticed, a Web site needs to be promoted extensively. Web page promotion comes in many forms, including being registered with the major search engines, Web
crawlers and robots, attracting link from other pages, and so on. In addition, the site’s URL (Uniform Resource Locator which is the standard WWW address format, e.g. http://www.yahoo.com) should be included in any ads the organization might place in magazines, newspapers, or trade journals.
WDC BSPI Homepage: A Site Designed for Information Sharing

Washington Development Center of Eastman Kodak Company (http://md-web-dc02.us.kodak.com) has constructed an Intranet Web site for its business software process improvement initiatives. The BSPI home page can be accessed by going to (http://md-web-dc02.us.kodak.com/wdcBSPI/index.html). The Washington Development Center (WDC) is a software center of excellence for technical support and product development to Eastman Kodak Company's digital imaging products. Located in the Washington D.C. area, WDC can be considered as a small-sized organization, employing some 45 software engineers, software quality and test engineers. The center’s mission is to:

- Carry out Eastman Kodak Company’s Values (Respect for the Individual, Trust, Credibility and Continuous Improvement and Personal Renewals) in conducting business.
- Harmonize multiple technologies to build core competencies. These competencies will support Eastman Kodak Company’s core digital products.
- Leverage skills and competencies across functions and business units. Generate new business by creatively combining core competencies
- Develop quality relationships across functions and business units
- Create a shared learning environment across functions through continuous improvement, team building and internal training.
- Migrate competencies such that existing ones provide a platform for building new ones.
- Shape and take advantage of architectural innovations (innovations that affect how a given set of core subsystems are linked together).
- Shape and re-shape markets and alter industry standards in the digital imaging and wide area network (WAN) markets through incremental innovations.
When WDC decided to go through the Software Engineering Institute’s Capability Maturity Model (CMM) for software level 2 assessment, it was decided that having a separate home page dedicated to its software process improvement activities would be a better means of communicating its capabilities to the rest of the company. Besides, it would be a way for members of WDC to share common procedures, templates and best practices. All members of the leadership/management team for the center (comprising of the WDC Development Manager, QA & Test Manager, Operations Manager, and the Software Engineering Manager) were familiar enough with the Web to realize that it represented the opportunity to develop a corporate web presence for a relatively little expense. They quickly defined the goals for the Web site.

**Design Goals**

After discussing the idea about creating a separate home page for software process improvement activities, the WDC Development Manager basically signed off on the idea and gave me the authority to create the Web site. The initial task was to define the goals and objectives of the site. The goals for the site included the following:

- Developing a presence on the corporate Intranet that could help convey the message of the center as a software center of excellence
- Providing an online information sharing for visitors by providing downloadable documents that represent some of our best practices
- Showing a schedule of events and activities related to the CMM effort that could change daily
- Develop a site that is not only elegant with excellent information content, but must be easy to navigate and load faster
- Establishing an effective strategy for testing and maintaining the WDC Web site.
Creating a Presence on the Corporate Intranet

To create as much exposure as possible for the site, the WDC leadership team decided to use many of the methods discussed in this paper for advertising a Web site. Before the site was finished, the Development Manager sent one technician for training in Web page designing, to prepare her to take over the Webmaster responsibility for the center. The Webmaster would be responsible for maintaining the site.

After the completion of the site, the site’s Webmaster would register the site with the corporate Intranet databases and Webcrawlers, and locate other business units and software development sites within the company that might be willing to list the WDC BSPI site.

Laying Out the Structure of the Site

After interviewing members of the WDC management team, and other staff members of the center, I identified four primary areas on which the organization would like to focus the site. These were the CMM level 2 activities of the center, the best practices of the center, the procedures and templates used by the center, and a means of downloading documents and materials from the center.

To give the site a proper structure, it was planned out completely before I began building it. It was decided that the site would be accessed from the WDC main site. That meant adding a link to the main site for the BSPI home page. Although the main site was supposed to undergo a major redesign, the Development Manager still wanted the BSPI site to be added as a link to the main site. According to her, this would encourage the center’s staff who are used to accessing the main site to gracefully get into the habit of using the BSPI site. If another Web site were to be provided for the center, it would be seen as a nuisance for the software engineers who usually don’t like to be overburdened with process.
Creating the Graphics and Images

WDC uses the company’s logo on its letterhead and on all its paper brochures, so to maintain a uniform appearance, I used it for the Web site also. The logo was provided as a jpg (JPEG) file and since the jpg format generally produces smaller image sizes, with some loss in quality, I didn’t have to convert it to another format. For what we wanted to do, the quality of the images was quite suitable.

Other images and graphics were created with Adobe Photoshop and converted to Graphical Interchange Format (GIF). Because it was a requirement for the pages to load fast, the image and graphic sizes were limited to 3K bytes or less. In addition, the amount of graphics was kept to a minimum.

Writing the Web Pages

After talking to the Development Manager, it was clear to me that she was more interested in having a visually exciting site than she was in having one that can be read using every browser available. Since this was only targeted for internal company audience, and since only Netscape Navigator and Microsoft Internet Explorer are the only supported browsers within the company, I only had to worry about HTML extensions that are supported by Netscape Navigator and Microsoft Internet Explorer.

This enabled me to use variable font sizes, background colors, and client-side image maps. Because we wanted the Web site to be highly responsive, using client-side image maps reduced the number of hits on the server, which led to greater performance for the site. These advantages were important because as a small remote software development center, WDC does not have a high-powered Web server, so anything that could be done to improve performance would be welcome.
Summary and Conclusion

As the preceding discussion has shown, technology has made it easier than ever for self-proclaimed designers to produce bad layouts for Web sites. The old adage that says “first impression matters” is also true when it comes to Web sites. In business, first impression means a great deal. That first impression is what shapes how we’re going to feel about a given company. More and more people will get those first impressions of an organization online, where they can see the firm’s site and hopefully interact with it. The look and feel of a business Web site speaks volumes in terms of what people think of that company, and its brand.

Creating, publishing, and publicizing a Web site can be as easy as 1-2-3 if one follows the steps outlined in this paper. Creating a Web site involves much more than creating pages, it involves developing a strategy and focusing on sound design concepts. To attract visitors, the pages must be friendly and inviting. One way to ensure that the pages are friendly is to design them with both first time and repeat visitors in mind.

Although the Web site that was designed for this course is not a marketing site, the author simply treated the Web site as one. The design goals that were laid out for me were completely satisfied. The next step is to find “affinity sites” that relate to the efforts that the center is making regarding software capability maturity process. These affinity sites are those that have something in common with WDC with respect to process improvement. With our webmaster trained and poised to maintain the site, there is no question that the WDC Web site will be kept up-to-date, and eventually meet the expectations of the center. With respect to the future of Web design, there is no doubt that the fundamental principles of designing effective Web sites will not only survive, they will flourish as the basic tenets of building Internet and Intranet homes.
References


