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The Web Site

To visitors, the Web site represents a context with its own constraints for taking actions and fulfilling goals. These constraints are different from the more general constraints of the genre context discussed in Chapter 6 and the more specific factors of the page context covered in Chapter 8. At the site level, there are seven key usability design issues that are particularly important for creating effective Web site interfaces.

- Conceptualizing the site with a visitor-centered focus
- Positioning the content
- Speeding up the response time
- Smoothing the navigation
- Assuring reasonable confidence in site security and privacy
- Making the site visible
- Maintaining quality

These seven constraints supersede any human factor guidelines at the page level with which they conflict.

Conceptualizing the Site with a Visitor-Centered Focus

Depending on the site's genre, which embodies its purpose, the site visitor can be an e-shopper, an information browser, a newsreader, a tourist, a student, a combination of these, or one of many other visitor types. Regardless of the visitor's specialized usage characteristics, which are considered at the genre level, visitor-centered design considerations must be incorporated at this time.

Keep the User in Focus. The designer should start with the question: What do I need to do to target the site's audience? The answer will require not only understanding the user, as discussed in Chapter 4, but also getting specific information on site visitors and what they want. Such information can be gathered effectively through the use of online questionnaires or forms without intruding on user privacy. Figure 7.1 is a sample registration form used by Barnes & Noble to collect information on customers interested in receiving a newsletter.

Focusing on the user also means designing for clients' hardware and software environments. If the user population is likely to use more than one browser, then designers should make sure that their designs work equally well for various desktop browsers as well as for mobile devices. The same attention should be paid to users' network connectivity. If, for example, we determine that most members of the target audience have modems with slow connection speeds, then designing for usability means giving a higher priority to reducing the file size of the graphics on the site.

Site Personalization. It is important to have in place noninvasive tools—those that do not violate privacy concerns—to continually gauge what visitors want. Visitors should have the option of giving the site permission to personalize its services. For example, an e-business site such as Amazon.com can collect information on its customers' habits and use it to send them “relevant” shopping information. In this case, Amazon.com is attempting to be visitor-adaptive by anticipating the needs of the user.

To make personalization totally visitor-centered, the e-business should first find out if the user is comfortable with being tracked to get personalized service. It is not enough to ask the user, “Can we send you information on related items?” or “Can we tailor the presentation of the site to the types of requests you've made in the past?” As part of asking users if they want



Figure 7.1: Barnes & Noble registration form
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personalization, the e-business should explain that it involves constructing user profiles based on tracking the visitors' past site behaviors.

Positioning the Content

Content owners and authors are usually the domain experts. They should be members of the usability design team from the very start. Before the designer can create formats, layout, and pages, the content needs to be specified.

Specifying the Goals. Defining a site's content starts with specifying goals. Making sure that the users' functional goals are met in the site design is paramount. The site's goals and functionality should be clearly marked and visible on the site's home page and on the most likely pages from which the site may be visited. This information can be effectively provided by using buttons or tabs with keywords denoting the primary site functions. As we can see in Figure 7.2, the CNNfn Web pages represent well the subsite's goals as keywords, such as *Deals & Debuts*, *Retirement*, *Markets*, *World Business*, and *News*, on tabs.

Specifying the Tasks. Task analysis to decide what tasks follow from the identified goals is the next step in the process of creating site content. Tasks can range from the general, such as "finding information," to the specific,



Figure 7.2: CNNfn Web page
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such as “contact customer service.” The designer should not only specify the tasks but also prioritize them. Priority can be determined on the basis of the most to the least important tasks or on the basis of a performance frequency scale. By prioritizing the tasks, the designer can decide on the order of functionality presentation on the site’s home page and on the subsites. Furthermore, in defining tasks, the site’s title should represent a major task and the site’s topics should represent subtasks. Each topic should have a clearly stated goal. The subtasks should also be ordered according to which task is most likely to be performed. Defining the tasks and topics can be done by such methods as structured interviews and focus groups.

Organizing Site and Content. The goal here is not simply to organize information on a single page but to make the site’s content coherent. A site that is structured in a coherent manner for the user supports the user’s structural and functional mental models of the content. These models should be directly related to the content’s goals and tasks discussed earlier. Often a site’s content is organized to reflect the internal structure of an organization (Heller and Rivers, 1996) instead of user expectations of the site’s topics and tasks.

To ascertain the users’ mental models of information organization (after specifying the tasks and topics as described earlier), we can employ the card-sorting technique reported by Nielsen and Sano (1994). Each topic and task is written on a card. Then a sample of users is asked to group the cards according to their relatedness or semantic closeness. The result of this process is a collection of information chunks that designers can use to organize the site. Depending on the size of the site, each topic will have its own page in a task-logical order or, for large sites, its own subsite. Figure 7.2 shows an example of topics within a subsite represented as tabs. Figure 7.3 shows the pull-down menu of the CNN subsites. Titles, labels, and names should be carefully selected with the audience in mind when organizing site content and chunks of information, as well as site and subsite goals. The user should not have to look up the definition of site words to figure out what the site is about.

At this stage, designers begin the task of structuring the information and the tasks into a Web site. They use the resulting chunks of information to organize the site into coherent pages, subsites, and related sites. Subsites organize a body of information that can be used in performing tasks without having to visit other subsites. The subsites of a given Web site are related by a common user interface and a consistent look and feel.



Figure 7.3: *The CNN subsites' pull-down menu*
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For example, the CNNfn subsite shown in Figure 7.2 allows the visitor to get all financial news of the day without ever visiting the CNN news home page. But because people who are interested in news are often interested in more than one type of news, the overall structure of a site should permit visitors to get to the home page of any of the subsites from any site page by clicking on the subsites menu. The CNN site allows you to do subsite navigation from only some of the pages. The subsite pull-down menu is not available on every page. It is not even available on every subsite home page. Additionally, where the menu is available, it is not placed in a consistent location. Contrast the home pages of CNN.com, CNN.com Europe, and CNN.com. Figures 7.3, 7.4, and 7.5 show that the subsites' pull-down menu is on the left side for CNN.com, on the right side for CNN.com Europe, and not available at all for CNN.com.

Once the structure of a site or subsites is established, then the designer should focus on identifying and creating types of pages within a site such as home pages, a log-in page, transaction pages, and feedback pages. Chapter 8 gives a more complete treatment of page selection and design.



Figure 7.4: The CNN.com Europe subsite pull-down menu (Reprinted with permission.)



Figure 7.5: CNN.com page with no subsites pull-down menu (Reprinted with permission.)

Speeding Up the Response

System response time has always been an important factor for designers to consider in human computer interaction. From a usability perspective, optimal response time is dependent on several contextual factors, including the task to be performed, user experience level, user expectations, and other related functions to be performed by the user. There are several studies that relate response time to performance. Butler (1983) reports a significant effect of system response time on user action time. The longer the system response time, the longer the user action time. Barber and Lucas (1983) report that shorter response times yield superior performance. Another study, Tobmaugh, et al. (1985), showed that errors increased in a reading task where participants had to read and answer questions, with more errors for slower display rates than for faster display rates.

It is generally accepted that on the Web, people are more satisfied with rapid response times. User surveys (GVU, 1996; Hamilton, 1997) have reported that slow Web response time was the number one problem listed by users. Slow response times include slow downloading and slow Internet connections. Of course, system response times and speed of downloading are not entirely under the control of the designer. Quality of phone lines, server speed, and CPU power are among the factors that ultimately determine response time. However, designers can anticipate speed problems and take preventive measures. In addition, context and expectations make a difference in visitors' reaction to slow times. Sears, et al. (1997) found that visitors who accessed documents containing text and graphics were much less tolerant with the process than when the document contained text only.

To maintain "reasonable" site response times (within ten seconds for modems ranging between 28Kbps and 56Kbps), designers should attend to the following guidelines.

- Make sure there is feedback, indicating delay.
- Keep the total page content to not more than 60KB of text and graphics.
- Keep graphics less than 25KB.
- For five or more graphics per page, keep each graphic at 10KB or less (see Figure 7.5).
- Resort to the use of thumbnails measuring 1" × 2" (see Figure 7.6).
- Provide text-only options.

- Avoid the use of animation if at all possible.
- Avoid the use of multimedia and audio clips requiring the download of plug-ins.
- Use progressive rendering, allowing text to download before graphics.

Smoothing the Navigation

Web visitors navigate both on a single site and across sites. They navigate within a single site to find specific information or simply to explore. They navigate the World Wide Web to find a site relevant to their goals or to reach a site related to a currently visited site. In either scenario, the visitor starts with a mental model of a navigation map. In some cases, the map is very primitive and incomplete, consisting primarily of a search engine and some keywords. In other instances, because of experience, the user has in mind a quite well-developed and precise map, as in the case of someone looking for the current DOW numbers on the CNN's home page.

Human Navigational Strategies. Research on site maps and navigational aids can be useful for designing Web navigational strategies. Let's consider what others have said about human navigational strategies. Wickens (1992) summarizes work by Thorndyke (1980) suggesting that human knowledge acquisition of navigational space progresses along three stages: landmark knowledge, route knowledge, and survey knowledge. To help us navigate, we start by using landmarks present in the environment to find our way and to remind us of how to navigate the same path again. Using distinctive visual clues is the critical attribute of this navigational strategy. In a Web space, titles, labels, link names, and icons can represent landmarks. Route knowledge enables navigators to connect landmarks into a distinctive path, helping them revisit a previously traveled route. Using visual history paths in a Web site can facilitate the acquisition of route knowledge for the visitor. With survey knowledge, navigators form a structural mental model of their navigational space. The inclusion and use of a Web site map would accelerate a visitor's survey knowledge of the site navigational space.

There are at least two different practical ways of presenting paths and site routes on a Web site: linear lists and actual schemata or site maps. Is one more effective than the other as a navigational aid? Bartram (1980) compared the two representations for travelers using the London bus system. In

this case, people had to construct a path between two locations from either a list or a map presentation of the route system. The findings indicated that map users made decisions more rapidly than list users. On the other hand, when people were asked by Wetherell (1979) to learn a route from either of the two presentation formats and then actually navigate the route between two locations, the map users made more mistakes. In a Web navigational context, designers need to include both formats. For novices, who are trying to *construct* a path, it is likely that maps are more effective. For experienced people, who are trying to *remember* a path, route lists are probably more effective.

Well-Defined versus Ill-Defined Task Statements. One useful way of classifying navigational tasks is on the basis of the completeness of information that a person perceives as available to perform the task. The key word is “perceives.” We call a task statement ill-defined to a user if the information necessary to perform the task successfully is perceived as incomplete by that person (Reitman, 1970; Badre, 1974). A well-defined task statement is one that, in the perception of the user, contains all the information required to perform the task successfully. In addition, one of the following two conditions is true: (1) the task statement explicitly says what is necessary for successful performance, or (2) the user can reconstruct the necessary elements for successful performance from memory when presented with the task statement. For example, consider the word-processing task of moving a block of text from one place to another. To a novice, the task statement is ill-defined because it does not explain the sequence of steps required to perform the task successfully. To the experienced user, the statement implies a sequence of actions, available for retrieval from memory, that when executed will permit a successful completion of the task. The task is well defined to the experienced user. It is ill defined to the novice. The task statement could be made well defined to the novice by making it explicit: “Place pointer at first word in block; press F8 to mark word; press F6 to extend; press F8 again.”

More precisely, a task may be defined in terms of the triple $\{I, O, G\}$, where I stands for initial task state, O denotes the set of admissible operators, and G stands for the goal state. An ill-defined task, one likely to be encountered by a novice user, is a task with a statement that, in the perception of the user, is incomplete in at least one of three specifications: (1) a complete description of the initial state; (2) a complete description of goal-state properties; and (3) the set of operators or rules that permit transformation from initial to goal states. When a user is faced with a task where at least one of

these three sets is not completely specified in the task statement—and at the same time, the statement does not trigger a set of memory reconstruction rules—then the task is considered ill defined. At that point the user must move to reformulate the task statement by either (a) completing the specification of the incomplete set or (b) identifying the set of rules required to reconstruct the necessary elements for successful task completion.

Navigating in Real-World Environments. When we navigate in real-world environments, we do so either to explore—often for the thrill of discovery—or because we are searching for a specific object. When we explore, we start with very little information about the task and the environment and with no specific object as the goal of our exploration. We are in an ill-defined task environment. As we navigate, we continuously redefine the environment to make it more familiar by keeping a record, even if a mental one, of our path. We like to be able to retrace our steps, visualize a context for our present position, and wonder what we will find if we go around the corner or over the next hill. When we find something that interests us—an antique store or a restaurant—we stop to investigate. As we explore and gain more information, our mental statement of the task environment becomes less ill defined. We are at the least gaining information about paths and landmarks that we can use to retrace our path to go back to where we started.

We also navigate in the real world to search for a specific object. We search in both ill- and well-defined task environments. Searching for a specific object in an ill-stated task environment is similar to exploring because we are learning to construct paths that we can retrace and to notice landmarks that we can use until we find the object of our search. Searching for specific objects in a well-defined environment requires recognizing relevant cues, remembering landmarks, and retracing previously traveled paths.

Navigating in Hyperspace. Navigating in Web hyperspace is not unlike navigating in the real world. Exploring on the Internet requires selecting an environment to explore, an environment that is defined conceptually rather than physically, as in the real world. For example, if we wish to meander into the area of “usability,” we can use a search engine to visit that topic. By doing so, we can be said to be exploring the “usability environment” on the Internet. The constituents of the environment are ill defined, and the goal is simply to explore. On the other hand, if we wanted to know the meaning of the term *discount usability*, then we are specifying a target goal in an exploratory environment. Once we find the meaning of discount usability in a document on Jakob Nielsen’s site (http://www.useit.com/papers/web_discount_usability.html), or we

have specific instructions on where to go to find the definition, then we are performing an Internet search in a well-defined environment for a specific object.

Navigational Aids. If users visit a site and find themselves unable to navigate easily and efficiently, they are likely to exit the site and look further for one that meets their navigational goals. How can a designer make a site easier to navigate? We can use several navigational tools to make both exploration and a well-defined search more efficient.

- Links
- Buttons and controls
- Site maps, content lists, and indexes
- Landmarks and history trails
- Keywords and site search engine

Links

Well-designed links show visitors how to navigate most effectively the content of a Web site. Accordingly, what a link says and where it is located relative to other links in a site and on a page are paramount to its effectiveness as a navigation tool. Haine (1998) suggests that to be effective and unambiguous, a link's label should indicate both a unique reason for selecting the link and the expected results of selection. In their study comparing the results of the Edmunds and Disney sites, Spool, et al. (1997, URL) report that one reason visitors did better on the Edmunds site is the superior design of the links. The Edmunds links contained more text describing the results of selecting the links. The Disney links were cryptic and terse. Figure 7.6 shows the Edmunds site with its textual links.

It is important that same-site links be labeled in a way that indicates definite distinctions. Visitors should be able to figure out where links will lead from the labeling. Spool, et al. report that link labeling relates to the time and accuracy of selecting a link. They also report that the greater the number of links on a page, the less efficient the search. Larson and Czerwinski (1998) report in their study of experienced users that site organizations with few links in a broad structure were more effective than sites with deep link structures. On the other hand, as we increase the number of links, the efficiency of access to content decreases. Designers must ensure that link destinations are accurate. The link label, or words used in a link, should be the same as the title of the destination page. In addition, some experts have found that confusion can occur when links are used for destinations within the same



Figures 7.6: *Edmunds.com page with links*
(Reprinted with permission of Edmunds.com, Inc.)

long page (Spool, et al., 1997; Heath, 1998). My recommendation is that same-page links should be labeled as such or put in a category with a title such as “links on this page.”

Buttons and Controls

Navigation buttons and controls, such as “back” and “forward,” are included in the navigation bar on the browser, and sometimes they are available on the Web site. As designers, should we prefer that navigation controls be available only on the browser or also on Web pages? It is quite important to keep in mind that the browser interface remains constant irrespective of which Web site the visitor navigates. Because most visitors consistently use the same browser, we would expect visitors to become very familiar with the browser’s controls and functionality and to use them frequently. This assumption is all the more likely because not all Web sites include navigational controls on their pages. See Figure 7.7 for the Netscape browser buttons.

Evidently, however, the results of this observation are mixed. Various studies (Tauscher and Greenberg, 1997; Cateledge and Pitkow, 1995) have reported that the browser back button is used frequently, in 30 to 40 percent



Figure 7.7: Netscape browser buttons

(© 2000 Netscape Communications Corporation. screen shot used with permission.)

of all navigation. On the other hand, the “forward” and “home” buttons are seldom used. This inconsistency in the use of browser controls suggests that visitors may be confused about the functionality on the browser and the functionality within the Web site. Therefore, it is preferable that navigation aids, particularly those related to content (Bachiochi, et al., 1997), be placed within the Web site.

Site Maps, Content Lists, and Indexes

Site maps, content lists, and indexes are content-specific navigational aids that are designed and placed intentionally within a Web site. As mentioned earlier, there is evidence that navigation efficiency improves when content navigational aids are placed consistently near the top of a page. In comparing the effectiveness of maps with content lists, McDonald and Stevenson (1998) determined that visitor performance using maps was superior to that of content lists. The use of either navigational aid yielded superior results over a hypertext condition with no navigation aids. See Figure 7.8 for an example of a site map.



Figure 7.8: Site map

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Furthermore, novice participants who were not knowledgeable in the domain relied more extensively on aids than did knowledgeable participants. It was clear, however, that both novice and knowledgeable participants benefited from the use of a map as a navigational aid. The implication for Web design is that designers should include a site map as a minimum navigational aid in their Web site. The general recommendation is that any site with 20 or more pages should have a site map link on every page where the visitor is likely to enter the site. Some investigators (Allison and Hammond, 1989) have suggested that maps are most useful when visitors are first attempting to gain familiarity with content. Finally, it is important to ensure that links in the site map are correctly named and lead to the intended destination.

Landmarks and History Trails

As discussed earlier, we use landmarks for navigating new environments. Accordingly, designers should supply functional placeholders to help the novice traverse the links and navigational buttons of a Web site. Site functions should be marked by unique icons and labels that visitors can remember easily when they return to a site. This means that landmarks or icons should have distinctive features, such as complex and unique shapes, and should be free standing (Vinson, 1999). Objects such as icons should be concrete, depicting real items (Ruddle, et al., 1997). Figure 7.9 (see also Plate 16) shows some uniquely shaped icons.



Figure 7.9: *Icons* (see also Plate 16)
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Like links, icons should be unique and distinctive relative to other icons and landmarks in the same space. When icons look the same, there is a higher likelihood that navigators will select the wrong one, usually the icon adjacent to the one they want. Darken and Banker (1998) report evidence supporting this navigation error, which they call the “parallel error.” The design should also make available a history of pages visited within a site and between sites. Pages should be designed with distinctive and memorable titles. Distinctive titles will help users when surveying a history trail or a list of bookmarks.



Figure 7.10: *Web page with history trail*
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Avoid the use of frames, which make bookmarking cumbersome. See Figure 7.10 for an example of a history trail.

Keywords and Site Search Engines

For large sites, 20 or more pages, designers should provide for keyword-based search engines. Spool, et al. (1997) report that when a large site did not have a search engine, visitors gave up on the site. Search engines are most likely to be used by visitors who know what they are looking for but are unfamiliar with the search environment. In such cases, visitors are searching for object(s) or information in an ill-defined environment because the statement of the search problem does not include a specific path or paths to retrace. Figure 7.11 shows the search engine on the upper left of the home page for the Graphic Visualization and Usability Center (GVU) site. Designers should make sure that search engines on large sites appear on the most frequent site-entry pages and that there are multiple search choices. For example, *www.metacrawler.com* in Figure 7.12 gives “any,” “all,” and “phrase” searches.



Figure 7.11: *GVU site with search engine*
(Reprinted with permission.)

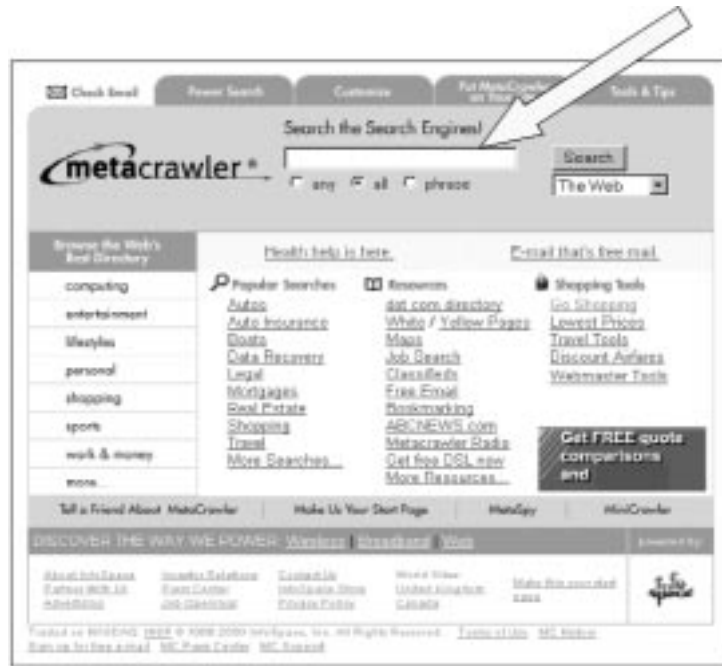


Figure 7.12: Metacrawler site with multiple search choices

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Assuring Reasonable Confidence in the Site's Privacy and Security

Privacy. If site owners track site visitors and collect personal behavior data, then site design etiquette requires that visitors be told about this from the beginning. Site owners should tell potential visitors about the method that they use to collect site behavior data and how the collected information will be used. For example, if “cookies” or temporary ID numbers are used to personalize, the designer should inform the site visitor by providing a site personalization link prominently on the home page and any other frequently visited pages. (Cookies are files that are created and remain attached to a user’s browser.) In some cases, full disclosure by site owners is not just a matter of etiquette but a question of legality. For example, the use of cookies is outlawed in many countries, as we discuss in Chapter 11.

Security. Security is a paramount concern for e-business Web site design. Visitors have more confidence in the security of professional-looking

sites. Site performance also reveals the level of security (Bouch, et al., 2000). Security technologies, such as SSL, are crucial, and the availability of a link to a “security practices” page helps to reassure visitors. For transaction pages, designers should provide confirmation pages that are easily printable and should remind users to print pages as receipts. Contact information including address, e-mail, and phone number should be prominently displayed. When designing the information needed to complete a transaction, it is important not to ask for more information than is absolutely necessary.

Making the Site Visible

It is the responsibility of the Web site designer and, later, the Web manager to ensure that the site is visible to the target audience. Visibility is both a design and a marketing task. Marketing strategies include such steps as arranging reciprocal links, submitting pages to popular search engines, and joining a banner exchange program. Our main concern in this book, however, is with design strategies. Designers can enhance site visibility to a target audience in a number of ways, including the following.

- Make sure to use domain-related keywords.
- Do not hide the keywords in the background. Instead, place keywords prominently on top of the target page.
- Compose a site name that thematically reflects the content.
- For brick and mortar companies, use the business name as the domain name.
- In other cases, create a domain name that is easy for the target audience to remember. For example, the name usabilityadvice.com is easy to recall by people looking for usability advice.
- Include a statement on the site’s home page reminding visitors to bookmark the page.
- On the most frequently accessed pages of the site, have only internal links that send visitors to other key locations within the site. Links sending visitors away from the site should be placed only on secondary pages.
- Provide multiple languages for a multinational targeted audience.

Maintaining Quality

There is a strong correlation between the actual and the perceived quality of service for Internet commerce (Bouch, et al., 2000). That is, if quality is a design goal, the subjective perception of users will be one of quality. Here is a set of design points that Web owners and designers should consider when their goal is to enhance a site's quality.

- Make sure that contact information is prominently placed.
- Make the customer service button or link highly visible.
- Provide for personalization on the site.
- Ask users to submit feedback and provide user reviews of services and products.
- Make sure that content is frequently updated with date of revision visible.
- Indicate “new” for new information.
- Include a statement guaranteeing the quality of service.
- Base design and service on user testing and market research should be the basis of design and service.
- Make sure that site pages, particularly receipts and confirmations, are easy to print.
- Perform continual reviews to look for and eliminate dangling links.
- Identify and incorporate on a continuing basis relevant new technology.