

HCI RESEARCH ISSUES IN E-COMMERCE

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ABSTRACT

This article outlines a number of important research issues in human-computer interaction in the e-commerce environment. It highlights some of the challenges faced by users in browsing Web sites and conducting searches for information, and suggests several areas of research for promoting ease of navigation and search. Also, it discusses the importance of trust in the online environment, describing some of the antecedents and consequences of trust, and provides guidelines for integrating trust into Web site design. The issues discussed in this article are presented under three broad categories of human-computer interaction – Web usability, interface design, and trust – and are intended to highlight what we believe are worthwhile areas for future research in e-commerce.

Keywords: Web usability, navigation, trust, e-commerce

1. Introduction

The Internet and the World Wide Web have revolutionized our daily lives and the way business is conducted. Since 1997, the Web has evolved into a true economy and a new frontier for business. In spite of what some observers refer to as the “Internet bust”, Web use for e-commerce continues to grow as many established brick-and-mortar businesses incorporate online components into their marketing strategies. The e-commerce environment today, however, is much different than in the early days. As competition grows for online customers, companies cannot simply assume that if they build Web sites customers will come. Web shoppers have become more sophisticated in their knowledge of online purchasing alternatives, and more importantly, they have become less patient with Web sites that are difficult to understand and use. The reality is that the Web is to a large extent about “instant gratification”. Users expect to find the information they want, find it quickly, and to do so with little effort. E-commerce site designs that ignore these facts risk the possibility of losing valuable customers and, in the long run, may even risk their economic viability. Unfortunately, many of today’s e-commerce sites still commit a number of errors in usability design. Poor navigability, slow download times, and confusing content are common among Web sites (Nielsen, 1999b). One objective of this article is to highlight important issues in usability design in the e-commerce context. Specifically, we focus on an issue that is perhaps the most commonly cited problem in Web design – users’ inability to navigate Web sites and to search for desired information. The first part of the paper focuses on issues and challenges faced by users in browsing Web sites and conducting searches for information. Based on these issues, we provide what we believe are important recommendations for future research into Web navigation and search. The second part deals more specifically with issues related to purchasing over the Web. Here, we discuss guidelines for e-commerce design to support the buying process.

A third issue that, arguably, has always been important, but only recently is receiving more attention is trust in e-commerce. Clearly, the Web-based environment places a unique set of constraints on the buyer-seller relationship that did not exist in traditional face-to-face transactions. No longer can the buyer meet with a salesperson, ask questions, observe body language, or actually see the physical product. Now, the entire transaction is conducted through the “veil” of the computer medium. For many potential customers, this raises real concerns about the trustworthiness of the selling organization, the reliability of the buying process, privacy of the transaction, and guarantees of buying satisfaction. To date, the topic of trust has received little attention in the e-commerce research literature. While many e-commerce sites have implemented some recommendations from the marketing area for promoting trust in the buyer-seller relationship, or have implemented their own common sense solutions for

promoting trust, we observe that most of them have done so in a rather haphazard way. More research needs to be conducted in the e-commerce area to provide guidance on how to design Web sites that promote trust. To explore possible answers to this question, we need to investigate issues such as the antecedents of trust, buyer and seller characteristics affecting the trust relationship, and how ongoing trust can be maintained. The third part of the article discusses the growing importance of trust in the context of Web-based commerce and provides a number of suggestions to guide future research in this area.

The rest of the article is organized as follows: Section 2 discusses issues related to the navigation and search aspects of Web usability. Section 3 presents the idea of an e-commerce Web site serving as a “purchasing support system”, facilitating the steps of the purchasing process. Future areas of research are also presented. Section 4 addresses the issue of trust in e-commerce and its antecedents. It also provides a set of guidelines for designing e-commerce Web sites to promote trust from consumers and suggests areas of future research in this area. Section 5 concludes the article with an overview of key issues of Web design to promote usability and trust.

2. Web Usability

Web usability can be defined in terms of several standard criteria: the ability to find one’s way around the Web, to locate desired information, to know what to do next, and, very importantly, to do so with minimal effort. Central to this idea of usability are the important concepts of ease of *navigation* and *search*.

The ability to navigate the Web and search for information is certainly of major importance to Web designers, researchers, e-commerce companies selling their products and services, and, of course, to millions of users who access the Web every day. The central role of navigation and search on the Web is not a new concept, however. It has grown out of a well established tradition (over a decade) of research and design in the hypermedia field involving issues such as: the relationship between task types and information structure (Gay, Trumbull, and Mazur, 1991; Radha and Murphy, 1992; Wright and Lickorish, 1989, Hardman, 1989), choice of navigation aids (Hammond and Allinson, 1989; Monk, 1989), evaluation of information-seeking strategies (Gray, 1990; Hardman, 1989), orientation and navigation (Webb and Kramer, 1990; Kim and Hirtle, 1995), and comparisons of hypermedia with other types of systems (Beard and Walker, 1990; Gray and Shasha, 1989). Arguably, the Web is very different from most early hypermedia systems, which were uniform in structure and limited in scope. In fact, the Web may be regarded as the anti-thesis of traditional hypermedia systems, with an endless array of site types, content, designs, and purposes. However, in structure and function, the Web is fundamentally a hypermedia-based system that can benefit from ongoing research in this field (Smith, Newman, and Parks, 1997).

Before discussing specific issues related to Web navigation and information search, we will distinguish between these two concepts. We use the term *navigation* in the Web-based context to describe what is more commonly referred to as “browsing”. Although some researchers have viewed browsing and search behaviors as overlapping (Carmel, Crawford, and Chen, 1992) or related information seeking behaviors (Belkin, Marchetti, and Cool, 1993), we adopt Toms’ (2000) view that the two are distinct. Toms describe browsing as “... an activity in which one gathers information while scanning an information space without an explicit objective” (p. 424). In other words, the user’s goals may be unclear, or there may be no goals focusing on finding a specific piece of information. This implies that the process may be, at times, quite haphazard, serendipitous, and unpredictable. Users may follow any number of paths and may use a variety of different navigation tools in exploring the Web, including hyperlinks and buttons (i.e., home, back, next) provided on individual Web pages. *Search* behavior, on the other hand, is a goal-directed information seeking behavior. For example, a user may want to find specific information about population growth in her hometown during the last five years. In this case, her goal is relatively well defined, and the process of searching is bounded by a very different set of navigation options (e.g., keyword based search engine or menu-based hierarchy). Some key issues related to Web-based navigation are discussed in the following sub-sections.

2.1 Issues and Challenges Related to Web-based Navigation

The challenges and issues of browsing and information search on the Web are described fairly clearly and consistently in the literature. Kanerva et al. (1997), for example, describe three types of user errors encountered during their Web usability studies: users not knowing where they are on the Web, not knowing where they can go, and not understanding *how* they can get to other places. Similarly, in the area of hypermedia research, Conklin (1987), Edwards and Hardman (1987), Nielsen (1990), and Pitkow and Kehoe (1996) identify the problem of *disorientation* (i.e., losing the sense of location and direction in a nonlinear document). Also, Conklin (1987) describes another challenge, *cognitive overhead*, as the challenge of maintaining several tasks or hyperlink trails simultaneously. For example, a user may need to keep in mind several potential hyperlinks when following leads in an information search. Concurrently, he may need to mentally note or record information found at each step of the search. These tasks add to his cognitive load as he browses or searches the Web for information. Kim and Hirtle (1995) describe one outcome of this cognitive overhead as the *digression* problem. In this situation, the user

experiences difficulties in planning, managing, and executing digressions from a course of action. High cognitive demands also often lead to *forgetting* or *not noticing* important information (i.e., the “art museum problem”, Foss (1989)).

The challenge for Web designers, therefore, is to facilitate the process of navigation and search on the Web – specifically, by minimizing occurrences of being “lost in space”, reducing the cognitive demands of information browsing and search, promoting information recognition and recall, and motivating (encouraging) users to explore Web sites. Central to the idea of Web usability is the ability to browse the Web to discover new information or relationships (between different pieces of information), or to perform a goal-directed search. So, the relevant questions for designers include: “How can Web design facilitate exploration and search activities? Is there a single best design for promoting browsing and search behaviors?” Some recommendations are discussed in the following sub-sections.

2.1.1 Matching Navigational Aids with the Task

With regard to the above questions, research in the hypermedia field suggests that design strategies need to take into account three related criteria: (1) the task to be performed, (2) how information is structured within the system, and (3) navigational support (Smith et al., 1997). These concepts are related in a top-down fashion, starting with the task.

First, task type may determine the optimal means of structuring information within a system. A number of researchers have investigated the relationship between task type and information structure (e.g., Gay et al., 1991; Radha and Murphy, 1992; Mohageg, 1992; Utting and Yankelovich, 1989), concluding that exploratory tasks are supported best by a network or combination information structure. This would be illustrated, for example, by a standard hyperlinked structure, such as the one found in the typical Web browser. On the other hand, these studies found that searching tasks are best supported by a hierarchical information structure, such as those used by many online stores. Second, task type also determines the optimal form of navigation support. For example, research in the hypermedia field has found that search tasks benefit most from using hierarchical navigation support, while exploration tasks work best with graphical representations (e.g., hyperlinked Web pages) (Edwards and Hardman, 1989; Hammond and Allison, 1989; Monk, 1989; Smith et al., 1997). Therefore, according to these recommendations, search tasks are performed most effectively when information is represented in a hierarchical structure using some type of hierarchical navigation support. Exploration tasks are most effective when supported by a network structure and a graphical browser. Given today’s implementation of the Web, most would agree that standard Web browsers implement the recommendation of a network information structure with a graphical interface, thus facilitating exploration tasks. With regard to search tasks, however, these studies do not take into account the key-word search structure used in many of today’s search engines (e.g., Google, Alta Vista, MSN Search). Therefore, the following question remains to be studied: For what types of tasks or search categories would a key-word search be more effective than a hierarchical search? Interestingly, almost all major search engines permit Web searches both via key words and by using menus.

While these basic recommendations seem to have become standards on the Web today, perhaps a more relevant question is, “What *form* of browser hyperlink structure is best for promoting exploration, or what *form* of index facilitates search behavior?” The answers to these questions, of course, will require ongoing research and study. However, researchers have begun examining some of these important issues. Kim (1999), for example, looks at the navigation process of on-line shoppers and their subjective evaluation of the shopping experience. He concluded that subjects using a navigation aid based on a spatial metaphor (with an “up” and “down” escalator button and “neighborhood” buttons) to search the hierarchical structure of a shopping mall had higher perceptions of ease of use, and that they found items more easily than those who used a non-spatial navigation aid (i.e., a text-based index and search engine). In particular, spatial navigation was superior for locating *ad hoc* items, where goals were constructed spontaneously (e.g., find a birthday present for a friend), versus items in predetermined categories (e.g., books, music). As a result, those using the spatial navigation aid also expressed greater shopping satisfaction. Kim and Yoo (2000) also examined the impact of various link navigation structures on online shopping pleasure and convenience. They found that the combination of a “neighborhood” link (allowing horizontal movement within a given level), a “top” link (moving the user to predetermined location), and “index” (moving to a predetermined lowest level, such as a product index) maximized shopping pleasure and convenience. One reason is that this combination minimized tedious use of the back and forward buttons. Campbell and Maglio (1999) evaluated the use of “traffic lights” and link relevance in a browser-based search task. Traffic lights were simply green, yellow, or red images added to each link to indicate its connection speed. Also, link relevance was indicated by the number of words each link shared with the search topic text provided to subjects. Therefore, each link indicated both its relevance to the search criteria and its connection speed. The goal of this study was to explore ways to help users find the most relevant information most quickly. Results indicated that this information did indeed improve Web

navigation performance. These are only a few examples of the type of research that focuses design efforts on the specific structures and navigational components of Web browsers to improve exploration and search behaviors. Much more research will be required to understand the relationship between information structures and navigational aids in promoting the ease of browsing and information search.

2.1.2 Web Page Revisitation

Another interesting stream of research investigating user browsing and information search behavior involves logging users' navigation activities over periods of time. The purpose of these studies is to discover the most prevalent browsing behaviors and to recommend changes to existing browsers to facilitate navigation. Notable among this group are studies by Catledge and Pitkow (1995) and Tauscher and Greenberg (1997). Catledge and Pitkow used log files to capture the browsing behavior of 107 XMOsaic 2.4 users over a three-week period. Tauscher and Greenberg used XMOsaic 2.6 with 23 users over a period of five to six weeks. Both studies collected a variety of behaviors, including the specific techniques used to navigate between pages. It is worth noting some of the differences and similarities of their results. Catledge and Pitkow found that the average page visit rate for each user was about 14 pages per day, while Tauscher and Greenberg found a higher rate of about 21 pages per day. However, both study results were very similar with regard to percentage of navigation actions initiated by clicking on hypertext links (42% for Tauscher and Greenberg versus 50% for Catledge and Pitkow), use of the BACK button (30% versus 37%), use of a hotlist (i.e., bookmarks) (2.7% versus 2.3%), and use of history lists (0.7% versus 0.1%). Also, both studies indicate that users revisit Web pages quite frequently (58% versus 61%). Therefore, this leads to the conclusion that navigational aids that facilitate page revisitation become very important components of useable Website design. The results of the preferred navigational aids suggest that most users in these studies revisited pages either by using the BACK button or by clicking on anchor links. Surprisingly, the technologies that were designed to facilitate revisitation, the hotlist and the history list, were used very little.

More recently, Cockburn and McKenzie (2001) have updated this research in a study using the Netscape browser (versions 4.5 - 4.7). They evaluated the browsing behavior of 17 subjects over a four-month period. Their results build on those of the previous studies by providing a clearer picture of browsing behavior using a contemporary browser. One interesting result reported by these researchers was that average number of page visits was 42 pages per day for each subject (versus 14 and 21 in the previous two studies). This increase in the number of page visits, perhaps, reflects both the growth of the Web and users' increased knowledge of currently available Web sites. With regard to page revisits, the results are even more striking than those of the previous two studies. They found that page revisits accounted for 81% of all page accesses, indicating that today's Web browsing characterizes a system that is even more *recurrent* (Greenberg, 1993) (i.e., relies heavily on revisitation) than in previous years. Therefore, navigational aids that facilitate revisits become even more important in browser design. Unlike the previous two studies, Cockburn and McKenzie do not assess *how* users accessed different pages. However, they do note that for users' top five most visited pages, 17.7% were set up as the home page, 11.7% were bookmarked, 6% were on the personal toolbar, and 64.7% had no special access method. Interestingly, the authors note that the mean maximum number of each subject's bookmarks was 184, with the number of bookmark additions heavily outweighing the number of deletions. In addition, about 25% of all bookmarked pages were invalid. This suggests that users may have problems organizing and managing their growing number of bookmarks, and, as the list grows, searching and using them become more difficult. Hence, more research might be needed to improve the organization and presentation of bookmarks, to make them easier to manage and use.

Based on their findings, Tauscher and Greenberg propose several design guidelines for history lists that facilitate browsing on the Web (a few of which are presented below).

- 1) *History lists should try to predict the user's next URL selection.* Most probable selections could be placed in the most visible location in the list (e.g., at the top).
- 2) *A history list of 6-10 items is a reasonable length.* Longer lists are unlikely to produce significantly better results.
- 3) *History items should have a meaningful representation.*
- 4) *It should be cheaper, in terms of physical and cognitive activity, for users to recall URLs from a history mechanism than to navigate them via other methods (e.g., BACK button, hypertext links).*
- 5) *Allow grouping of URLs into high-level Web tasks, and switching between tasks.*

Cockburn and McKenzie also provide several recommendations.

- 1) *Users may benefit from integrating all the different "revisitation" interfaces (e.g., BACK button, hot lists, history lists) into a single interface component.*
- 2) *Designers should consider different implementations of the BACK button that does not prune recently visited pages from history stack.*
- 3) *Bookmark collections should be scalable to manage very large lists.*

- 4) *Bookmark collections should provide tools to aid in managing the collection (e.g., identifying “dead” links).*
- 5) *Systems should support shortcut mechanisms for navigating a smaller set of frequently visited pages.*
- 6) *Because users typically spend very little time on most pages, they should be designed to load quickly and clearly present links to the user.*

2.1.3 Web Visualization

Recognizing some of the limitations of standard Web browsers, particularly in terms their inability to provide a global view of the Web, other researchers in recent years have begun to use visualization techniques to rethink and redesign the Web interface. Risden et al. (2000) explore the use of interactive 3D visualizations that provide users with a global view of a large Web site. In an experimental study, they use a computer-generated 3D hyperbolic graph to model the Snap.com Web site. The hyperbolic graph models Web pages as labeled nodes, and hyperlinks among those nodes as edges of the graph. The graph is laid out in 3-dimensional space within a globe-shaped structure. The node of current interest and its neighboring nodes are clearly visible in the center of the globe, while distant nodes appear to be smaller than those at the center of the globe. This structure provides a sense of “perspective” or space, and conveys an overall view of the pages within the given site. In their implementation, parent nodes were shown on the left-hand side, and the descendants appeared on the right. As the user selects a specific node, it moves to the center of the hyperbolic space, and other nodes shift, accordingly. In short, the user is able to search the Web by navigating a 3D interactive environment. Risden et al. compared a 3D Web browser (XML3D) with two more traditional 2D navigation techniques. Using the Snap.com search directory as the content, they first reconfigured it in the form of XML3D then compared it to two 2D versions, one of these two was Snap.com’s original hierarchical structure. The other version was a 2D collapsible tree browser (i.e., a Windows Explorer-like interface). Participants performed search and find tasks using all three browsers. The results indicated that users of the 3D browser performed some types of tasks (finding existing page categories) faster than users of either of the 2D browsers. Also, there was no decline in the quality of their responses. Therefore, results indicate that there is some promise for visualizing Web pages in a 3D format, perhaps as a result of providing a global view of Web sites thereby reducing users’ cognitive overhead.

2.2 Suggestions for Future Research

In the previous section, we have discussed what we believe are some key issues in designing usable Web sites. The ability to browse the Web and to search for specific information is fundamental to the notion of usability in this context. While a number of researchers have begun to investigate some of the issues described here, clearly there are many more questions that still need to be examined. In this section, we summarize what we believe are some promising areas for future study.

- (1) One of the issues discussed above, search behaviors, gives rise to several potential areas of further study. For example, given that current search engines consist of two basic forms – hierarchical and key word – what are the effects of search engine structure, and associated search processes, on searching outcomes? For example, are key word based searches more effective (e.g., less time, fewer errors, greater user satisfaction and confidence in their success) than hierarchical searches? For what types of users, or for what types of tasks is one structure more effective than the other? What are the cognitive processes associated with using different types of search tools? Understanding these design implications from a cognitive perspective may give designers better insight into the fit between certain designs and their use.
- (2) Further work needs to be done to determine the effects of navigational aids, used in the standard browser context, on browsing effectiveness. Kim and Yoo’s (2000) work on navigational button design for an online shopping mall provided a clearer picture of the types and combinations of navigation keys that facilitated browsing and information finding in that particular context. Are there other navigational aids that could be added to e-commerce sites that would facilitate finding and purchasing products or services? For example, would a virtual representation of a shopping mall facilitate locating products? Could there be differences in user satisfaction or performance by using different placements of navigational tools on a page? Would users benefit from several simultaneous implementations of specialized navigational aids? Again, understanding the cognitive process of navigation with such aids would facilitate our understanding of design.
- (3) The research on history lists also provides a number of interesting research avenues. One recommendation described earlier was that next generation history lists should be able to predict the user’s next URL, perhaps displaying it in the most prominent location in the list. How could that mechanism be implemented? Would some type of intelligent agent technology be the best approach for implementing this capability? What effect on “revisitation” behavior would this have? Would it encourage use of the history list versus more common and less efficient navigation methods (e.g., BACK button)? Related to this issue

is the question of how long the “optimal” history list should be. Tauscher and Greenberg (1997) suggest that 6-10 items is optimal. Would this reduce cognitive overhead to make use of the history list more efficient? Is there such a thing as an “optimal” list length? If so, what is it? Another question is how to best represent history list items. Current browsers use typically some combination of key words and a URL. However, are there other notations that would reduce cognitive overhead of processing and using long lists, such as a special icon to label a specific link or category of links? Are there other notation schemes that could be used to help organize history items into meaningful groupings? Cockburn and McKenzie (2001) also raise the question of how to organize history lists (e.g., by temporal chunks, alphabetically, title, or visit count). Can lists be organized around specific task types (e.g., finding information on auto repair or on how to manage investments)? Research could examine the effects of different organizational schemes on users’ browsing performance and satisfaction. Cockburn and McKenzie also raise the issue of organizing all “revisitation” interfaces under a single interface. For example, would it make sense to integrate the often-use BACK key with the history list? By clicking the BACK key, one might simultaneously view cursor movement on the history list, thereby having a clearer picture of exactly where BACK is taking you. What effect would an integrated “revisitation” interface have on user browsing and search performance and satisfaction? Finally, the research cited here raises the issue of BACK button stack pruning (eliminating, or “pruning” some sites from the list of visited sites). Cockburn and McKenzie call for research on different BACK button implementations, specifically non-pruned lists that show all sites visited. Research could examine the effects of this type of revision of the BACK button stack on browsing behavior and its fit with different browsing tasks.

- (4) A novel approach to Web navigation has been the development of 3D browsers (e.g., XML3D). Ridsen et al. (2000) evaluated the impact of their browser for a specific category of users (Web developers) and for a specific task (directory management). It would be interesting to evaluate the effects of a 3D browser on the typical browsing behavior of casual users. Alternatively, researchers could evaluate behaviors related to searching for specific information on a Web site. Would linking a 3D browser to some sort of 2D representation produce superior results to simply using the 3D browser alone? If so, what styles of 2D browser would be most effective? Can 3D browsers be developed that provide a visual trace (i.e., a graphical history) of all sites visited within a session, or across multiple sessions? How would this affect the ability to revisit Web sites?

These are only a few questions raised by our review of research issues in Web browsing and search. We hope they encourage researchers to begin to investigate these and other related issues and to improve Web navigation tools for future users.

3. Designing for Web Commerce

The previous section looks at very important aspects of Web usability, i.e., browser and search design. Arguably, however, these issues apply to Web use in general, not just e-commerce. In this section we touch on specific usability issues related to e-commerce and the user’s experience in purchasing over the Web.

3.1 Challenges of Purchasing Over the Web

Nielsen (2001) asserts that poor Web site design is a major factor affecting the profitability of Web-based retailers. He describes a recent study in which users made 496 attempts to perform various tasks on 20 large and small e-commerce sites – with only 56% of those attempts being successful. If these results are indicative of the larger population of e-commerce sites, then retailers may be losing a large percentage of potential sales simply because their sites are confusing and difficult to use. Nielsen (1999b) describes a number of design mistakes that many Web sites commonly make, including: slow download times, non-standard link colors, long scrolling navigation pages, scrolling text or looping animation, orphan pages, bleeding-edge technologies, and several others. To address these and other design challenges, he provides a number of guidelines. For example, for homepages, he suggests: starting the page with a short description that summarizes what the company does, write a window title with good visibility in search engines and bookmarks, emphasize the site’s top high priority tasks, include a search box, begin hyperlink names with most important keyword, use meaningful graphics, and several other important points (Nielsen, 2002). Clearly, the major emphasis is in facilitating users’ understanding and navigation of e-commerce sites. As we have discussed earlier, designs that reduce users’ cognitive overhead lead to greater success overall.

However, in the e-commerce context, it is also important to understand the processes that site visitors go through in purchasing items from a Web site. This builds on the fundamental notion that sites should be easy to navigate and understand. However, e-commerce site designers should also understand the buying process and should create designs that make purchasing easier to do. Miles, Howes, and Davies (2000) begin to address this

issue by suggesting that an e-commerce Web site is a type of “decision support system” that supports the stages of the purchasing decision. These stages include: i) search for products that meet the buyer’s criteria, via available navigation or search aids; ii) manage search criteria (new information may cause the buyer to reassess product criteria and to expand, refine, or constrict them); and, iii) comparison of products. Based on these stages, the authors identify a framework specifying probable dimensions of Web-based purchasing support. These dimensions include: for supporting product search: i) the type of site metaphor used (browsable Web structure and/or a search engine); ii) the structure of information on the site (hierarchical or network); for criteria management: i) the type of product representation; ii) how product information is provided; and for comparison support: i) the scope of comparison (intrasite or intersite); ii) the type of comparison tool used. This framework raises a number of issues that researchers can begin to investigate in order to design sites that better support the consumer purchasing process. These are discussed in the following section.

3.2 Suggestions for Future Research in Designing E-commerce Interfaces

A few suggestions for future research in the area of Web interface design that support consumer purchasing decisions follow. They are grouped under the three major buying behaviors discussed above: search for products, managing search criteria, and product comparison.

- (1) As we have seen from discussions in earlier sections, user search behavior can be supported using a variety of methods. For example, if the intent is to facilitate browsing and information discovery, then a networked information structure may be most effective. On the other hand, for those who have a clear idea of what they want, some type of search engine may be a more useful option. One potential research issue to explore may be how best to integrate exploration and searching behaviors. For example, if a shopper searches for automobile tires, is there a way to include information (i.e., links) in the product description to related items that the shopper might find useful (e.g., global positioning systems)? Also, would alternative interface designs encourage the integration of search and browsing behaviors (e.g., 3D browser that provides an overview of the site)? Alternatively, an interesting area of research may be to determine what types of search tools could be used to help users to determine the types, styles, etc. of products on the site might best fit their needs.
- (2) As Miles et al. point out, product representations may be the only means that users have to determine if products meet their criteria. So, what would be the most effective ways to present products so users can make the best possible decisions? For example, should products be represented using 3D imaging that allows buyers to view them from all angles, both inside and out, as many automobile manufacturers do for their models? Or, for some products, do simple 2D images work better? Also, what is the impact of representation quality on purchasing decisions? When do color rendering, sizing, displayed product details, etc. positively influence buying behavior within the electronic medium? Product information may also play a major role in the purchase decision. One issue is to determine the type of information that would be most useful to buyers (e.g., professional reviews, customer reviews, product comparison information). How should this information be provided on the Web site? For example, is it best to provide product information that is easily accessible from an online image via a mouse click, or via links, perhaps, to related Web sites?
- (3) Many of today’s e-commerce Web sites do not provide adequate support for comparing similar products. The user often simply has to note, print out, or remember relevant information across multiple Web pages in order to compare specific features. Clearly, support for product comparisons would benefit users in these cases. But, what type of support is needed? Questions here include: How many product features should be compared? What would be the effect of customizing comparisons so that only specific features dictated by users’ search criteria are compared? How many products or features can the user compare online before demands on cognitive processing become too great? Would the ability to run simple online simulations of different products aid decision makers (i.e., to compare the product in “action”)? Also, Miles et al. raise an interesting question – Does it make sense for a seller’s Web site to be able to compare its products to those of its competitors? They argue that cross-seller comparisons may actually increase buyer’s confidence in making the right decision and, over the long-run, two linked stores may sell more products by helping customers match products to their requirements.

Some of these ideas related to purchasing support, of course, have been implemented in current Web sites. However, even though some of them are now being used, we still do not know if these are the best, most effective ways to operationalize purchasing support. In order to make this determination, and to capitalize on an array of new opportunities for supporting user-purchasing behavior, further research is needed. These are a few suggestions about where we can start.

4. Trust in E-Commerce

A key reason for people's lack of willingness to provide information or shop online is "the fundamental lack of faith (or trust) between most businesses and consumers on the Web" (Hoffman, Novak, and Peralta, 1999, p. 80). In other words, trust is necessary for 'online relationship exchanges' involving personal and financial information which take place in a virtual environment characterized by uncertainty, lack of control, and potential opportunism (Hoffman et al., 1999; Bhattacharjee, 2002). Keen (1997) argues that the lack of consumer trust is the most significant long-term barrier for e-commerce. Similarly, as echoed by Bhattacharjee (2002) based on the opinions of several other e-commerce researchers, "lack of trust may eventually pose a substantial threat to the successful conduct of electronic commerce" (p. 212). Hence, a key question for e-commerce success from a human-computer interaction perspective is (Rosenbloom, 2000): How can e-commerce technology be engineered to inspire consumer trust?

To answer this question, it is necessary to first understand the concept of consumer trust in the online environment. Although trust has been recognized as a key facilitator (or inhibitor) of electronic commerce, many aspects concerning online trust and its antecedents and consequences are still not well understood (Bhattacharjee, 2002). Some of the related questions include: What are the elements that constitute both initial and ongoing trust in e-commerce? What are the antecedents, or factors influencing (initial and ongoing) trust in e-commerce? What are the design characteristics that constitute a trustworthy e-commerce Web site? Does propensity to trust differ among people of different demographics, such as age groups, gender, and educational qualifications? What are the mechanisms for initiating, building, and sustaining trust in e-commerce? How effective are the existing mechanisms for developing online trust? To what degree and in what ways is trust accountable for the success or failure of an e-commerce Web site?

In the following sub-sections, we will review the concept of consumer trust in e-commerce, its antecedents and consequences, and mechanisms and design issues for trust development in e-commerce. Note that we focus only on consumer-related trust, that is, trust in business-to-consumer (B2C) and consumer-to-consumer (C2C) e-commerce. Based on the review, we offer some recommendations concerning development of e-commerce Web sites, and highlight some key research issues concerning trust in e-commerce.

4.1 Concept of Trust in E-commerce – its Components, Antecedents and Consequences

Trust is a complex, multi-dimensional, context-dependent construct (Gefen, 2000; McKnight, Choudhury, and Kacmar, 2002). According to Friedman, Kahn, and Howe (2000), we trust "when we are vulnerable to harm from others yet believe these others would not harm us even though they could" (p. 34). In the context of e-commerce, consumer trust can be defined as the willingness of the consumer (trustor) to be vulnerable to the actions of an online party (trustee) by engaging in online relationship exchanges with the party. By providing sensitive information to the online party as part of the exchanges, the consumer, who has limited ability to monitor or control the behavior of the online party, becomes vulnerable to the actions of the party. By becoming vulnerable, the consumer is taking a risk in the relationship. Hence, "trust is not taking risk *per se*, but rather it is a willingness to take risk" (Mayer, Davis, and Schoorman, 1995, p. 712).

Consumers' lack of trust in the online environment is demonstrated by their fear of giving away personal and financial information because of privacy concerns arising from lack of environmental control and control over secondary use of information (Hoffman et al., 1999). Environmental control refers to the consumer's ability to control the actions of a Web vendor as well as the Web provider's ability to prevent the information from being hacked, whereas control over secondary use of information refers to the ability to control one's personal information from being used for other purposes after the transaction has taken place. According to Hoffman et al.'s (1999) analysis, 63% of consumers decline to provide personal information to Web sites because they do not trust those collecting the data, 69% of those who refuse to provide such information do so because the Web sites provide no information on how the data will be used, and 65% indicate that it is not worth the risk. Almost 95% of Web users have declined to provide personal information to Web sites at one time or another when asked (Hoffman et al., 1999).

The conceptualization of trust in e-commerce has been advanced by two recent efforts undertaken by Bhattacharjee (2002) and McKnight et al. (2002) where measures for the construct were developed. McKnight et al. conceptualized trust in e-commerce as comprising four aspects: disposition to trust (i.e., general willingness to trust others), institution-based trust (i.e., perceptions of the Internet environment), trusting beliefs (i.e., perceptions of Web vendor attributes), and trusting intentions (i.e., intentions to engage in trust-related behaviors with a Web vendor), whereas Bhattacharjee specifically addressed individual trust in online firms (or 'trusting beliefs' in McKnight et al.'s term) by developing a seven-item scale for the construct. In both studies, the concept of trusting beliefs is operationalized based on the dimensions proposed by Mayer et al. (1995): ability (competence), integrity (reliability and dependability), and benevolence (care and goodwill) of the trustee (or the online firm or party in the

context of e-commerce). Despite these two recent advancements in conceptualizing and operationalizing the trust construct in the e-commerce environment, the concept of ongoing or long-term trust in e-commerce is still not well understood or studied.

McAllister (1995) distinguishes between two types of trust: cognition-based trust and affect-based trust. In the context of e-commerce, cognition-based trust refers to reliability and dependability of the trustee, which corresponds to 'integrity' in Mayer et al.'s term. Affect-based trust refers to care and concern for the other party, or 'benevolence' in Mayer et al.'s term. Similarly, these two types of trust were also proposed by Doney and Cannon (1997) but termed credibility (cognition-based) versus benevolence (affect-based) by them. From the literature, it is clear that ability or competence is a necessary but not sufficient condition for trust. To engage in a trusting online relationship, a consumer is likely to first evaluate the competence and integrity of the online firm or party. Hence, cognition-based trust is crucial in establishing an initial relationship with an online party. On the other hand, as indicated by Mayer et al. (1995), the effect of perceived benevolence on trust is likely to increase over time as the relationship develops. Hence, affect-based trust is expected to become more important in subsequent online relationships. Although the literature suggests differences between the types of trust needed to establish an initial versus ongoing relationship, we are not aware of research studies that have empirically investigated, assessed or validated the differences between initial and ongoing trust in online exchange relationships.

Why is trust important? Several researchers have demonstrated its importance in e-commerce. Increased trust in an online store reduces consumers' perception of risk (of carrying out a transaction with the online store) and influences their attitudes toward the online store, which increase their willingness to purchase from the online store (Jarvenpaa, Tractinsky, and Vitale, 2000). Gefen (2000) has also shown a clear relationship between trust and both intention to purchase and intention to inquire about products on the vendor's Web site. Lee, Kim, and Moon (2000) demonstrate a positive relationship between trustworthiness of Web sites and customer loyalty. This relationship is even stronger for high involvement products. Although the importance of online trust has been demonstrated in the literature, and there is no doubt that trust is important for the success of e-commerce, the antecedents of consumer online trust and how they influence overall trust perceptions warrant further study (Bhattacharjee, 2002).

To identify and understand the antecedents of consumer trust in e-commerce, researchers have looked into the trust literature in various disciplines, including marketing, psychology, social psychology, sociology, organizational behavior, and economics. Drawing upon the marketing literature (Doney and Cannon, 1997), Jarvenpaa et al. (2000) assessed how the size and reputation of Internet stores evoke consumer trust in online exchange relationships. They found a strong relationship between perceived reputation and trust, and a significant but weaker relationship between perceived size of Internet stores and consumer trust. Perceived reputation was found to play an important role in the formation of trust, which has significant implications for the use of reputation systems in e-commerce (to be discussed later). The influence of perceived size on trust, however, was found to differ for different types of stores. They concluded that the degree of ambiguity and uncertainty in a purchase influence the relationship between store size and trust. In other words, the more significant (i.e., expensive) the purchase, the more consumers' trust might be influenced by store size. As noted earlier, McKnight et al. (2002) identified the antecedents and effect of trust in the e-commerce context by drawing on concepts from psychology (i.e., disposition to trust), sociology (institution-based trust), and social psychology (trusting beliefs and trusting intentions). From an economic perspective, information asymmetry affects trust (Ba, Whinston, and Zhang, 1999). In addition to the above factors, other research has identified familiarity (Gefen, 2000), aesthetics (Jarvenpaa et al., 2000), Internet security (Ernst and Young, 2001), and design issues of e-commerce Web sites (Shneiderman, 2000) as antecedents of consumer trust in e-commerce. A more complete understanding of the antecedents of consumer trust in e-commerce is not only necessary but also helpful for devising mechanisms and designs to promote trust.

Consumers' concerns with Internet security and information privacy are two key hurdles faced in e-commerce (Cox, 1999; Ernst and Young, 2001; Swaminathan, Lepkowska-White, and Rao, 1999). To overcome these hurdles, Web site design should help create and establish a climate of trust (Shneiderman, 2000). Trusted third parties play an increasing important role, and feedback mechanisms have also been introduced. The next section discusses these design issues and mechanisms for establishing trust.

4.2 Integrating Trust into Online Sites: Recommendations for E-commerce Web Site Development

Nielsen (1999a) and Shneiderman (2000) elaborate on Web design principles and guidelines that serve as cues influencing consumers' perceptions of the trustworthiness of online stores. As stated by Shneiderman (2000), "understanding the explicit and contract-like nature of trust between people and organizations leads to clearer guidelines for e-developers" (p. 58). Shneiderman identifies two key principles to establish consumer trust online: (1) invite participation by ensuring trust, and (2) accelerate action by clarifying responsibility. Nielsen (1999a) identifies four basic principles that communicate trustworthiness: (1) quality of Web design; (2) up-front disclosure; (3) comprehensive, correct and up-to-date content and product selection; and (4) connectivity to the rest of the Web.

We discuss thirteen guidelines underlying these principles under the following three main categories: Content, Design, and External Certifications and References.

4.2.1 Content

With regard to Web site content, the literature has highlighted five guidelines that help foster consumer trust [parentheses following each guideline below denote specific traits that promote the development of trust]:

4.2.1.1 Guideline 1: Provide Identity of Company (Integrity)

To develop trust in consumers, it is necessary for e-commerce Web sites to provide the identity and complete information of the company such as their physical location, full contact information, ownership, management, purpose, and mission (Greenspan, 2002; Shneiderman, 2000). Without a basic understanding of the background and management of the company, consumers are unlikely to have enough faith and confidence to do business with the company. Disclosure of such company information provides a sense of accountability to the consumers.

4.2.1.2 Guideline 2: Disclose Performance History (Competence)

Disclosure of a company's pattern of past behavior, including reliable self-reports of performance history and data, helps inspire consumer trust in future performance (Shneiderman, 2000). Openness about performance inspires confidence and trust in consumers.

4.2.1.3 Guideline 3: Post a Clear Privacy and Security Policy (Integrity)

Providing a clear and easy-to-understand privacy and security policy is essential for the development of trust (Greenspan, 2002). A privacy and security policy lays out information concerning how and what types of consumers' personal and transaction information will be collected, how they will be used, how they will be protected from unauthorized access. According to Shneiderman (2000), well-designed policy statements accompanied by reports of effective enforcement will distinguish some Web sites. With such information, users are able to make informed decisions concerning the benefits and risks of engaging in online business transactions with the company.

4.2.1.4 Guideline 4: Provide Comprehensive and Accurate Product and Pricing Information (Integrity)

Information quality is a key component of any e-commerce Web site. It is the online company's responsibility to ensure that the product and pricing information is complete and accurate, and all other information posted on the Web site is correct and up-to-date (Nielsen, 1999a). Any possible mistake should be corrected as soon as it is reported or discovered. Accuracy of information is key to maintaining consumers' trust and confidence in the company.

4.2.1.5 Guideline 5: Disclose All Aspects of the Customer Relationship Up-front (Integrity and Benevolence)

Up-front disclosure of all aspects of the customer relationship is key to development of trust. According to Shneiderman (2000), each participant's responsibilities and obligations should be clearly specified, guarantees and their associated compensation should be clearly stated, and support for dispute resolution and mediation services should be clearly explained. For instance, all charges, delivery information, and return policy should be clearly presented before a purchase transaction is confirmed, compensation for late delivery and privacy invasions should be specified, and information on the dispute process needs to be laid out clearly.

4.2.2 Design

As for Web site design, four guidelines can be used to instill trust in consumers [parentheses following each guideline below denote specific traits that promote the development of trust]:

4.2.2.1 Guideline 6: Timely and Professional Web Site Design (Integrity and Competence)

Professionalism is an important aspect and determinant of trust. A professionally designed and user-friendly Web site instills trust and confidence in consumers. In other words, the Web site is expected to follow an orderly structure that is easy to understand and navigate, and be thoroughly tested from both the technical point of view and the usability standpoint. Having privacy and security policies that are easy to find, easy to read, and strictly enforced, and a transaction process that is simple to follow, also contribute to consumer trust. As indicated by Nielsen (1999a), professional appearance brings confidence to consumers, clear navigation conveys respect for consumers and an implied promise of good service, and typos or difficult navigation communicate disregard for the users.

4.2.2.2 Guideline 7: Reliable and Secure Technology (Integrity and Competence)

As discussed earlier, security has always been a major concern of consumers (Cox, 1999; Ernst and Young, 2001). It is the responsibility of the vendor to ensure that its technology is reliable and secure, and to provide security assurance to its consumers. A high level of security controls should be in place to ensure timely and accurate completion of transactions, to detect and prevent the occurrence of fraud and manipulation (i.e., hacking), and to safeguard transaction authentication (Siau and Shen, 2002).

4.2.2.3 Guideline 8: Informed Consent (Integrity and Benevolence)

Decisions concerning the tracking and use of personal information, such as putting cookies on users' machines, tracking of users' mouse movements, the types of customer information captured, and sharing of customer profiles with other parties, should be made by individual users (Friedman et al., 2000). Informed consent involves informing users of the potential benefit and harm of an online interaction and providing them the option to explicitly consent or decline (i.e., using opt-in/opt-out feature) to participate in the interaction (Friedman et al., 2000). This is an effective way to allow users of a Web site to make decisions concerning what online companies are allowed and not allowed to do with their profiles and personal information.

4.2.2.4 Guideline 9: Personalization (Benevolence)

As long as customers' privacy is rightfully protected, personalization can go a long way. Understanding customers' needs through sophisticated data mining techniques, such as collaborative filtering, and providing recommendations that meet their needs can facilitate customers' shopping experience, and increase their overall perception of trust and level of loyalty. In order to provide such experiences, customers' profiles will need to be captured and their preferences analyzed using Web mining tools. Although this may be seen as a benefit to some consumers, it may also present a concern to others. Hence, such issues will need to be addressed both in the privacy policy and with informed consent.

4.2.3 External Certifications and References

External certifications and references are helpful in cultivating trust because of their indirect benefits. Four guidelines have been proposed in the literature [parentheses following each guideline below denote traits that promote the development of trust]:

4.2.3.1 Guideline 10: Get Certifications from Third Parties (Integrity and Competence)

Certifications from third parties can increase credibility of online services (Shneiderman, 2002). Certifications may be obtained from professional third parties such as the American Medical Association, and/or third party assurance services such as TRUSTe (www.truste.com), BBBOnline (www.bbbonline.org) and VeriSign (www.verisign.com). Approvals from professional associations enhance credibility concerning the competence of the online vendor and the quality of services offered, while third party assurance services certify that privacy and security practices and enforcement are in place.

4.2.3.2 Guideline 11: Use Third Party Services (Integrity)

Escrow services are sometimes used to increase consumer trust in online markets (Kollock, 1999). For example, they are used in C2C auction markets to protect online traders from Internet fraud. The procedure usually takes place as follows: 1) the buyer first transfers funds to the escrow service, 2) the seller ships the goods only after the funds have been cleared by the escrow service, and 3) the buyer approves payment to the seller after the goods have been inspected. One major disadvantage of using the escrow service is the high fee or service charge involved, usually from 2 to 15 percent. Hence, escrow services are typically used only when high priced items are involved (due to the higher risk associated with such transactions).

4.2.3.3 Guideline 12: Credible Third Parties' Referrals and Connectivity (Competence, Integrity and Benevolence)

Referrals from credible third parties, including being hyperlinked from and having hyperlinks to credible third parties' Web sites, increase consumer trust. As noted by Nielsen (1999a), it is advantageous for a site to be connected to the rest of the Web with links in and out, as it conveys confidence in its services, whereas isolated sites are perceived to "have something to hide" and are perceived to be of low credibility.

4.2.3.4 Guideline 13: Provide References from Past and Current Users (Competence, Integrity and Benevolence)

References from past and current users provide an effective means for assessing reputation (Shneiderman, 2000; Resnick et al., 2000), which is a key antecedent of consumer trust (Jarvenpaa et al., 2000). In the online environment, such reputations of online firms or parties can be gathered from online comments and ratings posted by consumers and experts in the area. These systems, which collect, distribute, and aggregate feedback from participants, are referred to as *reputation* systems (Kollock, 1999; Resnick et al., 2000). Examples of reputation systems include the reputation manager (or Feedback Forum) of eBay (www.ebay.com) and the rating and review systems available from Amazon.com, Bizrate.com, and Epinions.com. However, these systems do differ in their implementations. For instance, BizRate.com and eBay.com request consumers to complete a survey after each transaction, whereas any party can contribute their opinions at Epinions.com. Reputation systems can serve as a feedback mechanism to help consumers assess the trustworthiness of an online party, and are becoming a vital resource for consumers in making online purchase decisions concerning whom to trust (or not to trust), whom to purchase from, and which brand or model of products to purchase. Some problems associated with reputation systems include the difficulty of assessing the reliability and validity of reviews (i.e., which review to trust and which not to trust) and the general lack of incentives by the general public to post or contribute reviews. Future research is needed to overcome these problems and limitations.

4.3 Discussions and Suggestions for Future Research

The challenge of establishing consumer trust in e-commerce poses problems and issues that need further research. To date, most of the studies in the MIS literature have examined only initial online trust (e.g., Ba and Pavlou, 2002; Bhattacharjee, 2002; McKnight et al., 2002) or do not differentiate between initial and ongoing trust (e.g., Jarvenpaa et al., 2000). Although establishing initial trust is crucial, online firms also need to focus their attention on establishing long-term relationships with their customers. More research on both initial and ongoing trust is warranted, and a better understanding of how trust can be developed online and then sustained over time is crucial to the survival of e-commerce.

Although the literature has provided us with some basic understanding of the antecedents of trust, the current knowledge base is both sparse and fragmented. A comprehensive knowledge base will need to be developed to better understand these antecedents in the e-commerce context – from both the initial and long-term trust perspectives. Some of the relevant questions include: What are the main factors influencing online trust, and how are these factors related? How do these factors influence the dynamics of trust formation in online relationships and affect consumers' online shopping and purchase behavior? Can these factors be fostered or enhanced in an online environment, and if so, how? Which factors are more effective for initial trust formation and which play a greater role in sustaining consumer trust? For example, do familiarity, personalization, and experience take on a greater role than disposition to trust for repeat customers? Developing a good knowledge base of the antecedents of online trust is crucial as it not only provide us better knowledge and understanding of how trust can be cultivated online, but it may also suggest new ways of establishing consumer trust. Furthermore, it may provide new research ideas and guidance on future research in this area

Trust is defined by Shneiderman (2000) as “the positive expectation a person has for another person or organization based on past performance and truthful guarantees (p. 58).” In the absence of prior online exchanges, how does a consumer determine the past performance of an Internet store, and whether its guarantee is likely to be truthful? In other words, how could initial trust be established? Reputation systems play a key role in this respect and, hence, deserve more research attention. Future research should address the limitations of reputation systems and the role they play in long-term trust building efforts. In addition to reputation systems, the literature has provided other guidelines concerning the development of online trust (refer to Section 4). Examples of questions that need further research include: To what degree and in what ways does each of these guidelines foster consumer trust? Which of these guidelines are more effective for fostering initial versus sustained trust? Do people with high versus low disposition of trust respond differently to personalization and other trust building treatments (e.g., third party assurance seal)? What is the role of intermediaries (e.g., trusted third party certifications, escrow services) in development of online trust, and how does it compare to endogenous solutions (e.g., privacy policies)? Which characteristic(s) of a trusted third party assurance seal promote the greatest amount of consumer trust – security, privacy, professional? Is third-party certification an effective method to promote online trust? How can it be made more effective (e.g., changing presentation, look, placement, etc.)? How does it compare to other methods such as reputation systems?

With regard to reputation systems, Kollock (1999) and Resnick et al. (2000) have raised many issues concerning their implementation. Despite some limitations (Resnick et al., 2000), reputation systems have evolved to take on an increasingly important role in online consumers' purchase decisions. Some basic questions concerning reputation systems remain to be studied, and their findings will help improve the continually evolving designs of reputation systems. These questions include: What is the most effective method of deploying the reputation management concept? How effective are reputation systems under different conditions and scenarios, such as types of products traded, and B2C versus C2C e-commerce? How can we balance the trade-off between accountability and anonymity of reviewers, since credibility of reviews increases with identity and accountability? How can reputation systems be designed more effectively? In order to improve the effectiveness of reputation systems, more attention should also be devoted to evaluate the presentation format and validity of reviewers' feedback. Examples of relevant questions include: How can the feedback in reputation systems be aggregated and presented more effectively? What methods can be used to assess and maintain the reliability and validity of reputation systems? How can we effectively assess the trustworthiness of reviewers within a reputation system, and perhaps create a reliable “network of trust” among participants in the online community? What key attributes and mechanisms contribute toward the success of reputation systems by encouraging trustworthy behavior and deterring dishonest participation? Does the provision of incentives and rewards (given for high quality feedback) change the dynamics of postings and interactions within a reputation system, and if so, how does that in turn affect consumers' patterns of purchase behavior? Answers to these questions can help improve the effectiveness and validity of reputation systems.

Empirical studies are needed to understand the above issues and relationships, to assess the effectiveness of the suggested guidelines, and to integrate the guidelines that have been shown to be effective into e-commerce development methodologies. With a better understanding of these factors and relationships, we might be able to introduce more powerful and effective mechanisms to establish a stronger online climate of consumer trust. For instance, from a software development standpoint, research on intelligent agents shows promise for developing a social experience that establishes a climate of trust (Cassell and Bickmore, 2000). More work is also needed to examine and understand the dynamics of trust formation in establishing a network of trust (i.e., relationships of trust among parties of an online community or participants of a reputation system, as in the case of Epinions.com) in order to assess the validity of such a trust-building mechanism.

Many questions relating to trust in e-commerce remain to be answered and are awaiting further research. We have identified a few key questions above and argue that a professionally designed Web site that integrates trust-building mechanisms – such as informed consent, giving assurances, providing guarantees of privacy and security and backing them up with financial compensation, and using (or linking to) references from current and past users – is crucial for success. Web designers and developers need to understand how to foster conditions and devise methods that facilitate the development of trust among participants of e-commerce. We provide some basic guidelines in this article, which we hope will serve as a starting point for those designers and developers and for future research in this area.

5. Conclusions

Human-computer interaction in e-commerce is an important research area. With the popularity of the WWW and the constant emergence of new technologies designed for the Web, the amount of research that requires attention is phenomenal. A good understanding of Web-based interaction is crucial for designing usable and effective Web sites, especially in the e-commerce context.

In this article, we examine issues and challenges in the design of Web sites, provide suggestions for improvement, and recommendations for future research. First, we examine Web design for browsing versus information search and assess their relationship and fit with task type. We found that exploratory tasks are best supported by a network or combination information structure while searching tasks are best supported by a hierarchical information structure. Similarly, spatial navigational structure is particularly suited for ad hoc browsing. Our suggestions for future research in this area include assessing the relationship between information structures and navigational aids, and their impact on searching/browsing behaviors and outcomes. Studies on Web revisitation were also reviewed and recommendations concerning design and management of bookmark (or hotlist), and history list are presented. Next, 3D versus 2D Web visualization is compared and future research directions are discussed. Building upon our understanding of the issues involved in Web navigation, we examine these issues in the e-commerce context, or more specifically, in the context of three buying behaviors: product search, search criteria, and product comparison.

With the advancement of Web-based technology, e-commerce is now a reality. However, the lack of trust or the difficulty of cultivating trust in an online environment poses a major hurdle to the future of e-commerce. Research on trust is needed to understand its antecedents and to devise ways to foster trust online. Thirteen guidelines are provided in this article to integrate trust-building strategies into e-commerce sites. Future research is needed to assess the effectiveness of these strategies and to propose other forms of trust building mechanisms.

Although the issues covered in this article are not in any way complete, we highlight some of the trends and important issues for future research in e-commerce. This article has covered two key concepts related to e-commerce – Web navigation and development of trust online. In order to succeed in e-commerce, online vendors need to begin with a user-friendly and trustworthy Web site so that users feel comfortable and confident interacting with it. The process of navigation and search on the Web site should require minimal effort, and the Web site should be designed in such a way that it facilitates product search within a short amount of time and provide users with a good sense of control over the interaction. Having a user-friendly Web site, by itself, is not adequate. It also needs to cultivate a climate of trust and confidence among its users. For example, a privacy policy and tight security controls should be in place, information on all aspects of the customer relationship should be clearly stated on the Web site, informed consent should be used to maintain the highest level of consumers' privacy, third party certifications may be used, and having a reputation system in place would be very useful. These two components, Web usability (or ease of navigation) and establishing a climate of trust, are crucial and necessary (not but sufficient) factors for e-commerce success.

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