

Human Computer Interaction: Issues and Challenges

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Chapter XII

User Considerations in Electronic Commerce Transactions

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ABSTRACT

This chapter will provide a discussion of user considerations in electronic commerce transactions. A consumer in an electronic commerce transaction is essentially a user. There are a number of user considerations that must be addressed for an electronic commerce transaction task to be successful. This chapter will address the functionality and usability needs of a user in an electronic commerce transaction. Results of a study of over 150 users and the factors that influence their decision to purchase textbooks will be presented, analyzed, and discussed.

INTRODUCTION

The most important element of a business-to-consumer transaction in electronic commerce is the consumer. Businesses can place whatever site they choose on the Internet, but it is the consumer who chooses whether to purchase something and therefore, the consumer decides whether to make a transaction occur. For the consumer to make an electronic commerce transaction, the user must interact with the computer. Therefore, a consumer is just another name for a user, and the focus should be on designing an electronic commerce transaction around the needs of the user (Miles, Howes and Davies, 2000).

In a traditional information system in an organization or company, the user may need to access the system as part of their job. In fact, the user may be required to use the system. In electronic commerce, the opposite scenario is true. The user will only perform an electronic commerce transaction if they want to. No one is forcing the user to perform an electronic commerce transaction. In addition, there are many alternatives to using a specific electronic commerce site. Users can choose to purchase their products from traditional brick-and-mortar stores, as well as mail-order catalogs. There are many other e-commerce sites that sell similar products, and there are virtually no costs involved for a user to switch from one site to another (Nielsen and Norman, 2000). Therefore, the user interaction experience in electronic commerce must be a good one for an electronic commerce site to be successful, and for the transaction to actually take place.

Electronic commerce creates a number of new concerns. Electronic retailers must deal with issues of electronic payment, security, supply chain management and delivery. In dealing with all of these new concerns, frequently, the human interaction factors in the transaction are forgotten. The customer in an electronic commerce transaction is, in reality, a user. To purchase products from an electronic retailer, the customer/user must perform a set of computer tasks. The electronic commerce transaction cannot successfully be completed without the user. In this chapter, we will focus on the user factors in an electronic commerce transaction. Our discussion will address the human-computer interaction literature as it relates to the electronic commerce transaction. The electronic commerce transaction will be approached from the traditional human-computer interaction viewpoints of functionality and usability.

FUNCTIONALITY

One of the first considerations in an electronic commerce transaction is whether an e-commerce site has something interesting and valuable for the user. No one is going to go to an e-commerce site to purchase a case of cola for fifteen dollars when any food store in the country sells the same case of cola for four dollars. There are a number of reasons why a user might want to purchase something through an e-commerce site:

- The e-commerce site might offer a better selection of products than the brick-and-mortar store. It is possible that the e-commerce site might offer items of a higher quality than that the brick-and-mortar store, or offer products that the brick-and-mortar store simply does not offer (Turban, Lee, King and Chung, 2000).
- The e-commerce site might offer better pricing than a brick-and-mortar store. (Turban et al., 2000).
- The e-commerce site might offer better customer service than a brick-and-mortar store (Mossberg, 1999; Turban et al., 2000). For instance, the e-commerce store can be open 24 hours a day, which most brick-and-mortar stores are not.

Another functionality consideration is simply whether an e-commerce site can respond to a request from a consumer/user. Assuming that a user wants to purchase from a specific e-commerce site, and assuming that the e-commerce site is easy to use so that there are no usability problems, the transaction will take place, right? Not necessarily. There might be a number of technical problems that could keep the transaction from taking place. For instance, in a study done by Anderson Consulting during the 1999 Holiday season, over 25% of transactions could not take place due to server error (Reuters, 1999). Another study done by the Boston Consulting Group estimated that 28% of attempted transactions failed (Bonisteel, 2000). For some reason, the e-commerce server could not respond to the user request. It is quite possible that this was due to overwhelming transaction demand. A number of e-commerce sites simply could not keep up with the demand for transactions.

An interesting concern from the user point of view is what took place when the server could not respond to the user request. Did users receive an error message? If so, what type of error message did the users receive? In user interactions, novice users tend to blame themselves for errors, even if the errors were not due to the actions of the user (Lazar and Norcio, 1999; Lazar and Norcio, 2000b). In addition, error messages often are unclear and do not provide guidance to the user (Lazar and Norcio, 2000a). These error messages often increase the frustration level for the user. When the user attempted to complete an electronic commerce transaction, but the server was not able to respond, did the error messages clearly let the users know that e-commerce site was having technical problems, and that none of this

was the fault of the user? Did the error message encourage the user to attempt their transaction again later the same day? Error messages need to be positive, and need to let the user know what actions to take.

USABILITY

There are a number of factors that affect the usability of a web site. All of these web usability rules apply to e-commerce. Usability is an extremely important consideration in electronic commerce since the user is not being forced to use the system, but rather, the e-commerce web site is competing with a number of brick-and-mortar stores and mail-order catalogs. In an ideal world, e-commerce sites would be created with user-centered design techniques, where the user is the main focus of the design process (Lazar, 2001; Norman, 1986). In user-centered design, there are a number of different techniques for evaluating the usability of an interface. For instance, usability testing involves users in determining whether an interface is easy to use and what problems exist (Nielsen, 1994). Expert reviews consist of usability experts critiquing an interface for usability problems (Nielsen and Mack, 1994). Unfortunately, many e-commerce sites are not built with user-centered design techniques, but instead are built quickly to meet short deadlines. The next sections discuss some of the important concepts of web usability as they relate to e-commerce.

Navigation

As Jakob Nielsen says, "...if the customer can't find a product, then he or she will not buy it." (Nielsen, 2000a, p. 9). The user needs to be able to find what they are looking for on a web site. If the user cannot find what they are looking for, then the e-commerce transaction will not take place. Navigation needs to be provided to allow users to find what they are looking for among the many web pages on a web site. Traditionally, navigation on each page should be provided so that the users can easily access all of the main topical sections of the web site (Nielsen, 2000a). In addition, a search engine might be helpful (Lynch and Horton, 1999).

On the web page, the navigation should be provided on either the top of the web page, or the left side of the web page (Lynch and Horton, 1999). Navigation should not be placed on the bottom or the right side of the web page. The user may never scroll to the bottom of the web page, and therefore would not see the navigation. If navigation was placed on the right side of the web page, it is possible that the user might not have the browser window open to the full screen size, or that the screen size would be smaller than the intended web page size. In either of these situations, the user would not be able to see the navigation. Navigation should be text-based and should be simple. If navigation is provided graphically, users who have graphics turned off may not be able to effectively use the web site. Also, those who have JavaScript or Java applet functionality turned off will not be able to use the site if those technologies are required for navigation (Nielsen, 2000a).

Navigation on an e-commerce site should be easy. Users should not have to struggle to find the products that they want, nor should they have to struggle to get from one part of the e-commerce site to the other (Tilson et al., 1999). The user should not be required to click a lot of times to get to the item that they are interested in (Tilson et al., 1999). Tilson, Dong, Martin, and Kieke suggest limiting the use of drop-down menus in navigation, as they obscure the choices from view, and they require extra clicks just to see a complete list of items (Tilson et al., 1999). The easier it is for a user to find the item that they are looking for, the more likely it is that the user will purchase the item.

Browser Compatibility

The issue of browser compatibility is one of the most serious issues facing designers of web sites. The same web page can appear very differently in the two main web browsers, Internet Explorer and Netscape Navigator (Niederst, 1999). Both browsers (as well as the many versions of each browser) respond differently to HTML code, JavaScript, and stylesheets. Designers of e-commerce sites must make sure that their site displays properly in both browsers. Proper testing can assist in meeting this goal.

Download Time

Web pages that take a long time to download can frustrate the user (Nielsen, 2000a). In fact, the perceived quality of a web page can be affected by the download speed (Ramsay, Barbesi and Preece, 1998). The longer the page takes to download, the lower the perceived quality of the content. Therefore, the longer the page takes to download, the less likely the user is to complete the e-commerce transaction. Web pages should include a minimal amount of graphics, to help limit download time. If a page must have a large number of graphics, and therefore, will take a long time to download, users should be notified and be prepared to expect a slow download (Nielsen, 2000a). Users do not want to wait long to view a web page.

When the user sends a request for information or to complete a transaction, server response time can be both a functionality and usability problem. If a server is slow to respond to user requests, this is a usability concern. However, as server response time increases, it can become more than frustrating. The user may perceive that there is a functionality problem; that the server isn't just taking too long to respond, but rather, the user may perceive that the server cannot provide the services that the user needs.

Page Layout

Meaningful design and organization of the information on the screen is important for creating an interaction environment that enables effective user performance (Wickens & Andre, 1990). It is well established that the chunking process forms the basis of human cognitive processing, and that we have limits on how much information we can take in at one time (Miller, 1956). Consequently, page layout needs to conform to the chunking principle in order to be sure that the user can comprehend and correctly process the information on the page. For instance, it will be overwhelming to the user if they are provided with a list of fifty items (such as men's shirts) from which to choose. It will be easy for the user if these fifty items are chunked into ten categories of five items each. Effective information organization allows the user to search a page in a manner that conforms to the user's style (Hornof and Kieras, 1997). The number of colors on the page also needs to be minimal so as not to overwhelm the user (Lynch and Horton, 1999).

Metaphors

Metaphors provide useful conceptual models for designing interfaces (Carroll and Thomas, 1982). Metaphors are used to compare objects in an interface to items in the user's real-world setting. Metaphors are especially valuable as design models in e-commerce systems because the majority of e-commerce users are typically casual computer users. The more obvious the interface is to the users, the more satisfying the interaction becomes for the user (Igarria and Nachman, 1990). This results in customers who are highly likely to return to the e-commerce site for additional transactions.

Some useful metaphors for novice users are the shopping cart metaphor and the desktop metaphor. In the desktop metaphor, which is used in the MacOS and MS-Windows interfaces, objects in the interface are compared to objects in the user's real world setting, such as trash cans, recycling bins, folders and printers. In most e-commerce sites, the shopping cart metaphor is used. Users "load" items into their shopping cart, which is a metaphor that relates to the real world shopping experience for most users. Users then go to the "check-out," at which point the transaction becomes final. Again, this relates to the real world shopping experience for most users. These metaphors are easy to understand because they are representative of the commonplace real world experience of the typical user (Nielsen, 2000a). The shopping cart metaphor has become a standard in e-commerce, and when a company deviates from that standard, sales may go down (Nielsen, 2000b).

SURVEY METHODOLOGY

To learn more about the functionality and usability factors that contribute to a successful electronic commerce transaction, a survey was created. After a pilot study to refine our survey instrument, we distributed our survey to a targeted population of users. The purpose of the study was to learn more about the factors that influence a user decision to purchase textbooks from an electronic commerce site.

Two of the reasons why users might not purchase items on-line are that 1) they are not comfortable using computers and the Internet, and 2) they do not have access to computers and the Internet. Our study specifically focused on users who are students majoring in computer science or computer information systems or information systems. By definition, these users are all comfortable with using computers; they have chosen to spend a large amount of their time taking computer courses, with the goal of working in the information technology field. Also, Internet access is not an issue; these students all have access to a number of computer labs. Not only do students have access to the open campus labs, but they also have access to computer labs that are reserved for only CS/CIS/IS majors. Therefore, Internet access would not be an issue for these students. By taking these two major factors out of the equation, we were able to isolate other factors that influence the decision to purchase textbooks from an electronic commerce site.

Pilot Study

In September, 1999, thirty students took part in a pre-testing of the survey instrument. Their responses were not counted, rather, their feedback was used to help improve the survey instrument. The post-pilot survey that was developed as a result of their feedback can be seen in Appendix A.

RESULTS

Surveys were collected during the Fall 1999 and Spring 2000 semesters. A total of 159 surveys were collected. Of the respondents 46 out of 159 (28.9%) were female while 113 (71.1%) of respondents were male. The average age of respondents was 23.3 years, with the range being 19 years old to 46 years old. Figure 1 displays the estimated graduation dates of respondents.

Out of 159 respondents, 13/159 (8.17%) were computer science majors, 146/159 (89.9%) were computer information systems majors, and 1/159 (0.63%) of respondents were

Figure 1. Estimated graduation dates

Estimated Graduation Date	Respondents	Percentage
1999	22/159	13.8%
2000	79/159	49.7%
2001	47/159	29.6%
2002	9/159	5.7%
No answer	2/159	1.3%

other majors. Based on the age, gender and graduation year, it is possible to determine that we had a diverse sample that is representative of college students who major in the computing and information sciences.

Reasons for not purchasing textbooks on-line

Out of the 159 surveys, 24/159 (15.1%) of respondents indicated that they had purchased textbooks on-line during the current semester, while 39/159 (24.5%) of respondents indicated that they had purchased textbooks on-line sometime in the past. Figure 2 displays the reasons given by respondents for not purchasing textbooks on-line.

Other reasons cited for not purchasing textbooks on-line include respondents being worried that the bookstore wouldn't "buy back" books at the end of the semester if they were purchased from e-commerce sites, instructors frequently changing the textbooks during the first week of the semester or the name of required textbooks not being available until the first week of classes, university scholarships only allowing them to purchase textbooks from the bookstore, and students trying not to purchase books until after the first class, since they frequently add and/or drop classes.

Reasons for purchasing textbooks online

Figure 2. Reasons for not purchasing textbooks on-line

The traditional campus bookstore has all of the textbooks that I need	88/120	73.3%
I am concerned about giving out my credit card number over the Internet	35/120	29.2%
I find the Internet-based textbook sites hard to use	1/120	00.8%
I did not see the need to use an Internet-based textbook seller	52/120	43.3%
I was not sure whether I would receive the books in time	45/120	37.5%
I did not want to pay for shipping and handling costs	46/120	38.3%
The Internet-based textbook seller did not accept my credit cards	0/120	0%
I browsed to learn more about the books, but I did not purchase	20/120	16.7%
I attempted to purchase textbooks on-line, but the site was confusing to use	4/120	3.3%
I attempted to purchase textbooks on-line, but the site was having technical problems	1/120	00.8%

Figure 3. Reasons for purchasing textbooks on-line

Reason for purchasing books on-line		
I did not want to wait on a long line at the campus bookstore	10/39	25.6%
The Internet-based bookstore offered better prices	25/39	64.1%
The Internet-based bookstore offered books that the campus bookstore was out of	4/39	10.3%
The traditional campus bookstore was closed when I wanted to purchase books	1/39	2.6%
I enjoy purchasing items on-line	8/39	20.5%

For those who had purchased textbooks on-line, 3/39 (7.6%) had purchased all of their books on-line during the current semester, while 24/39 (61.5%) had purchased some of their books on-line during the current semester. Some of the e-commerce sites that respondents had purchased textbooks from include amazon.com (14), varsitybooks.com (9), ecampus.com (4), barnesandnoble.com (3), borders.com (2), bigwords.com (2), textbooks.com (2), and bestbooksbuys.com (1). Figure 3 displays the reasons why respondents chose to purchase textbooks on-line.

Satisfaction

The average response on the scale of satisfaction for survey respondents who had purchased textbooks on-line was 4.09, where 1 is "very satisfied" and 9 is "very unsatisfied." Final comments from respondents include being frustrated about books being out of stock at the e-commerce bookstore, concern over shipping and handling costs, concern about long delivery times, and concern about purchasing used books on-line without being able to see the condition of the textbooks.

Analysis

Why did people choose to not purchase textbooks on-line, or if they did purchase textbooks on-line, why did they do so? It is interesting to note that the two most cited reasons for not purchasing textbooks on-line were 1) *the traditional campus bookstore has all of the textbooks that I need* (73.3%) and 2) *I did not see the need to use an Internet-based textbook seller* (43.3%). Respondents did not cite problems with the e-commerce textbook sites themselves, but rather, did not see any convincing need to use the e-commerce sites. This is an important finding because e-commerce companies may need to refocus their advertising to convince people to use their web sites.

A large percentage of respondents indicated that 1) *I did not want to pay for shipping and handling costs* (38.3%) and 2) *I wasn't sure whether I would receive the books in time* (37.5%). This may point to the need for e-commerce textbook companies to improve their distribution networks, allaying consumer fears about delivery costs and delivery time. In addition, 29.2% of respondents indicated that *I am concerned about giving out my credit card number over the Internet*. This finding reinforces the findings of Tilson et. al. (1999), who found that consumers fearing the theft of their credit card numbers was one of the biggest hindrances to an e-commerce transaction (Tilson et al., 1999). This finding may also

point out the need for alternative payment methods for e-commerce transactions, such as "digital cash" (Turban et al., 2000).

For survey respondents who had purchased textbooks on-line, the most popular reason for purchasing textbooks on-line was that *The Internet-based bookstore offered better prices* (64.1%). The second-most cited reason for purchasing textbooks on-line was that *I did not want to wait on a long line at the campus bookstore* (25.6%). These statistics point to two of the reasons that people like shopping on-line: better prices and better customer service. When attempting to market their web sites, e-commerce companies might want to focus on the main reasons that users come to web sites: better prices and better service.

It is interesting to note that the interface design, and the usability of the web sites, did not seem to play a major part in users deciding to perform or not to perform an e-commerce transaction in the textbook market. This may be due to a number of factors. For instance, e-commerce textbook sites may, as a group, be well designed. The target population of this study (university students who are majoring in the computing and information sciences) may all have fast connections to the Internet, so download time might not have been a problem. It is interesting, however, to note that the satisfaction score reported by those who had purchased a textbook on-line was 4.09, on a scale of 1 to 9 where 1 is very satisfied and 9 is very unsatisfied. Users who responded to this study are not overwhelmingly satisfied with their on-line shopping experience. In addition, a large majority of those who responded to this study had never purchased textbooks on-line, even though they are comfortable using the Internet and have access to the Internet. For most of the respondents, they just didn't feel that the e-commerce textbooks sites offered anything more valuable than the campus bookstore. The users who responded did not see any reason to purchase on-line.

Usability is a very important consideration in designing web sites, to ensure a successful user experience and increase on-line sales (Tedeschi, 1999). However, once usability is taken into consideration, and the connection speeds and experience levels of the users are taken into account, the major advantages and disadvantages of e-commerce are still the same: users go to e-commerce sites because they want better prices and better customer service, and users are frightened about giving out their credit card numbers on the Internet. These are important findings, which can be used to create a more successful experience for the user in an e-commerce transaction.

SUMMARY

This chapter focused on user considerations in an e-commerce transaction. The e-commerce site must offer functionality that the user is interested in, and the e-commerce site must also be easy to use. In this study, the usability of e-commerce textbook sites did not appear to be a problem. For those who did not purchase textbooks on-line, the most frequently cited reasons were that there was no need to use the e-commerce site, concerns about shipping and delivery time, and concerns about credit card security. For those who did purchase textbooks on-line, the most frequently cited reasons were improved prices and customer service. All of these findings point to what users want, both those who have not purchased on-line, and those who have purchased on-line. Users want: 1) Good prices and customer service, 2) Quick and inexpensive delivery of products, and 3) Secure methods of payment. By focusing on these areas, e-commerce sites can provide a more positive experience for the user and possibly increase sales for the e-commerce company.

APPENDIX A. CUSTOMER SATISFACTION SURVEY

The purpose of the following survey is to learn more about factors that contribute to the success of Internet-based textbook sellers. This study includes both sites that focus on textbooks, such as efollett.com, varsitybooks.com, and ecampus.com, as well as mainline booksellers, such as amazon.com, borders.com, and barnesandnoble.com

1. Age _____
2. Gender _____
3. Expected year of Graduation _____
4. Major _____ Computer Science ____ Computer Information Systems ____
Other _____ (please indicate)
5. Have you used an Internet-based textbook seller to purchase your textbooks this semester?
Yes ____ Which seller(s?) _____
No ____
6. Have you ever used an Internet-based textbook seller?
Yes ____ Which seller(s?) _____
No ____

If you have NEVER purchased textbooks from an Internet-based textbook seller, please complete question number 7, and then turn in your survey. If you HAVE purchased textbooks from an Internet-based textbook seller, please complete the questions (starting with number 8) on the other side of this survey

7. If you HAVE NOT purchased textbooks from an Internet-based textbook seller, why not?
(Check as many as you wish)
____ The traditional campus bookstore has all of the textbooks that I need.
____ I am concerned about giving out my credit card number over the Internet.
____ I find the Internet-based textbook sites hard to use.
____ I did not see the need to use an Internet-based textbook seller.
____ I was not sure whether I would receive the books in time.
____ I did not want to pay for shipping and handling costs.
____ The Internet-based textbook seller did not accept my credit cards.
____ I browsed to learn more about the books, but I did not purchase.
____ I attempted to purchase textbooks on-line, but the site was confusing to use.
____ I attempted to purchase textbooks on-line, but the site was having technical problems.
____ Other (please elaborate) _____

8. If you HAVE used an Internet-based textbook seller this semester, please complete the rest of the survey.

(Check only one)

- I purchased all of my books this semester through an Internet-based textbook seller.
- I purchased some of my books this semester through an Internet site, and some of my books through a campus bookstore or traditional bookstore.

9. Why did you choose to use an Internet-based textbook seller?

(Check as many as you wish)

- I did not want to wait on a long line at the campus bookstore.
- The Internet-based bookstore offered better prices.
- The Internet-based bookstore offered books that the campus bookstore was out of.
- The traditional campus bookstore was closed when I wanted to purchase books.
- I enjoy purchasing items on-line
- Other _____

10. How satisfied were you with your experience purchasing textbooks on the Internet?

Very Satisfied									Very Unsatisfied
1	2	3	4	5	6	7	8	9	

11. Any other comments?

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