2004

Likelihood of Purchase On-Line: Reliability, Security, and Design

Milam Aiken
University of Mississippi

Mahesh B. Vanjani
Georgia College and State University

Recommended Citation

Likelihood of Purchase On-Line: Reliability, Security, and Design

Milam Aiken

School of Business, University of Mississippi, University, MS 38677
: (662) 915-5777, aiken@bus.olemiss.edu

Mahesh B. Vanjani

ISC Department – CBX 12, School of Business, Georgia College and State University, Milledgeville, GA 31061
(478) 445-2566, mahesh.vanjani@gcsu.edu

ABSTRACT

Several factors can influence a consumer's likelihood of purchasing on the Web including trust, ease-of-use, and price discounts. This study examines over a dozen different variables that affect the decision to conduct business online. A survey of experienced Web users validated that poor design, security, and reliability tend to decrease a person's willingness to purchase through the Web.

INTRODUCTION

Internet use has surged in the United States. Statistics for 2002 indicate that 63% of the US adult population (or a little over 128 million people) were online (Pew Internet and American Life Project, 2003). While there are significant differences in how people use the Internet, one of the fastest growing areas has been online shopping. Approximately 61% of US Internet users had purchased a product online as of December, 2002 (Pew Internet and American Life Project, 2003). While the percent of women online (61% as of August, 2003) is catching up with the percent of men online (65% as of August, 2003) it is interesting to note that, in sheer numbers, more women are online in the US since women outnumber men as per population statistics for the country (U.S. Census Bureau, 2002; Pew Internet and American Life Project, 2003). For e-commerce retailers, this implies that there are increasing numbers of women shopping online in the US.

Several studies have examined individual factors that can affect a person's likelihood of purchase (e.g., presence of Web Assurance Seals, use of encryption technology, and the existence of spelling errors in text), but few have examined, in one survey, a wide variety of these factors (Ambra & Rice, 2001; Bellman, et al., 1999; Bhattacherjee, 2001; Jones, 2002; Tan & Thoen, 2002). The purpose of this study is to investigate the effect of a wide variety of

variables on a potential Web user's likelihood to purchase a product or service. These variables have been classified into design, security, and reliability categories. First, we summarize prior research on these factors, and then we present the results of a survey replicating and extending these prior studies.

BACKGROUND

While e-commerce has been growing steadily despite a general economic slump and lower consumer confidence the growth has not been even. For example, African Americans are less likely to make a purchase online. In addition to ethnicity; income level, level of education, gender and on-line experience also have a direct impact on how the Internet is used and this in turn impacts the likelihood of e-commerce purchase (Pew Internet and American Life Project, 2003).

Consumers have offered several reasons for not shopping on-line. Some of these include: "It is faster to shop in stores," "I don't know how," I'm not interested," and "There is no need" (Georgia Tech, 1998). Purchasing through the Web can be easier than shopping in stores and can result in cost and time savings. However, despite that, many potential customers are reluctant to shop on-line generally because of a lack of trust in the relatively new medium of exchange (Hoffman et al., 1999; Lee & Turban, 2001). For example, only about 29% of Internet users say they trust Web sites that sell products or services (Consumer WebWatch, 2002).

Since purchases through the Web are not face-to-face as in a physical store, electronic commerce increases the perceived and actual risks associated with business transactions (Castelfranchi & Tan, 2002). Many variables affect consumer trust in an on-line business, and a few of these have been summarized in the categories of design, security, and reliability as follows:

Design

The six most important factors of good Web page design are (Zhang & von Dran, 2001):
  i. ease-of-navigation
  ii. completeness of information
  iii. technical features
  iv. timeliness of information
  v. accuracy of information
  vi. readability

Results of the 10th WWW User Survey conducted by the Georgia Tech Research Group indicate that approximately 59% of Web users will move from one site to another if they perceive the former to be disorganized or confusing. Also, about 38% will leave a particular site if it exhibits other aspect of poor page design (Georgia Tech, 1998). Additionally, web page unavailability and broken hyperlinks have been identified as contributing factors to decreasing credibility (Fogg, et al., 2002a).

About 46.1% of perceived credibility in a Web site is based upon visual appeal (Fogg, et al., 2002b), and just one or two typographical errors in an otherwise well designed, professional site can negatively influence a potential customer, especially in Web sites containing vital information (Kim, 1998; Stanford, et al., 2002). The presence of typographical errors on a company's Web site may cause some potential customers to have the same negative impression as if the company were experiencing legal or financial problems.

Security

We restrict our definition of security to the safe and restricted handling of account information (e.g., credit card numbers, customer addresses, etc.). About 50% of Internet users have serious privacy concerns and security fears, and nearly 85% of users believe that security features are either a significant or deciding factor in their decision to shop with an e-business (Georgia Tech, 1998).

Internet fraud statistics for the United States indicate that credit card fraud is prevalent and is a cause for concern for Internet shoppers (National Internet Fraud Watch Information Center, 2003). For example, Internet transactions generated 50% of all credit card disputes and fraud at Visa International, despite the fact that only 2% of the company's business involved Internet trade (Georgia Tech, 1998). Consequently, it is not surprising that about 13% of Internet users indicated that they never transmitted credit card information over the Web due to security concerns (Georgia Tech, 1998).

Besides credit card numbers, Web users are often reluctant to provide other personal information. Only about 33% of Web users think their online transactions are safe, and about 25% of them believe that personal information provided to a Web site is secure (Conference Board, 2003). While Internet users are getting more savvy and confident about using the medium for commercial transactions a past survey indicated that about 91% of online shoppers refused to provide income information, 74% declined to provide a phone number, and 67% did not disclose their correct address (Yankelovich Partners, 1997).

Reliability

In addition to professional design and secure transactions, other factors affect a Web site's credibility. For example, Web users have presumed or reputed credibility in a site if there are a large number of page visits (shown by a Web counter, for example), if information on the site is constantly updated (shown by a date/time stamp on the page), if the Web site has won an award, if an authoritative Web site linked to this site, or if the domain name has ".org" in the URL (Silberg, et al., 1997; Fogg, 1999). One study found there was a relationship between trust and purchase intention, and the presence of Web Assurance Seals significantly enhanced perceived trust in an online company (Wakefield, 2001). Another study found that even the advertisements attached to a site can have the potential for increasing credibility (Kim, 1998).

SURVEY

To investigate further the antecedents of perceptions of professional design, security, reliability, and intention to purchase, we conducted a survey using 105 subjects (47.6% female) from business school classes at a small Southern university. All the subjects were students enrolled for undergraduate classes and the survey was generally completed by all students in attendance for a specific class on the day the survey was administered. A large percentage of these students were information systems majors. All had extensive computer, Internet, and Web experience from personal, work, and academic use. After a brief introduction, the subjects were asked to complete the survey (Appendix) which addresses the following hypotheses:

Web Page Design

H1. Slow page loading speed negatively affects perceptions of professional design.

H2. Broken hyperlinks negatively affect perceptions of professional design.

H3. Spelling or grammar errors negatively affect perceptions of professional design.

H4. Animated graphics positively affects perceptions of professional design.

H5. Errors in a script program negatively affect perceptions of professional design.

Security

H6. An encrypted order form positively affects perceptions of security.

H7. A credit card security policy positively affects perceptions of security.

H8. A policy of not sharing customer information positively affects perceptions of security.

Reliability

H9. A well-known brand positively affects perceptions of reliability.

H10. A physical address positively affects perceptions of reliability.

H11. A phone number positively affects perceptions of reliability.

H12. An email address positively affects perceptions of reliability.

H13. An order-tracking feature positively affects perceptions of reliability.

H14. A page without its own domain name negatively affects perceptions of reliability.

H15. A Web Assurance Seal positively affects perceptions of reliability.

H16. Current information positively affects perceptions of reliability.

Likelihood of Purchase

H17. Poor design decreases likelihood of purchase.

H18. Unreliability decreases likelihood of purchase.

H19. Insecurity decreases likelihood of purchase.

H20. Lower prices (at least 10%) increase likelihood of purchase.

Variable	Mean	Std Dev
W1	3.09	1.71
W2	2.58	1.74
W3	2.76	2.01
W4	4.35	1.55
W5	2.71	1.53
S1	5.33	1.32
S2	5.81	1.23
S3	5.54	1.43
R1	5.68	0.98
R2	5.63	1.25
R3	5.85	1.15
R4	5.85	1.00
R5	6.06	0.97
R6	3.43	1.49
R7	5.45	1.14
R8	2.32	1.45
L1	2.75	1.50
L2	1.98	1.31
L3	1.63	1.24
L4	4.74	1.45

See questionnaire (Appendix) for variable definitions.

All means significantly different from median value 4 at $\alpha = 0.05$

Table 1: Questionnaire Summary (N= 105)

Variable	Mean	Std Dev
W1	3.22	1.82
W2	2.65	1.78
W3	3.20	2.12
W4	4.49	1.56
W5	2.74	1.61
S1	5.49	1.15
S2	5.80	1.22
S3	5.58	1.40
R1	5.75	0.93
R2	5.78	1.25
R3	5.92	1.14
R4	5.85	1.08
R5	6.04	1.05
R6	3.36	1.57
R7	5.49	1.09
R8	2.38	1.58
L1	2.67	1.47
L2	1.91	1.19
L3	1.59	1.14
L4	5.17	1.27

See questionnaire (Appendix) for variable definitions.

All means significantly different from median value 4 at $\alpha = 0.05$

Table 2: Questionnaire Summary (Males: N= 55)

Variable	Mean	Std Dev
W1	2.94	1.58
W2	2.50	1.72
W3	2.28	1.78
W4	4.20	1.54
W5	2.68	1.45
S1	5.16	1.48
S2	5.82	1.24
S3	5.50	1.47
R1	5.60	1.03
R2	5.48	1.23
R3	5.78	1.17
R4	5.86	0.93
R5	6.08	0.90

R6	3.50	1.40
R7	5.40	1.20
R8	2.26	1.31
L1	2.84	1.54
L2	2.06	1.43
L3	1.66	1.35
L4	4.28	1.51

See questionnaire (Appendix) for variable definitions.

All means significantly different from median value 4 at $\alpha = 0.05$ (except W4 and L4)

Table 3: Questionnaire Summary (Females: N= 50)

RESULTS

Table 1 shows means of all subjects' responses, and tables 2 and 3 shows male and female mean responses. Difference-of-means T tests were conducted. With the exception of two measures reported by females, all means were significantly different from the median value of 4 on the 1-7 Likert scale, and the mean values were as predicted. Therefore, we cannot reject any of the hypotheses.

In the area of 'Web Page Design', results based on the sample population show that all participants view slow loading web pages, broken hyperlinks, spelling or grammar errors, and script program errors as being unprofessional. However, the male participants were more tolerant of slow loading pages, broken hyperlinks and script program errors. They were significantly more tolerant of spelling errors. It is also interesting to note that while the overall results indicate that animated graphics had a positive affect on viewer perceptions the gender specific results show that this perception was not statistically significant for the female participants but was statistically significant for the male participants.

With regard to 'Security' features all participants have similar views. That is, in general, all participants indicated that the presence of encryption, a clearly stated credit card policy and an explicit assurance that the web site will not share information with external agencies are all features that have a positive impact on their perception of web-site credibility. However, within this sample, encryption was rated as being more important by the males whereas information sharing policies were more significant for females.

The 'Reliability' features indicated some interesting gender differences in reported results. Overall, features that have a positive impact on viewer perceptions include brand name, presence of a published physical address with an associated phone number and e-mail address, a web assurance seal and an order tracking feature with the order tracking feature being one of the most significant determining factor. Alternately, lack of own domain name and a lack of update currency have a detrimental impact. The gender based results are of interest to niche marketers selling on-line. The brand name was apparently more important for male shoppers as was the

presence of a physical address, a phone number and a web assurance seal. The need for Web page currency was more significant for the female participants.

Overall results indicate that the 'Likelihood of Purchase' is going to be higher if the web-site is well designed and appears to be reliable and secure. Also, survey results indicated that the participants were more likely to purchase on-line if there was a 10% price difference. In this regard, it was interesting to note that the male participants were more sensitive to price differences than female participants. Results based on female survey participants were not statistically significant for this feature implying that other factors may have a more significant impact on their likelihood of purchase on-line.

Web Page Design	
1. Main Web page does not load, or loads very slowly	Less professional
2. Links on main page to other pages do not work	Less professional
3. Web page has spelling or grammar errors	Less professional
4. Web page has many animated graphics	More professional
5. Web page's script program has errors	Less professional
Security	
1. Web site has a credit card security policy stated	More secure
2. Web site states it will not share information	More secure
3. Web site has encrypted order form	More secure
Reliability	
1. Web site is a well-known brand	More reliable
2. Web site includes physical address	More reliable
3. Web site has phone number listed	More reliable
4. Web site has email address for customer contact	More reliable
5. Web site has an order-tracking feature	More reliable
6. Web site does not have its own domain name	Less reliable
7. Web page has a Web Assurance Seal on page	More reliable
8. Web page is not current	Less reliable
Likelihood of purchase	
1. Web site is not well designed	Less likely
2. Web site does not appear to be reliable	Less likely
3. Web site does not appear to be secure	Less likely
4. Web site product prices are at least 10% lower	More likely

Table 4: Result Summary

Table 4 summarizes the overall results of the survey. Because questions in the survey were worded negatively or positively, the distances of the overall means from the medians were calculated to evaluate which factors impacted user perceptions the most. Thus, broken hyperlinks affected the subjects' perceptions of design the most, followed by script errors, spelling errors, slow page loading, and animated graphics, while the most important factors influencing security were (in order) a credit card security policy, an information sharing policy, and an encrypted order form. Perceptions of reliability were affected most by an order tracking feature followed by the presence of phone numbers and email addresses, brand name, current information, a physical address, a Web Assurance Seal, and own domain name. The likelihood of purchase was influenced most by security, reliability, design, and finally, lower prices.

CONCLUSION

A survey of 105 experienced Web users indicates that many factors influence perceptions of good page design, security and reliability. These perceptions in turn will likely have an impact on the individual's probability of purchasing on-line. However, there were some interesting gender specific differences in these perceptions. In general, for the overall sample, the survey results indicated that variables expected to negatively impact (e.g., broken hyperlinks and poor design) or positively impact (e.g., Web Assurance Seals and reliability) were rated accordingly. A further analysis of survey results based on gender indicated that some web-site features were of more significance to males versus females and vice-versa. These gender specific perceptual differences can be addressed to advantage by on-line marketers targeting a specific consumer group. Additionally, these results can be used by designers to ensure that all vital features are included and addressed on Web pages, while researchers can replicate or extend the results in other surveys to further analyze variables that can impact the likelihood of purchase on-line.

APPENDIX: SURVEY QUESTIONNAIRE

Please answer the following questions about online business Web pages (e.g., Amazon.com). When looking at an online business, to what degree do the following factors affect your opinion of the site?

WEB PAGE DESIGN

W1. Main Web page does not load, or loads very slowly.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Very   Very
Unprofessional   Professional

W2. Links on main page to other pages do not work.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Very   Very
Unprofessional   Professional

W3. Web page has spelling or grammar errors.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Very
Unprofessional

Very

Professional

W4. Web page has many animated graphics (e.g. flashing messages, images moving on screen)

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Very
Unprofessional

Very

Professional

W5. Web page's script program has errors causing a debug message to appear in browser.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Very
Unprofessional

Very

Professional

SECURITY

S1. Web site has encrypted order form, e.g. https.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Very
Insecure

Very

Secure

S2. Web site has a credit card security policy stated. (Company will safeguard your card number.)

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Very
Insecure

Very

Secure

S3. Web site states it will not share your information with other companies (e.g. mailing lists).

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Very
Insecure

Very

Secure

RELIABILITY

R1. Web site is a well-known brand (e.g. Wal-Mart, Amazon, Sears).

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Very
Unreliable

Very

Reliable

R2. Web site includes physical address (e.g. 123 Main Street, Boston, MA 123456)

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Very
Unreliable

Very

Reliable

R3. Web site has phone number listed for customer contact.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Very
Unreliable

Very

Reliable

R4. Web site has email address for customer contact.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Very
Unreliable

Very

Reliable

R5. Web site has an order-tracking feature (e.g. customer can see online status of order).

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Very
Unreliable

Very

Reliable

R6. Web site does not have its own domain name (e.g. www.earlthink.net/~SmithShoes)

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Very
Unreliable

Very

Reliable

R7. Web page has a Web Assurance Seal on page (e.g. Better Business Bureau)

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Very
Unreliable

Very

Reliable

R8. Web page is not current (e.g. Text on the page states it was last updated 2 years ago).

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Very
Unreliable

Very

Reliable

Likelihood of purchase

L1. Web site is not well designed.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Very unlikely
to purchase

Very likely
to purchase

L2. Web site does not appear to be reliable.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Very unlikely
to purchase

Very likely
to purchase

L3. Web site does not appear to be secure.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Very unlikely

Very likely

to purchase   to purchase

L4. Web site product prices are at least 10% lower than elsewhere.

1   2   3   4   5   6   7
Very unlikely   Very likely
to purchase   to purchase

REFERENCES

Ambra, J., and Rice, R. (2001). Emerging Factors in User Evaluation of the World Wide Web. *Information and Management* 38, 373-384.

Bellman, S., Lohse, G., and Johnson, E. (1999). Predictors of Online Buying Behavior. *Communications of the ACM* 42(12), 32-38.

Bhattacherjee, A. (2001). An Empirical Analysis of the Antecedents of Electronic Commerce Service Continuance. *Decision Support Systems* 32, 201-214.

Castelfranchi, C., and Tan, Y. (2002). The Role of Trust and Deception in Virtual Society. *International Journal of Electronic Commerce* 6(3), 55-70.

Conference Board. (2003). More Consumers Trust that their Online Transactions are Safe. January 2. http://www.conference-board.org/economics/press.cfm?press_ID=2043

Consumer WebWatch. (2002). A Matter of Trust: What Users Want from Web Sites. *Consumer WebWatch Research Report*, Princeton Survey Research Associates, Washington, DC.

Fogg, B. (1999). What Variables Affect Web Credibility? *CSLI Industrial Affiliate Conference*, Stanford University, November 11.

Fogg, B., Kameda, T., Boyd, J., Marshall, J., Sethi, R., Sockol, M., and Trowbridge, T. (2002a). Stanford-Makovsky Web Credibility Study 2002: Investigating What Makes Web Sites Credible Today. *Research Report by the Stanford Persuasive Technology Lab & Makovsky & Company, Stanford University.*

Fogg, B., Marable, L., Stanford, J., and Tauber, E. (2002b). How do People Evaluate a Web Site's Credibility? Results from a Large Study. *Consumer WebWatch Research Report*, Stanford Persuasive Technology Lab, Stanford University, CA.

Fogg, B., Marshal, J., Laraki, O., Osipovich, A., Varma, C., Fang, N., Paul, J., Rangnekar, A., Shon, J., Swani, P., and Treinen, M. (2001). What Makes a Web Site Credible? A Report on a Large Quantitative Study. *Proceedings of the ACM CHI 2001 Conference on Human Factors in Computing Systems*. New York: ACM Press.

Georgia Tech Research Group. (1998). *10th WWW User Survey*, http://www.gvu.gatech.edu/user_surveys/

Hoffman, L., Novak, T., and Peralta, M. (1999). Building Consumer Trust Online. *Communications of the ACM* (42), April, 80-85.

Jones, A. (2002). On the Concept of Trust, *Decision Support Systems* 33, 225-232.

Kim, N. (1998). Credibility on the WWW. *Honors Thesis, Stanford University, CA.*

Lee, M., and Turban, E. (2001). A Trust Model for Consumer Internet Shopping. *International Journal of Electronic Commerce* 6(1), 75-91.

National Internet Fraud Watch Information Center (2003). Internet Fraud Statistics: Fraud Trends January-December, 2003. http://www.fraud.org/

Pew Internet and American Life Project (2003). America's Online Pursuits: The Changing Picture of Who's Online and What They Do. December 22, 2003. http://www.pewinternet.org/

Pew Internet Project. (2002). Women Surpass Men as E-Shoppers during the Holidays. January 1. http://www.pewinternet.org/

Silberg, W., Lundberg, G., and Musacchio, R. (1997). Assessing, Controlling, and Assuring the Quality of Medical Information on the Internet: Caveant Lector Et Viewor - Let the Reader and Viewer Beware. *JAMA*, 277, 1244-1245.

Stanford, J., Tauber, E., and Marable, L. (2002). A Comparative Credibility Study of Health and Finance Web Sites. *Consumer WebWatch*, 2002.

Tan, Y., and Thoen, W. (2002). Formal Aspects of a Generic Model of Trust for Electronic Commerce, *Decision Support Systems* 33, 233-246.

U.S. Census Bureau (2002). American Community Survey Profile, 2002. http://www.census.gov/acs/www/Products/Profiles/Single/2002/ACS/Tabular/010/01000US1.htm

Wakefield, R. (2001). A Determination of the Antecedents of Online Trust and an Evaluation of the Current Web Assurance Seals, *Unpublished PhD Dissertation, University of Mississippi, University, MS.*

Yankelovich Partners. (1997). Initiative to Set Criteria and Provide Independent Verification for Electronic Commerce. *Yankelovich Partners, Inc.*, September 16.

Zhang, P., and Von Dran, G. (2001). User Expectations and Rankings of Quality Factors in Different Web Site Domains. *International Journal of Electronic Commerce* 6(2), Winter, 9-33.