

Research Grant proposal

For: Maureen Francis Mascha, Assistant Professor, CBE

I. Project Summary:

This research project examines the effect that three different security messages as well as individual risk attitude have on Internet buying behavior. This study is motivated by two factors. First, many people refuse to buy goods or services over the Internet because of security concerns stemming from the transmission of sensitive information, most notably credit card number, over telephone lines. Therefore, identifying whether security information (such as a security “seal”) has a favorable impact on Internet buying behavior could affect not only the design of web sites, but also assist firms in better targeting Internet buyers. Since one aim of this research is to determine if a security “seal” and/or message affects buying behavior, three different security messages are included (none, a security “seal,” defined as an icon located on a web site, and a simple written message describing security practices). Essentially the principle difference between the security “seal” (hereafter “seal”) and the message is that the icon is pictorial while the message is written. These were chosen since in total they represent what is currently available on the majority of web sites.

The second, motivating factor stems from the effect, if any, that risk attitude has on Internet buying behavior. While most academicians recognize that risk, namely an individual’s risk attitude or profile, affects buying behavior, there is little, if any, research examining whether risk is a factor and, more importantly, if other factors, such as a “seal” and/or message, change risk attitude. To the best of my knowledge, no published study exists which has investigated the effect of risk attitude on Internet buying behavior; thus, this study provides a rich opportunity to make a substantial contribution to the literature.

This study address three main issues: recognition (i.e. do visitors “see” the “seal” or security message), placement (i.e. is recognition a function of where the “seal” or security is placed), and risk attitude (i.e. the risk attitude towards Internet buying of the web site visitor). It specifically examines whether recognition, placement, and/or risk attitude affect the visitor’s decision to buy over the Internet. The first issue is motivated by the fact that while firms affix “seals” and/or security messages to their web sites, many visitors fail to recognize them, limiting their opportunity to favorably affect the buying decision (see Kovar 2000 for a review). The second issue stems from the first. It addresses whether recognition is a function of where on the web site the “seal” or security message is placed (i.e. first page, last page, etc.). In addressing this issue, the study draws on both marketing and psychology for guidance in assessing the effect of placement on recognition. Since placement is a relatively easy variable to change, it seems reasonable to assess if placement affects recognition. The third question this study addresses concerns whether individual risk attitude (defined as the *individual web site visitor’s* risk attitude toward Internet purchasing) affects whether or not the visitor actually buys from the web site.

These issues will be addressed using a field experiment employing MBA and other “non traditional” students from two schools: Elmhurst College and the University of Michigan-Flint. In order to assess whether placement affects recognition of security type, and whether recognition affects buying behavior, the experiment uses an actual, “live” web site that sells flowers over the Internet. (NOTE: The site is NOT an actual business, but rather has a “live” Internet address to enhance realism.) In order to incorporate all combinations of placement and security message type (“seal” or written), five different web sites were designed and will be

used. (See the references for site addresses.) In order to assess the visitor's risk attitude, subjects will *first* complete (prior to web site exposure) a questionnaire assessing their personal risk attitude toward Internet purchases. The experiment will be conducted from May through August, 2002, at two educational institutions: Elmhurst College and the University of Michigan-Flint. Results will be tabulated during the Fall and early Winter of 2002-2003 and disseminated to numerous academic and practitioner journals as well as the Elmhurst community through a variety of venues

II. Narrative:

Current situation:

It is estimated the Internet commerce between businesses and consumers will reach a staggering one trillion dollars by 2006 (Kovar 2000; Hunton, et al. 2001). Despite this exponential increase, experts agree that the figure could be significantly higher. A commonly cited reason given for individuals not purchasing over the Internet is uncertainty and fear regarding security over web based transactions, such as misappropriation of personal or credit card information. The security of data transmission issue, while especially salient to Internet buyers, is salient to all Internet users, as sensitive data are frequently transmitted over the Internet, without an actual purchase occurring (such as those who "shop" over the Internet, obtaining information regarding loans, cars, etc. without actually buying).

In order to address these security issues, firms generally have two options: obtain a security "seal" or provide a written explanation of their security measures. Such an explanation is termed a security message. "Seals" are issued by external, third parties such as the Better Business Bureau, the American Institute of Certified Public Accountants, etc. In order for a firm to obtain a seal it must undergo a review of its security practices. Only after the firm has met all security criteria is the seal issued. By contrast, a written explanation of security measures is simply that: a one or two sentence explanation of the security techniques used by the firm in securing transactions (i.e. secure socket layers, SET encryption, etc.) Essentially, there are two main differences between the products. The first is that the seal provides no specific information itself; visitors must "drill down" (i.e. "click" on it) in order to obtain more information on it. The intent, however, is to attract visitors to the "seal" by using colored icons in the hopes that prospective buyers will recognize the "seal" and feel more secure because of it, regardless of whether or not they chose to "drill down". By contrast, the written message is designed to provide straightforward, simple information to users, without the need to "drill down". The second difference is that the "seal" is generated by an independent, third party, while the firm itself generates the message.

Despite the intuitive appeal of seals and/or security messages, there is little research as to the exact effect either the "seal" or security message has on buying behavior. Indeed, some preliminary studies indicate that many web site visitors fail to notice the "seal" or message and many who claim to have recognized a "seal" or message cannot recall what it meant or implied (Kovar 2000). One reason for failure to recognize a seal or message could be a function of where the seal and/or message are placed. Researchers in the areas marketing and psychology note that recognition (and recall) is very often a function of placement, in this context meaning on which page is the "seal" or message physically located. Many studies point to the favorable effects of primacy placement (i.e. first page), while many also report that latency placement (i.e. last page) is better. (See Beltramini and Strafford 1993 for a review.) Since either the "seal" or

message can be placed on any/all web pages, the first issue this study will address is whether web page (first versus last) placement of the seal/message affects recognition. Assuming that subjects notice the seal/message, the second issue is whether subjects will buy the flowers as a result of seal/message presence.

The third issue centers on risk. Studies examining web-based security often cite the differential risks posed by e-commerce (See Greenstein and Vasarhelyi 2001 for a summary). Often, these studies conclude that e-commerce is “riskier” than “traditional” commerce because of the risks associated with the potential for data interception and alteration, such as credit card theft, identity theft, etc. The increased risk arises because most data are transmitted over the Internet using phone and data lines available to virtually everyone. Researchers cite these “transmission” risks as the primary reason that individuals refuse to buy over the Internet.

Despite the fact that researchers often cite the fact that Internet transactions are riskier than “traditional” transactions, there is little empirical evidence that buyers *perceive* them as riskier and virtually no research that studies that link risk attitude and buying behavior in an Internet environment. Thus, the final question this study addresses concerns the relationship between individual risk attitude and purchase behavior. Numerous research studies link risk attitude with behavior in general (Selto and Cooper 1990). These studies conclude that risk attitude is not static; rather it changes based on the task at hand (Selto and Cooper 1991). Thus, this study develops a risk assessment scale that attempts to measure specific individual risk attitude in an e-commerce setting. If Internet purchasing is perceived as being more risky than “traditional” purchasing, this should negatively impact buying behavior. Furthermore, subjects displaying risk aversion may be less reluctant to purchase if they notice a “seal” or security message. Measuring risk attitude *prior to* web site exposure should allow for determination of the relationship between risk attitude with purchasing behavior.

2. Project Plan: Timeline

The timeline consists of four phases, described below. Note: Phase 1 is almost totally completed while Phase 2 should be completed by May 2002. It is estimated that Phases 3-4 will be completed by March 2003. In the interests of full disclosure, reviewers may recognize portions of the following from the proposal submitted by me in 2001. The reason for this “re-submission” is two-fold: first, the timeline as originally planned was not met because of problems discovered during pretesting and second, this project, while similar to the previous one, has undergone significant modifications and improvements.

Phase One

This phase is almost totally completed. It was begun in the Spring of 2001 and completed in March of 2002. Essentially Phase I is the design and pre-test phase of the web sites, risk scale, and experimental materials. During Phase I, five different web pages and the risk scale were designed. The five sites consist of: a “fictitious” seal on the first page; a fictitious “seal” on the last page; a message regarding security on the first page; a message regarding security on the last page; and finally, a site with no “seal” or message. This work was completed, thanks in large part to the efforts of Ayanna Gaines and Tim O’Toole (a student assistant). The sites are referenced in the reference section and the scale is included as an addendum. Once the sites and attitude scale were finished, both were pretested at Elmhurst College and the University of Michigan-Flint over the summer of 2001. After my colleague and I analyzed the data, extensive changes in both the risk attitude scale as well as the web sites were made by my colleague, Tim O’Toole, and myself. Upon modification, a second pretest was

conducted, resulting in minor modifications. All web site and risk scale modifications were completed in February and March of 2002; I am in the process of completing modifications to the experimental materials, that I anticipate to be completed by May 2002.

Phase Two

This phase consists of the experimental design and testing of the design portion of the project, primarily designed by myself. Based on results of the pretest, I made several changes to the design, the most notable being the elimination of the “seal/message on first *and* last page”. The experiment will consist of a 3 x 2 design, with security type varied three ways: none, fictitious “seal,” and placement varied two ways: first page only and last page only.

This is a field experiment (designed to provide more “realism”). Therefore, subjects will be able to perform it at home, school, work, etc. Comments from the pretest indicated that a laboratory setting was too “artificial,” and many students indicated that “I don’t think this is real.” When we revised the materials and experiment to a “field” setting, comments were generally favorable and 33% of participants *actually* bought flowers!

Experimental sequence: After recruitment, subjects will be handed a packet with instructional materials. The first will be the consent form and the second the paper and pencil risk scale. It is anticipated that subjects will complete these in the presence of the researcher. Upon completion of these documents, subjects will be free to leave with the experimental materials, but asked to perform the experiment within one week. In the packet of information, subjects will be asked to complete the demographics questionnaire, and given a scenario regarding the experimental task. As part of the experimental materials, each subject will receive a letter stating that he/she has been pre-approved for a store credit card. The “card” number provided will be the subject’s identification. As part of the instructions, the subject will be asked to log on to one of the five web sites. The subject next decides whether to buy or not and the results are electronically submitted to me. Finally, subjects are asked to complete a post-experimental questionnaire measuring seal recognition/recall, attitude toward the site, etc. Subjects are to return the experimental materials to the researcher within one week of completion. It is important to note that the subject is not required to purchase on-line. He/she is told that he/she is free to not purchase at all. After the experiment is completed, subjects will be debriefed and thanked for their participation.

Phase two will be completed by me after successful pretesting of final experimental materials, a thorough review of the logical sequence of the experiment, development of final experimental materials (i.e. instructions), and a review of my work by outside colleagues (i.e. colleagues at Elmhurst, Michigan-Flint, and other institutions).

Phase Three

This phase consists of running the experiment. The experiment will be conducted at Elmhurst College and the University of Michigan-Flint over the latter part of Spring and Summer 2002 (assuming IRB approval at both schools). I will oversee the experiment at Elmhurst College and plan to travel to Flint to oversee that portion of the experiment. Subjects will be recruited from MBA and other settings offering access to “non-traditional students,” such as students enrolled in masters of education, masters of nursing, etc. programs.

Phase Four

This phase consists of data analysis and write-up. Assuming that data are collected in the anticipated time frame, data will be coded and entered into an Excel file by my colleague and myself. These data will then be proofed, again by my colleague and myself, and data analysis

begun. I plan to write many of the SAS programs used for data analysis. Upon review of the results, I also plan to write the paper and ready it for journal/conference submission.

Applicability to Elmhurst College

This study impacts Elmhurst College in three keyways. First, this study involves students at Elmhurst College, specifically Tim O'Toole who designed the sites and my graduate students who provided "real life" feedback. Tim readily admits that his skills as a web page designer were significantly enhanced as a result of working on this project AND uses the sites as "advertisements" for his web design business (see www.imaxx.net/~bullz14/). The opportunity for my graduate students extends beyond the pretest phase; they will be the primary recipients of the effect of security type, placement, and risk on e-commerce, enabling them to have access to the most current findings in the ecommerce purchasing area. It also provides undergraduate students with information about Internet based security products, especially how they differ. This issue is important, since dissemination of security information may affect a user's decision as to whether or not to exchange data over the Internet. By allowing students to participate they gain an understanding of the different security features available.

Second, this study impacts my research agenda by offering me the opportunity to explore key issues in the area of e-commerce, particularly the issue of risk and its relationship to buying behavior. It further impacts my research agenda by allowing me to develop a risk questionnaire that can be compared with prior (possibly less specific) measures of risk.

Finally, if results mirror those of the pretest, this study should draw attention to Elmhurst College given the (hopefully) novel findings.

3. Faculty expertise:

I have expertise as follows.

Academic: Ph.D. in Accounting, 1998 from the University of Kentucky. For my dissertation, I designed an expert system and ran an experiment that examined the effect of task complexity and expert system feedback type on decision accuracy. In addition, I have doctoral coursework in the design of expert and decision support systems.

E-commerce: I have designed and taught four courses at the graduate level that address e-commerce. I have three other research projects in progress that examine various factors involving e-commerce (including this one), and have attended numerous information systems conferences where e-commerce issues have been discussed in detail.

Data analysis: I have extensive experience using SAS and have analyzed data for at least five research projects.

Professional: Certified Information Systems Auditor (CISA)

Publications and Research in Progress (that relate to this project):

NOTE: For ALL studies below, I am the lead author.

The Effect of Task Complexity and Feedback Type on the Acquisition of Procedural Knowledge in an Expert System Setting: Some New Evidence. *International Journal of Information Systems* (Fall, 2001).

Can Computerized Decision Aids do "Damage"? The Case for Tailoring Feedback and Task based on level of Pre-existing Knowledge. Under review at the *International Journal of Information Systems*.

Integrating ERP and Internal Control: A Case Study. Under review at the *Journal of Information Systems*.

SPAM, MUNG and Electronic Certs: Some Food for Thought Regarding E-mail Security (with Cathleen L. Miller). Under review at the Journal of Accountancy.

Internal Control Issues with Application Service Providers. (Co-authored with David Jensen, a graduate student.)

Presentations and Proceedings:

Presentation of: *Can Computerized Decision Aids do "Damage"? The Case for Tailoring Feedback and Task based on level of Pre-existing Knowledge* at the 2001 American Accounting Association Annual Conference, Atlanta, GA. Published in the collected abstracts.

Presentation of: *The Effect of Task Complexity and a Decision Aid on Accuracy, Consensus, and Efficiency* at the American Accounting Association Midwest Conference, April 2001, St. Louis, MO. Published in the collected abstracts.

Presentation of: *Using Internal Control to Demonstrate the Impact of ERP* at the Fourth Annual Accounting Information Systems Teaching Conference, February 2001, Scottsdale, AZ. Published in the collected abstracts.

Forum Presentation of: *The Effect of Task Complexity and a Decision Aid on Accuracy, Consensus, and Efficiency* at the Auditing mid-year Conference, January 2001, Houston, TX.

Presentation of *The Effect of Task Complexity and Feedback Type on the Acquisition of Procedural Knowledge in an Expert System Setting using an Audit Task* at the Fifth Annual Accounting Information Systems Research Conference, February 1999, Scottsdale, AZ.

4. Plans for evaluation and dissemination:

The outcome of this project is anticipated to result in two or three papers. The first will address the effects of the web security products on purchase behavior. The second will address the effects of risk attitude on purchase behavior and the third will explain how the risk instrument was developed, tested, and validated.

Dissemination will occur at five conferences: The national American Accounting Association conference; The Auditing Conference of the AAA; the Information Systems conference of the AAA; the Midwest Regional Conference of the AAA, and finally, the Elmhurst College Faculty Women's Conference.

III. Time line:

<u>Task</u>	<u>Estimated Date of Completion</u>
Test web page	Completed, March 2002-by my colleague & myself
Test instrument	Completed, March 2002 “ “
Test experimental materials	May 2002- I am currently preparing these
Conduct experiment	May- August 2002- I will oversee this phase
Analyze data and write-up	August-December 2002- I will oversee this phase
Disseminate	December 2002-August 2003- I will be the lead author, so it is likely that I will present
Journal Submission	From August 2002- on, as the lead author, I will write, edit, and submit.

IV. Budget:

Total amount requested: \$3,500, summarized as follows:

Faculty salary	\$2,500
Travel to Flint for the experiment	500
Travel to conferences	500
Total:	<u>\$3,500</u>

V. Grants:

Current and previous grants: Two travel grants from Elmhurst College
 Research grant from University of Wisconsin-Green Bay
 UMAIE Grant for study abroad

VI. Publications:

NOTE: For all publications listed below, I am the lead author.

A Review of Cost Management, 4th edition. *Issues in Accounting Education: Spring 2000.*

The Effect of Task Complexity and Feedback Type on the Acquisition of Procedural Knowledge in an Expert System Setting: Some New Evidence. *International Journal of Information Systems (Fall, 2001).*

Under Review at Journals:

Can Computerized Decision Aids do “Damage“? The Case for Tailoring Feedback and Task based on level of Pre-existing Knowledge. Under review at the *International Journal of Information Systems.*

Integrating ERP and Internal Control: A Case Study. Under review at the *Journal of Information Systems.*

The Effect of Task Complexity and a Decision Aid on Accuracy, Consensus, and

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References

Image / Seal on first page

<http://www.elmhurst.edu/~timo3864/mandm/sf/>

Image / Seal on last page

<http://www.elmhurst.edu/~timo3864/mandm/sb/>

Message on first page

<http://www.elmhurst.edu/~timo3864/mandm/mf/>

Message on last page

<http://www.elmhurst.edu/~timo3864/mandm/sb/>

No image or message

<http://www.elmhurst.edu/~timo3864/mandm/nm/>

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