



Inducing Consumer Trust Online: An Empirical Approach to Testing E-Commerce Interface Design Features

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INTRODUCTION AND BACKGROUND

Today's Internet users are well aware of the risks that are present in cyberspace. Thus, to online merchants, gaining online trust from Internet users is more important than ever. Derived from the general definition for trust (Rousseau et al., 1998), online trust can be defined as an Internet user's psychological state of risk acceptance based upon the positive expectations of the intentions or behaviors of an online merchant. Research has repeatedly identified online trust as a crucial factor for consumers' purchase decisions online (Ang & Lee, 2000; Jarvenpaa, Tractinsky, & Saarinen, 1999; Teo, 2002). If consumers trust online merchants or have confidence in their reliability and integrity, they will feel more at ease in making purchases and disclosing sensitive information online. Therefore, the present success of millions of online merchants and the future of e-commerce depend on online trust.

To gain trust from consumers, however, is a challenging task. Due to the nature of the Internet, people nowadays browse different e-commerce web sites as fast as they switch TV channels. Consequently, to succeed in e-commerce, online merchants must be able to convey their trustworthiness to first-time visitors and effectively and efficiently build trust in the eyes of consumers. This requires online merchants to implement optimal electronic storefronts that can attract potential consumers and induce their trust. According to Ang and Lee (2000), "If the web site does not lead the consumer to believe that the merchant is trustworthy, no purchase decision will result" (p. 3). In other words, the key for initiating the development of a consumer's online trust is to build a trust-inducing e-commerce interface.

Given the importance of web interface design in achieving online trust, it is surprising that few studies have focused on effective interface design features that web designers can easily comprehend and conveniently implement. The majority of the existing studies in the field have taken a theoretical perspective on how trust is formed in online consumers' minds, rather than what interface design features can lead to the formation of trust (Gefen, 2002; Walczuch, Seelen, & Lundgren, 2001). Some other studies (Egger, 2001; Neilsen, 1999) have suggested various managerial measures and design guidelines for building online trust, but are often too general to be operational. Furthermore, there is historically a lack of empirical evidence or scientific methodology for supporting the reliability and validity of the design guidelines that are suggested in some studies. For example, to evaluate the suggested design features, the researchers may manipulate a list of design features into survey questions, and then they ask subjects to rate the relative importance of each design feature in inducing trust, without providing some visual illustrations or examples of what each design feature exactly references (e.g., Fogg et al., 2001; Lee, Kim, & Moon, 2000). As a result,

different subjects might give ratings on the same item based on different interpretations and imagination, leaving the validation interpretation uncertain.

To avoid the previously mentioned problems, the authors of the present paper developed an optimized e-commerce interface that includes 14 trust-inducing features identified in our previous study (Wang & Emurian, in press). The design features were classified into four dimensions, namely (1) graphic design, (2) structure design, (3) content design, and (4) social-cue design. The interface was used in the current study for the sole purposes of showing live examples of those design features and aiding the subjects in completing a survey that was aimed to evaluate the relative importance of each feature in inducing trust. The unique use of the interface also enabled us to reach the following specific objectives for the current study: (1) to supplement our previous study by empirically validating the proposed conceptual framework of trust-inducing features and verifying its underlying dimensions and (2) to evaluate the relative importance of each dimension of the design features in inducing online trust.

It needs to be pointed out that consumers' concerns about technical Internet infrastructure security issues and their perceptions of trustworthiness of an online merchant should be recognized as two distinct issues. Unlike most of the other studies, the focus of our study is on interface design techniques only, that is, to use what consumers can see on an e-commerce interface to affect their feelings of trust toward the online merchant that the e-commerce interface represents.

The rest of this paper describes the optimized e-commerce interface, our research methodology, the results of the survey in detail, and, finally, our conclusions.

OPTIMIZED E-COMMERCE INTERFACE

To provide a live illustration of the framework of 14 interface design features, a synthetic e-commerce interface (see Figure 1) selling plasma TVs was created based on all the previously identified trust-inducing features. We chose the selling product to be Plasma TV for the attractiveness of the image and for its unique ability to induce serious reflection and thought on the purpose of the survey—to evaluate specific features in regard to trust. We gave an imaginary name, "PlasmaTV.com," to the site. The interface was tailored in a way that every feature could be visually illustrated by some element or aspect of the interface.

The first three dimensions - graphic, structure, and content design dimensions - were seemingly straightforward, and every feature within each dimension was demonstrated by the most representative instance. For example, the company logo in the upper left corner and main selling

Figure 1: Optimized E-commerce Interface



point in the product picture were on the interface to represent the design feature of “displaying brand-promoting information,” and the VeriSign seal in the lower left corner was used to present the design feature of “displaying seals of approval or third-party certificate.” The last dimension, the social-cue design dimension, relates to embedding social cues into web site interfaces via different communication media, and it is a relatively new design strategy being suggested by some HCI researchers (Basso et al., 2001; Riegelsberger & Sasse, 2001; Steinbruck et al., 2002). The first feature of the social-cue dimension, which was “inclusion of representative photograph or video clip,” was represented by displaying an employee photo in the lower left corner of the interface. The second feature of the dimension, which was “use of synchronous communication media,” was represented by displaying a hyperlink to a synthetic online sales chat. The interface was implemented using professional web page development tools in conjunction with a graphic editing software package. The interface was accessible on the world wide web1.

METHODOLOGY

Survey

A web-based survey was conducted to test the proposed framework of trust-inducing features. The reasons for and advantages of using a web-based survey in our study were numerous. First, the abilities of a web-based survey to make respondents feel anonymous and overcome time and place constraints helped us to reach respondents more easily than using other data collection methods. Second, the survey was implemented to require mandatory responses for every item, preventing uncompleted answers from being submitted. Last, the web-based survey included a hyperlink to the e-commerce interface, providing a convenient method to direct the respondents to the web interface that needed to be viewed and evaluated in an online setting.

The initial survey was first reviewed by four experienced online shoppers and two language experts for accessing consistency, completeness, and readability. The objectives of this step were to examine the face validity of each item in the survey. A few items were reworded to improve readability and clarity, and two more demographic questions were inserted as suggested.

The resulting survey2 is described as follows. As previously mentioned, a link to the optimized e-commerce interface that opened up in a new window was inserted at the top of the survey so that subjects could examine the interface carefully while completing the survey. Below the link were the three sections of the survey. The first section was 7 drop-down menus gathering demographic information on a respondent's age, gender, current location, highest education attained, weekly hours spent on the Internet, and experience with purchasing online. The second section of the survey included 15 items to rate, of which the first 14 items corresponded to the 14 design features, and the last item assessed the

overall level of trustworthiness perception of the interface as a whole. The visual element examples representing each design feature were indicated in parentheses after each item. Respondents rated each item using a 10-point Likert-type scale, which allowed them to select a response indicating the trust-inducing importance of each feature. The scale anchors ranged from “1,” representing that the feature was “not important at all,” to “10,” indicating that the feature was “extremely important.” The last section of the survey was a feedback box providing for comments.

Respondents

To collect a sample that could be as close to the general public of Internet users as possible, we distributed the link to the survey through various methods, including university listservs, online discussion boards, and personal email contacts. No monetary compensation was provided, so the participants were purely volunteers who were also interested in the research topic. We eliminated two respondents who were obviously unconcerned (i.e., giving the same rating for all features), and eventually a total of 181 respondents was included in the final analysis. Among the respondents, 73 (40%) were female. Most of the respondents were in their twenties ($n = 104$, 58%), well-educated ($n = 94$, 52% had earned bachelor's degrees), and experienced with the Internet ($n = 105$, 58% spent more than 15 hours per week online). Most of them ($n = 137$, 76%) reported that they had made purchases online before, and 27 (15%) of them reported that they had been cheated in online shopping.

STATISTICAL ANALYSES AND RESULTS

The data analysis had two parts: (1) validating the conceptual framework of trust-inducing features and detecting the underlying dimensions and (2) evaluating the magnitude of each dimension in regard to trust ratings by comparing the median values across the dimensions.

Validating the Conceptual Framework

The content validity of the constructs was based on (1) the existence of research to formulate the 14 features of the conceptual framework and (2) involving experienced online shoppers and language experts to construct the survey. However, the initial classification of the four dimensions was based on the authors' informed judgment. Hence, the 14 features were then subjected to a confirmatory factor analysis to assess the construct validity and internal reliability of the constructs. Factor analysis identifies clusters of variables that share some underlying relationship (Basilevsky, 1994), and in our study, it was used to determine the essential dimensions of the trust-inducing features. Before we could apply a factor analysis, however, we ran two tests that indicated the suitability of our data for structure detection. The high value (0.81) from the Kaiser-Meyer-Olkin test, which measures sampling adequacy, indicated that a factor analysis would be useful with the data. The significant Bartlett's test ($p < .001$), which examines whether the variables are related, indicated that the data were suitable for structure detection. Therefore, a factor analysis was performed.

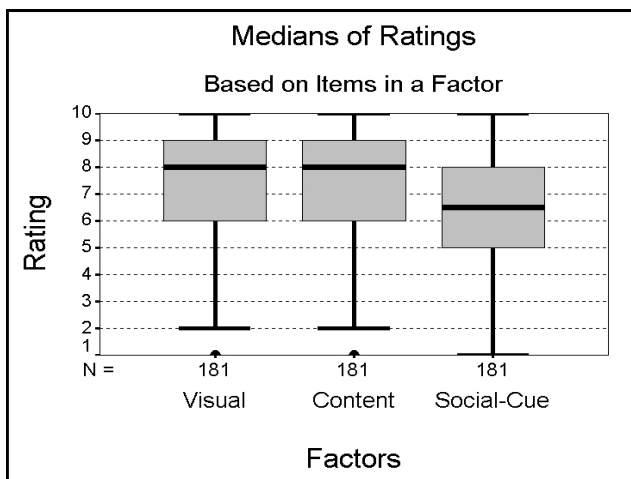
We used the principal components analysis to analyze the raw matrix of 181 responses with the latent root criterion (Eigen value = 1 criterion). Three components (Eigen values > 1.44) accounted for 56% of the total variance of the data set. The scree test, which showed that there were some bending points at three factors, further verified the number of components. Based on this initial analysis, we tried several rotation methods to determine which features loaded on each of the three dimensions. We chose the Varimax rotation method, which best revealed the underlying relationship. As can be read from Table 1, all factor loadings reach the acceptable level of 0.3 (Nunnally, 1978), with most of them exceeding 0.6. To examine the internal reliability of each dimension (i.e., visual design, content design, and social-cue design), Cronbach's alpha was calculated on each dimension, and the alpha coefficients were 0.80, 0.77, and 0.53, respectively. According to Nunnally (1978), an alpha of 0.50 or higher indicates a sufficient level of internal reliability.

The factor analysis revealed that no feature in the proposed framework should be eliminated, due to the fact that every item fit into one of the three components (all factor loadings $\geq .30$). The analysis also showed that the items for each component loaded unambiguously.

Table 1: Rotated Component Matrix of the Conceptual Framework (N = 181)

Dimensions	Features	Component		
		1	2	3
Visual Design (Refers to the graphical and structural aspects of displayed elements on the web site.)	V1 - Three-dimensional and half-screen size clipart	.504		
	V2 - Symmetrical, moderate pastel color of low brightness and cool tone	.685		
	V3 - Well-chosen, good-shot photographs	.762		
	V4 - Easy-to-use navigation	.748		
	V5 - Accessible information	.696		
	V6 - Navigation reinforcement	.532		
	V7 - Page design techniques	.636		
Content Design (Refers to the informational components that can be included on the web site.)	C1 - Brand-promoting information		.447	
	C2 - All aspects of customer relationship information		.795	
	C3 - Seals of approval or third-party certificate		.778	
	C4 - Comprehensive, correct, and current product information		.688	
	C5 - Relevant domain name		.476	
Social-cue Design (Refers to embedding social cues, such as face-to-face interaction and social presence, into web interface via different communication media.)	S1 - Representative photograph or video clip			.744
	S2 - Synchronous communication media			.734

Figure 2: Comparison of Three Factors



The only difference between the analysis result and our proposed model was the number of dimensions: the 14 features clustered into three components rather than four. Closer investigation indicated that the first component actually included the first two dimensions of the proposed framework, and the last two components were consistent with the last two dimensions as proposed. Therefore, we named the first component “visual design dimension” that reflected both graphic and structure aspects, and kept the names for the last two components as “content design” and “social-cue design.” Because little covariance existed among these three components, it may be concluded that these three dimensions represented different aspects of interface design to promote trust.

Evaluating Relative Importance

To investigate the relative magnitudes in ratings among the survey items that fell within each of the three identified components, the median rating across those items was determined for each of the 181 respondents. The median is the appropriate index of central tendency for ordinal data. Figure 2 presents boxplots of those ratings for each of

the three factors. The figure, then, is a boxplot of the medians. Figure 2 shows that all three medians exceed 5, but the median for the social cue factor is lower in comparison to the other two. The result of the Kruskal-Wallis test was significant ($\chi^2 = 42.50$, $df = 2$, $p < .001$). Pairwise comparisons, Bonferroni corrected, showed significant differences between the social cue median and the other two medians.

These data suggest that all three factors contributed to the value of the respondents’ evaluations, but the social-cue dimension was rated as somewhat less important than the other two dimensions. It is suspected that the lower rating of the social-cue dimension is partially due to the fact that the two features within that dimension are the only ones that were not actually implemented as functional examples on the optimized e-commerce interface, and thus were not understood well by the respondents.

CONCLUSION

As e-commerce gains widespread attention and rapidly emerges as a competitive business form, online merchants are facing an urgent challenge of building and sustaining consumer trust on the Internet. While the issue has initiated numerous investigations by researchers from multiple disciplines for valid research methods and effective solutions, the authors have taken an HCI approach in an attempt to confront the challenge by applying trust-inducing design features to an e-commerce interface. In this paper, the 14 trust-inducing design features that construct the conceptual framework proposed in our previous study have been identified and empirically validated. The relative strengths of these design features on consumer trust toward online merchants have been evaluated.

The contributions that the paper brings to the research field are twofold. First, the paper provides empirical evidence for the validity and importance of the interface aspect in building online trust. Second, the unique research approach, including conducting a web-based survey and developing an optimized e-commerce interface for illustration and testing purposes, substantiates the methodological knowledge on the topic of online trust and generates insights into the field.

The findings of the study are summarized as follows. First, the factor analysis has suggested that three underlying dimensions exist among the 14 design features, and they are visual, content, and social-cue design dimensions. Second, all 14 features were found to contribute to online trust ratings, and the three dimensions that were identified differed in terms of their relative importance to the respondents. The social-cue design dimension has been rated significantly lower than the other two dimensions. The finding calls for deeper understanding on applying the sociological concept called “re-embedding” to interface design via various communication media.

It is the authors’ hope that this paper will help accelerate the growth of e-commerce by both delivering the instructive messages from Internet users on what design features induce their trust and by offering the framework and the methodological account on how to implement and evaluate such trust-inducing e-commerce interfaces.

ENDNOTES

¹ The optimized e-commerce interface is accessible at http://userpages.umbc.edu/~ywang8/online_trust/

² The survey, which shows all features in the conceptual framework, is available for viewing at http://fs10.formsite.com/online_trust/form904001627/index.html

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