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Trust in E-Commerce:
Consideration of Interface Design Factors[1]

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EXECUTIVE SUMMARY

The design of the interface for e-commerce transactions is one source of influence that can affect an online shopper's trust in the merchant. This paper undertook a confirmatory factor analysis involving 14 trust-inducing interface design features that populated a conceptual framework proposed in our previous study. The factor analysis of self-reported ratings of the features, which were illustrated on a synthetic e-commerce interface by 181 survey respondents, revealed the following three underlying dimensions: (1) visual, (2) content, and (3) social-cue design dimensions. All 14 features were found to contribute to the composition of the three dimensions. The social-cue dimension was rated as less important than the other two dimensions, and shoppers who had been cheated by an online merchant showed lower overall trust ratings in comparison to the remaining shoppers. Qualitative reports by the survey respondents yielded additional insights about the importance of the interface. The results of this study may contribute to an appreciation of interface design features that may influence a user's perception of the trustworthiness of an online merchant's Web site.

Keywords: *e-commerce; factor analysis; interface design features; online trust*

INTRODUCTION AND BACKGROUND

Derived from the general definition of trust (Rousseau, Sitkin, Burt, & Camerer, 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 and have confidence in the reliability and integrity of merchants, they will likely feel more at ease making purchases and disclosing sensitive information online. Therefore, the success of online merchants and the future of e-commerce may depend heavily on online trust.

Gaining trust from consumers, however, is a challenging task. 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, one key consideration in fostering online trust is to build a trust-inducing e-commerce interface. In that regard, several studies have reported evaluations of a list of design features that potentially could appear on an interface to impact trust (Fogg et al., 2001; Lee, Kim, & Moon, 2000). Related studies have reported evaluations of existing e-commerce Web sites, such as Amazon.com, as a method for determining trust-inducing features (Cheskin/Sapient, 1999; Gefen, 2002; Jarvenpaa, Tractinsky & Saarinen, 1999). However, the trust-inducing features of those sites could not always be measured accurately or generalized to other e-commerce Web sites, due to a lack of a standardized interface for evaluation.

Against that background, the authors developed a synthetic e-commerce interface that reflects 14 trust-inducing features reported in our previous study (Wang & Emurian, 2005). The trust-inducing features were presented together as a conceptual framework in an effort to synthesize existing literature on enhancing online trust by Web interface design. The interface, which was aimed to represent an online merchant's Web home page, was used in the current study to show examples of the design features that were identified and to assist subjects in completing a survey that evaluated the trust-inducing importance of each feature. Using a synthetic e-commerce interface enabled us to address the following objectives: (1) to continue our previous study by undertaking a factor analysis in order to confirm and evaluate the underlying dimensions of the conceptual framework and (2) to obtain insights into practical trust-building issues by collecting qualitative data directly from Internet users.

There are almost certainly many potential sources of influence that promote or hinder online trust. However, the present study focuses on investigating interface design features and seeking indicative support for the importance of the interface design aspect in inducing online trust. Nevertheless, the intent of the study is not to compare the presence or absence of these features on trust ratings or to manipulate the features themselves in an experimental analysis. We chose first to develop a standardized synthetic interface to assure the presence of all 14 features rather than to attempt to find an existing e-commerce interface that might exhibit all 14 features in the manner that we intended to assess. Although the Saks Fifth Avenue[2] e-commerce Web site, which is given in a figure in Wang and Emurian (2005), closely approximates a coverage of the 14 features, the dynamic nature of electronic storefronts, together with our intent to assure the presence of all 14 features, motivated the development of a standardized interface for this research.

The remainder of this paper describes the proposed conceptual framework, the research methodology, the results of the survey, the synthesis of respondents' feedback, and, finally, our conclusions.

PROPOSED CONCEPTUAL FRAMEWORK OF TRUST-INDUCING FEATURES

The outcome of our previous study (Wang & Emurian, 2005) was a conceptual framework of trust-inducing features that were identified from the literature on

Table 1. Conceptual framework of trust-inducing features

Dimension	Explanation	Features	Literature Sources
Graphics Design	Refers to the graphical design factors on the Web site that normally give consumers a first impression.	• Use of three-dimensional and half-screen size clipart • Symmetric use of moderate pastel color of low brightness and cool tone • Use of well chosen, good-shot photographs	Karvonen and Parkkinen (2001); Kim and Moon (1998).
Structure Design	Defines the overall organization and accessibility of displayed information on the Web site.	• Implementation of easy-to-use navigation (simplicity, consistency) • Use of accessible information (e.g., no broken links or missing pictures) • Use of navigation reinforcement (e.g., guides, tutorials, instructions, etc.) • Application of page design techniques (e.g., white space and margin, strict grouping, visual density, etc.)	Cheskin/Sapient (1999); Karvonen and Parkkinen (2001); Nielsen (1998); Zhang, von Dran, Small, and Barcellos (1999).
Content Design	Refers to the informational components that can be included on the Web site, either textual or graphical.	• Display of brand-promoting information (e.g., prominent company logo or slogan, main selling point) • Up-front disclosure of all aspects of the customer relationship (company competence, security, privacy, financial, and legal concerns) • Display of seals of approval or third-party certificate • Use of comprehensive, correct, and current product information • Use of a relevant domain name	Belanger, Hiller, and Smith (2002); Cheskin/Sapient (1999); Egger (2001); Hu, Lin, and Zhang (2001); Nielsen (1999); Shneiderman (2000).
Social-Cue Design	Relates to embedding social cues, such as face-to-face interaction and social presence, into Web interface via different communication media.	• Inclusion of representative photograph or video clip • Use of synchronous communication media (instant messaging, chat lines, video telephony, etc.)	Basso, Goldberg, Greenspan, and Weimer (2001); Riegelsberger and Sasse (2001); Steinbruck, Schaumburg, Duda, and Kruger (2002).

enhancing online trust by Web interface design. The framework classifies 14 trust-inducing features into four broad dimensions: namely, (1) graphics design, (2) structure design, (3) content design, and (4) social-cue design. Table 1 illustrates the framework in detail, including the explanations, design features, and literature sources for each dimension, which was proposed on the basis of a semantic and functional grouping of features obtained from the literature. The first three dimensions are straightforward. The fourth 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 human-computer interaction (HCI) researchers (Basso, Goldberg, Greenspan & Weimer, 2001; Riegelsberger & Sasse, 2001; Steinbruck, Schaumburg, Duda & Kruger, 2002). The framework is not exhaustive in the sense that it does not attempt to capture every possible trust-inducing feature the Web designer can apply. It is focused on articulating the most prominent set of trust-inducing features derived from numerous previous studies and presenting them as an integrated entity that can be evaluated empirically.

Figure 1. Synthetic e-commerce interface

METHODOLOGY

Synthetic E-Commerce Interface

To provide an illustrative example of the framework, a synthetic e-commerce interface (see Figure 1) for a hypothetical online merchant selling plasma TVs was created, based on the 14 identified trust-inducing features. We chose the selling product to be plasma TVs because of the attractiveness of the image and its unique ability to induce serious reflection and thought on the purpose of the survey, which was to evaluate specific features concerning trust. We gave an imaginary name, PlasmaTV.com, to the Web site. The interface was tailored such that every feature could be illustrated visually by some element or aspect of the interface. For example, the company logo in the upper left corner and the main selling point in the central image were on the interface to represent "display of brand-promoting information." The VeriSign seal in the lower left corner was used to present "display of seals of approval or third-party certificates." We intentionally created the interface in two languages — English and Chinese — so that we could perform cross-cultural analyses of the data. Both versions of the interface were implemented using professional Web page development tools in conjunction with a graphics editing package. The interfaces were accessible to the general public at a subdomain that was provided by the university.

Survey

A Web-based survey was conducted to confirm the proposed framework of trust-inducing features. A text version of the survey is presented in the Appendix. The reasons for and advantages of using a Web-based survey in our study were as follows. 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 answerers from being submitted. Last, the Web-based survey included a hyperlink to the e-commerce interface, providing an advantageous and convenient way 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 consistency, completeness, and readability. The language experts were asked to pay special attention to the accuracy of the translation between the English and Chinese versions. The objectives of this step were to examine the face validity of each item in the survey and to avoid any misleading cultural differences due to inaccurate translation.

The resulting survey is described as follows. As previously mentioned, a link to the synthetic 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 consisted of seven drop-down menus that gathered demographic and experiential information on a respondent's age, gender, current location, highest education attained, weekly hours spent on the Internet, and experience with online purchasing. The second section of the survey consisted of 15 items to rate; the first 14 items corresponded to the 14 design features, and the last item assessed the overall level of trustworthiness. The visual element examples representing each design feature on the interface were indicated in parentheses after each item on the survey.

Respondents rated each of the first 14 items using a 10-point Likert-type scale, which allowed them to select a response indicating the trust-inducing importance of each feature. The responses ranged from "1," indicating that the feature was "not important at all," to "10," indicating that the feature was "extremely important." The anchors for item 15, an overall evaluation of the trustworthiness of the interface, were "1 = Not at all trustworthy" to "10 = Totally trustworthy." The last section of the survey was a feedback box for providing comments. Like the interface itself, the survey also was created in both English and Chinese in order to reach more respondents and to enable cross-cultural comparisons.

In developing the survey, we used the best possible wording for the features, and our preliminary trials with the survey did not reveal a serious or compromising problem with the survey content. Since the reliability of the item ratings within three identified factors was satisfactorily high, as presented in a subsequent section of the paper, we conclude that the survey items were understood by the respondents. Aberrant items would have revealed themselves in the factor analysis.

Respondents

To solicit a pool of respondents who would be as close to the general public of Internet users as possible, we distributed

Table 2. Characteristics of survey respondents

Age		**Location of Participant**	
11-20	17	USA	108
21-30	104	Other	73
31-40	28		
41-50	18	**Gender**	
51-60	13	Female	73
61-70	1	Male	108
Education		**Weekly Internet Hours**	
High School	23	1-5	20
Associates Degree	10	6-10	35
Bachelors Degree	94	11-15	21
Masters Degree	40	>15	105
Doctoral Degree	14		
Internet Purchase		**Purchasers Cheated**	
Yes	141	Yes	26
No	40	No	115
Language of Interface			
Chinese	58		
English	123		

the link to the survey through university listservs, online discussion boards, and personal e-mail contacts. No monetary compensation was provided. The participants were 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. Table 2 presents the characteristics of the participants, based upon the information reported on the survey. Since the survey did not target specific individuals, there is no response-rate calculation. In addition, this approach did not yield a truly random sample from a population, but it did produce a representative pool of Internet users. For that reason, the generality of the results best applies to respondents who exhibit the characteristics reported and to those who are disposed to answer a circulated request to participate in a similar survey.

Among the respondents, 108 (60%) were located in the U.S. There were 73 (40%) female participants, and 123 (68%) of the participants used the English language interface[3]. Most of them had a bachelor's degree (94, 52%), spent more than 15 hours per week online (105, 58%), and were in their 20s (104, 57%). Most respondents (141, 78%) reported that they had made a purchase online, and 26 (18%) of the purchasers reported that they had been cheated in online shopping.

RESULTS

The data analysis had four major parts: (1) confirming the underlying dimensions in the conceptual framework of trust-inducing features, (2) comparing the magnitudes of the ratings across the dimensions obtained, (3) correlating ratings within the dimensions with overall trust ratings, and (4) comparing overall trust ratings based on demographic and experiential subgroups.

Table 3. Rotated component matrix (N = 181)

Dimensions	Features	Factor		
		1	2	3
Visual Design	V1 - Three-dimensional and half-screen size clipart	0.504		
	V2 - Symmetrical, moderate pastel color of low brightness and cool tone	0.685		
	V3 - Well chosen, good-shot photographs	0.762		
	V4 - Easy-to-use navigation	0.748		
	V5 - Accessible information	0.696		
	V6 - Navigation reinforcement	0.532		
	V7 - Page design techniques	0.636		
Content Design	C1 - Brand-promoting information		0.447	
	C2 - All aspects of customer relationship information		0.795	
	C3 - Seals of approval or third-party certificate		0.778	
	C4 - Comprehensive, correct, and current product information		0.688	
	C5 - Relevant domain name		0.476	
Social-Cue Design	S1 - Representative photograph or video clip			0.744
	S2 - Synchronous communication media			0.734

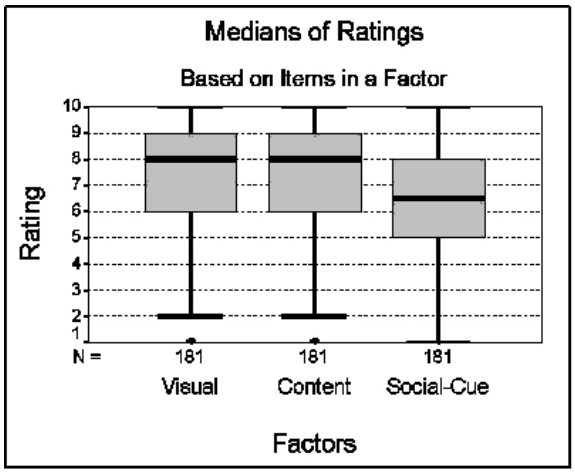
Confirming the Underlying Dimensions

The references from the existing literature used to formulate the 14 features of the conceptual framework, together with the involvement of experienced online shoppers and language experts in constructing the survey, established the content validity of the survey items. However, the classification into the four groupings was based on the authors' informed judgment. Hence, the 14 features were subjected to a confirmatory factor analysis in order to confirm the underlying dimensions and to assess the construct validity and internal reliability of the framework. The statistical tests presented next are standard in this type of analysis, and information about them is readily available elsewhere (Lee & Turban, 2001).

Before we conducted a factor analysis, we ran two tests that indicated the suitability of the 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 ($p < 0.001$), 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 dimensions. Based on this initial analysis, we tried several rotation methods to determine which features loaded on each of the three dimensions and eventually chose the Varimax rotation method, which revealed the under-

Figure 2. Boxplots of the ratings of the features within each factor (the circles are outliers)



lying relationship the best. As presented in Table 3, all factor loadings reach the acceptable level of 0.3 (Nunally, 1978), with most of them exceeding 0.6. To examine the internal reliability of each factor (i.e., visual design, content design, and social-cue design dimension), Cronbach's alpha was calculated on each factor, and the alpha coefficients were 0.80, 0.77, and 0.53, respectively. According to Nunally (1978), an alpha of 0.50 or higher indicates a sufficient level of internal reliability.

The factor analysis revealed that none of the 14 features in the proposed framework should be eliminated, because each item fell into one of the three factors (all factor loadings ≥ 0.30). The analysis also showed that the items for each factor loaded unambiguously. The only difference between the confirmatory analysis results and our proposed framework was the number of groupings; the 14 features clustered into three factors (i.e., dimensions) rather than four. The first factor included the first two dimensions of the proposed framework, and the last two factors were consistent with the last two dimensions, as proposed. Therefore, we named the first factor *visual design*, which reflected both graphics and structure aspects, and we kept the names for the last two factors as *content design* and *social-cue design*. Because little covariance existed among these three factors, it may be concluded that these three dimensions reflect different aspects of interface design to promote ratings of trust.

Evaluating Relative Magnitudes

To investigate the relative magnitudes in ratings among the survey items that fell within each of the three identified dimensions, 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 dimensions. 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 design dimension is graphically lower in comparison to the other two. The result of a Kruskal-Wallis ANOVA-by-ranks test (Maxwell &

Delaney, 2000), which is most appropriate for ordinal data and which can be used to assess differences across two or more samples, was significant ($\chi^2 = 42.50$, df = 2, $p < 0.001$). Pair-wise comparisons, Bonferroni corrected, showed significant differences between the social-cue median and the other two medians. These data suggest that all three dimensions were sensitive to the respondents' evaluations, but the social-cue dimension was rated as somewhat less important than the other two dimensions.

Evaluating Correlational Relationships

To evaluate the correlation between each dimension and the respondents' overall trust evaluations toward the synthetic interface, the ratings from item 15 in the survey were collected to represent the overall trust level as a result of the 14 trust-inducing design features. Because only two indicators were available for the social-cue dimension and only one for the overall trust rating, structural equation modeling (SEM) was not appropriate for analyzing these data (Garson, 2004). In its place, a step-wise regression was undertaken, using each participant's median rating within each dimension as the predictor variable for the visual, content, and social-cue dimensions, respectively, and using the overall trust rating as the criterion variable. The outcome showed that only the content ratings were related significantly to the overall trust ratings (beta = 0.198, t = 2.07, p = 0.008). The visual and social-cue predictors were both excluded by the step-wise regression.

Comparing Demographic and Experiential Subgroups

The overall trustworthiness ratings were compared, based on the different characteristics of the respondents. The purpose of this part of the analysis was to investigate whether demographic characteristics and individual experiences are related to users' overall trustworthiness ratings of the e-commerce interface under consideration.

Comparisons Based on Demographic Characteristics

The survey asked the subject to indicate his or her age by selecting one of six age categories. The Kruskal-Wallis test showed no significant differences among the age groups in overall trustworthiness ratings ($\chi^2 = 8.69$, df = 5, $p > 0.10$). A comparison between male (n = 108) and female (n = 73) subjects was not significant ($\chi^2 = 0.33$, $p > 0.10$), and a comparison among the five education level categories was not significant ($\chi^2 = 9.40$, df = 4, $p > 0.05$).

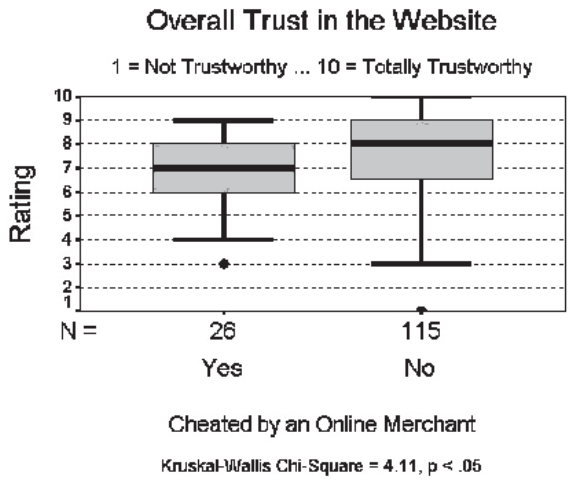
Cross-Cultural Comparisons

Because we developed the survey and the e-commerce interface in both English and Chinese, we were able to make cross-cultural comparisons in overall trust ratings. Due to the fact that people's current locations do not necessarily represent their national culture, we divided the respondents into two cultural groups, based on the language of the survey that they chose as their mother tongue. A Kruskal-Wallis test was conducted to compare the difference in overall trustworthiness ratings between English (n = 123) and Chinese (n = 58) speakers, and the outcome was not significant ($\chi^2 = 0.45$, $p > 0.10$).

Comparisons Based on Online Experience

The respondents selected one of four categories, based on their reported weekly hours spent online. The result of the Kruskal-Wallis test across the four time

Figure 3. Boxplots of overall trust ratings for purchasers who had been and who had not been cheated by an online merchant (the circles are outliers)



intervals was not significant ($\chi^2 = 4.02$, df = 3, $p > 0.25$). In this survey, we did not also request information about the years of Internet use. We would suggest, however, that it does not take too long to come up to speed on using the Internet, especially for users who were kind enough to answer our survey. Therefore, the weekly-hours measure is used only to provide a rough sense of the characteristics of the population under consideration.

There was no significant difference in trustworthiness ratings between subjects who did report previous online purchasing experiences (n = 141) and those who did not ($\chi^2 = 0.11$, $p > 0.10$). We also compared the overall trust ratings between the respondents who had been cheated by an online merchant (n = 26) and those who had not been cheated. The result showed a significant difference ($\chi^2 = 4.13$, $p < 0.05$). Figure 3 shows that the respondents who had been cheated by an online merchant gave comparatively lower ratings of the overall trustworthiness of the Web site than those who had never been cheated.

PRACTICAL WISDOMS IN THE FEEDBACK

In addition to the 181 rating responses, we also received comments from 56 respondents who shared their thoughts about their perceptions of the e-commerce interface. Their insightful comments yielded a pool of practical wisdoms. These comments, which constitute qualitative data, supplemented the findings based on the conceptual framework and the rating data. This section summarizes several important trust-inducing design tips, which were synthesized from the respondents' feedback, that can be implemented easily and that can communicate effectively with e-commerce Web site designers.

Design is More Than an Artistic Interface

Defining an effective trust-inducing design only in terms of graphical appearance is too narrow. The respondents revealed that they often ignored the "eye candy" and looked deeper than the surface

of the design. They judged a Web site to have a good design, not only because it could bring visual pleasure, but also because the overall design made the Web site easy and comfortable to read, navigate, and use. Some characteristics that were specifically mentioned as indicating good design included appropriate placement of interface components, consistent structure of Web pages, and a neat design that facilitates ease of use. The following are some comments from the respondents:

- Basic site trustworthiness is built upon a foundation of an ability to quickly direct your cursor to the item you want ... Placement is important ... I'm looking at the top for a link. I'm very used to seeing menus and buttons near the top of the page where my eyes begin looking. I honestly didn't pay a lot of attention to what is at the bottom because bottom area is usually reserved for unimportant items or redundant links.
- I think it is important to realize that it is not one page that makes a trustworthy impression. Often it is not only the presentation of the main page, but also the consistent structure design and information on the subsequent pages of the site following the initial impression.

Professionalism Can Be Reached from Multiple Angles

The respondents repeatedly identified professionalism in design as a positive indicator for an online merchant's competence and a factor that can evoke their trust. However, it is difficult to provide an absolute definition for professionalism in terms of Web site design, because professional design carries too broad and too vague a meaning and can be interpreted differently by different people. One implementation method for professional design that emerged from the literature was the use of eye-catching graphics, as indicated by Basso et al. (2001), that not only could attract a user's attention but also convey competence or professionalism. In their own words, the respondents described some other Web site features that could evoke professional feelings, such as the use of online sales chat, three-dimensional flash images, and clear and thorough presentations of merchandise images:

- Site looks professional which positively influences my level of trust. The sales chat feature gives me the impression of a large firm with a higher level of sophistication. Thus it adds to my sense of trust about this site.
- Overall the site has a professional feeling, and I think the photo of the TV screen is important to making it look professional. The blue and white color scheme has a technical feel that supports the product and makes me think this is the manufacturer.
- I've seen in toshiba.com, when I was looking for a laptop, the way they present the product in three dimensions and a rotatable format enabled me to check each feature in the product. That was very helpful in understanding the product more and thus increased my trust in that web site.

Reputation is Not Built Alone

Having a trustworthy reputation means a lot to online merchants in attracting potential customers and developing their trust. While most online merchants strive to establish a strong reputation via various marketing and advertising strategies alone, the power of third-party referral and second opinions in this building process can be

neglected easily. Some respondents revealed that self-promoted reputation was less believable than one generated by other sources of accreditation. Besides the third-party seals, such as VeriSign and TRUSTe, which have gradually gained popularity and recognition, other methods that also can satisfy consumers' needs for outsider recommendations include reports and articles from other business publications and displays of links to independent review comments. Here are some relevant comments from the respondents:

- The most important criteria for purchasing through the Internet is to know the company through business articles and reports of it reliable business practices. The VeriSign seal in my mind caries much weight in determining the trustworthiness of a company that trades over the Internet.
- I would have given PlasmaTV.COM a higher level of trustworthiness *IF* the site had displayed active links to recent positive independent rating review comments. For example, *Video Review* magazine rates PlasmaTV.COM as its top vendor for 2003 — click here to see the full article…

Real-World Presence is the Key to Trust

It is difficult to trust a stranger or to believe something that exists only in cyberspace. Therefore, making connections to a physical reality is an essential and effective way for online merchants to enhance the perceived trustworthiness of their Web sites. Some respondents reported that their trust of well-established merchants with physical stores could be transferred directly from the real world to the online world. They also appreciated proof that showed the existence of the company. These symbols of real-world presence include online sales chat, physical addresses, and phone numbers, as reflected in the following comments:

- The last thing to mention is to have some more information about the location of the company and the way to make contact with the representative ...because at least customers can be sure in some level that the company really exists.
- Also adding to the credibility of the site is that you can talk with a sales rep online. As an online consumer all you want to know is that you can get your money back if there are any problems with the product.
- If I were to make a major purchase online it would probably be from a well-established national company such as Best Buy or REI with physical stores that I could visit or (better) from the website of a local independent merchant that I like and want to support ...One final note, I like to see a phone number and other real world contact information.

Security Assurance Should Be Conveyed With the Audience in Mind

Building secured infrastructures for online payment transactions is a topic that has been discussed exhaustively. Developers tend to use technical and abstract terms to ensure users of the sophistication of the system in the hope that they will be more at ease making financial transactions online. Nevertheless, the respondents have sent a message, in non-technical terms, about how their concerns in regard to security issues can be addressed, indicating

a need for clear and exact communications on their levels of comprehension.

- I LIKE IT A LOT when a merchant explicitly states that my credit card information *IS NOT* being stored on their servers. So my credit information is ephemeral to them — they retain it just long enough for the charge to go through, then it s wiped out of RAM. It is important that the site appear to be professionally done although I think I still would purchase items from a less-than-professional Website as long as the policies were clearly stated and that all sensitive information was properly being encrypted.
- When I am ready to pull out my credit card. I want to see an indication that a secure session has been established.

DISCUSSION

In this paper, the underlying dimensions of the conceptual framework proposed in our previous study were partially confirmed, and the relative magnitudes of respondents' ratings of the three dimensions were further evaluated. The results of the statistical tests suggest that three identified dimensions contributed to the respondents' evaluations of the synthetic e-commerce interface, but the social-cue design dimension was rated somewhat less important than the other two dimensions. It is suspected that the lower ratings on the social-cue design dimension items are due to the fact that the two rated features within the social-cue design dimension were the only ones that were not actually implemented as functional examples on the interface and, thus, were not understood well by the respondents.

A further step was taken to evaluate the correlational relationships between each dimension and overall trust ratings. It was found that the content design dimension was the only group of ratings that was significantly related to overall trust ratings, although the small beta weight makes questionable any practical importance of even that relationship. This outcome suggests the insensitivity of a single global rating of trust, and it indicates the importance of collecting information on several features of an interface rather than relying simply on a global rating of trustworthiness.

The results, however, did reveal that having been cheated by an online merchant is influential enough to affect a respondent's overall trust rating of an e-commerce interface. The respondents who had been cheated by online merchants gave significantly lower ratings on the overall trustworthiness of the interface than those who had never been cheated. Other demographic and experiential factors, such as age, gender, language, and time spent online, were not found to have significant relationships with trust ratings in the current study. The lack of significant cultural and other individual differences relationships in the results might be attributable to the sample size and narrow measurement of overall trust and, thus, will need more thorough examination and elaboration in the future. Finally, the fact that the overall trustworthiness ratings of the interface were sensitive to the prior purchasing history of the respondents does suggest that the synthetic interface evoked feelings similar to those that might be expected to occur when using an online merchant's Web site.

Researchers, however, may adopt a theoretical rationale for conjecturing a relationship, based on structural equation modeling (SEM), between a criterion-latent variable and actual future performance, even when the data consist of ratings on

multi-item scales (Bassellier, Benbasat & Reich, 2003). Although covariance structure models frequently are used to infer the strength of causal relationships from a set of correlations (Meehl & Waller, 2002), proposing an interpretive transition from correlation to causation based upon such models is not free from ongoing controversy (Freedman, 1997). In the present set of correlations, we refrain from inferring that the three uncovered dimensions or, more specifically, the content dimension cause trust. Rather, we suggest that similar antecedent variables might be influential in both the rated ingredients constituting the dimensions and the overall rating of trust, with the content dimension ratings showing the most robust correlational relationship with that more general evaluation. The use of self-reported correlational data without predictive validity determinations that are empirically verified leads to sensible restraint in recommending strategic interventions where a purchasing action, not verbal behavior about a potential future action (i.e., intention), is the ultimate outcome of interest and importance to an organization.

Despite these methodological reservations, the results of this survey do indicate that e-commerce merchants would be well advised not to neglect the contributions of several aspects of Web site design, as those factors act together to promote consumer trust. With respect to the social-cue dimension, in particular, the results call for a deeper understanding on applying the sociological concept of re-embedding to interface design via various communication media and for further investigations on its implications. When implementing social cues, special care also should be taken, as advised by Riegelsberger and Sasse (2001), to prevent online shoppers from being disappointed by elements lacking functionality other than giving cues of social interaction. The design of a trustworthy e-commerce interface, then, requires attention to a wide range of features that synergistically contribute to effective levels of trust in the Web site. As suggested above, the qualitative reports generally support and enlighten the survey results, and they indicate the importance of additional sources of trust, such as the online merchant's reputation in the off-line marketplace and the inclusion of interface links to evaluations of buyers' experience with the online merchant.

CONCLUSION AND RESEARCH DIRECTIONS

As e-commerce continues to evolve and emerge as a competitive business form, online merchants face the challenge of building and sustaining consumer trust on the Internet. This issue has occasioned numerous inquiries by investigators from diverse disciplines, whose research methods and outcomes intend to offer effective solutions. In this vein, the authors adopted an HCI approach in an attempt to address the challenge by applying trust-inducing design features to an e-commerce interface.

The contributions that the present study brings to the research field are twofold. First, the paper provides empirical evidence and indicative support for the importance of interface design in inducing online trust. Second, the research approach, which included conducting a Web-based survey and developing a synthetic e-commerce interface for illustration and testing purposes, adds to the growing methodological knowledge on the topic of online trust and generates insights into the field.

The practical wisdoms articulated from the respondents' written comments

enriched the context of the survey study and confirmatory analysis of a conceptual framework. The qualitative comments by the respondents also contributed to our understanding of the trust-inducing features of an e-commerce interface, and they supplemented the quantitative data. Respondents highlighted the importance of the functionality of the interface, and this feature was represented in the visual content factor. The professionalism of the interface generally reflected the presence of a comprehensive set of ingredients from among the three factors that were identified. Respondents appreciated the security assurances and opportunities for interacting with representatives of the company, and they would have appreciated information about the off-line status of the company to include location and reviews of its reputation. Although respondents offered these and other suggestions for features not always represented within the 14 that were chosen for quantitative evaluation, the preponderance of the comments were reflected by items within one of the three factors identified in the analysis.

The authors hope that the complementary findings from both quantitative and qualitative sources of information will contribute to future applications and research in e-commerce interface design considerations affecting online trust. Future research may continue to elaborate and substantiate the conceptual framework in order to include more social-cue design features and to validate the framework in a more controllable experimental setting. Some of the practical issues for building online trust that evolved from the respondents' feedback are also subject to further investigation for reaching the ultimate goal of helping online merchants to foster optimal levels of trust in their customers.

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ENDNOTES

1. A briefer version of this paper was presented at the 15th International Conference of the Information Resources Management Association, 2004, and appeared within the proceedings.
2. http://www.saksfifthavenue.com/
3. These numbers are accurate, although the identical bifurcation of frequencies within the location and gender categories is obviously notable.

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APPENDIX: ABBREVIATED SURVEY (ENGLISH VERSION)

Instructions

Assume that you are interested in purchasing a product online from PlasmaTV.com, an online merchant. The trustworthiness of an e-commerce Web site refers to your opinion or perception of confidence in a merchant's reliability and integrity. The purpose of this study is to evaluate your perceived trustworthiness of an e-commerce web site by asking you to rate the importance of several trust-inducing features illustrated by the PlasmaTV.com e-commerce interface, which has been designed for this particular study. Please open the following link in a separate window (best viewed with Internet Explorer): http://userpages.umbc.edu/~ywang8/online_trust/

Demographic Information

The choices below were implemented by checkboxes.

1. Age
2. Gender
3. Current Location
4. Highest Education Attained
5. Average hours per week spent on the Internet
6. Have you ever purchased anything online?
7. Have you ever been cheated by an online merchant?

Features to Rate

Please indicate how unimportant or important each feature is in Table 1 in affecting or influencing your perceived trustworthiness of an e-commerce Web site. An example of the feature to evaluate is given in parentheses. The range of your rating is from 1 = Not important at all to 10 = Extremely important. You may choose any number from 1 to 10 to rate the importance of the feature to you. Please refer to the example featured on the PlasmaTV.com interface before you make your evaluation, and be sure to choose only one number for each feature.

1. Use of three-dimensional and half-screen size clipart (See the main picture of a plasma TV)
2. Symmetric use of moderate pastel color of low brightness and cool tone (See the overall color of the Web page)

(continued on following page)

3. Use of well chosen, good-shot photographs
4. Easy-to-use navigation (see the drop-down menus and pay attention to the simplicity and consistency in fonts, symbols, and text)
5. Accessible information (Assume there are no broken links and missing pictures on the main interface and all subpages)
6. Use of navigation reinforcement (see the navigation anchor "You are here >> HOME" on the upper left corner and the drop-down menu of "How To Documents")
7. Application of page design techniques (see the use of ample white space and adequate margins; also see strict grouping of related information and low visual density)
8. Display of brand-promoting information (see the company logo on the upper left corner and main selling point in the main picture)
9. Up-front disclosure of all aspects of the customer relationship (see the drop-down menu for "Store Policy")
10. Display of seals of approval or third-party certificates (see the VeriSign seal on the lower left corner)
11. Comprehensive, correct, and current product information (see "Most Popular Models")
12. Use of a relevant domain name (assume the domain name is www.PlasmaTV.com)
13. Inclusion of representative photograph or video clip (see the picture in the lower right corner)
14. Use of synchronous communication media (see "Sales Chat" where users can exchange instant messages with a sales representative)
15. Rate your opinion or perception of the overall level of trustworthiness of the PlasmaTV.com Web site.