Modeling Web Site Design Across Cultures: Relationships to Trust, Satisfaction, and E-Loyalty

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ABSTRACT: Despite rapidly increasing numbers of diverse online shoppers, the relationship of Web site design to trust, satisfaction, and loyalty has not previously been modeled across cultures. In the current investigation, three components of Web site design (information design, navigation design, and visual design) are considered for their impact on trust and satisfaction. In turn, relationships of trust and satisfaction to online loyalty are evaluated. Utilizing data collected from 571 participants in Canada, Germany, and China, various relationships in the research model are tested using partial least squares analysis for each country separately. In addition, the overall model is tested for all countries combined as a control and verification of earlier research findings, although this time with a mixed country sample. All paths in the overall model are confirmed. Differences are determined for separate country samples concerning whether navigation design, visual design, and information design result in trust, satisfaction, and ultimately loyalty—suggesting design characteristics should be a central consideration in Web site design across cultures.

KEY WORDS AND PHRASES: culture impacts, e-commerce, e-loyalty, satisfaction, trust, Web site design.

IN 2007, THERE WERE OVER 1 BILLION INTERNET USERS worldwide representing a 183 percent increase since the year 2000.[1] Of those Internet users, the primary language is English (35.6 percent), followed by Chinese (12.2 percent), Japanese (9.5 percent), Spanish (8 percent), and German (7 percent). Internet vendors aim to capture this burgeoning international market through the creation of positive shopping experiences that encourage shoppers to return to the Web site or to purchase from it in the future, termed e-loyalty [20]. There is a business case for this goal. According to Reichheld and Schefter [44], an increase in customer retention rates by only 5 percent can increase profits by 25 percent to 95 percent.

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It is expected that effective Web site design, including navigation capability or visual appeal of the Web site, can potentially result in online trust [26, 33] or satisfaction [1, 2, 55], although work that systematically examines these elements across cultures is sparse. In turn, no previous work has examined how trust and satisfaction relate to e-loyalty across cultures. One goal of this research is to model Web site trust and Web site satisfaction in different cultures related to loyalty.

Web site design preferences vary across cultures [4, 15] and affect trust and satisfaction, although these relationships have not been statistically modeled. To date, design characteristics have been broad and diffusely defined. In the current research specific design categories for information design (ID), navigation design (ND), and visual design (VD) are adopted from the usability literature and are tested as antecedents to Web site trust and Web site satisfaction. Based on earlier work [15, 50], it is expected these design categories will have different effects on trust or satisfaction dependent on culture. Hence, a second goal of this study is to model three separate design constructs to Web site trust and Web site satisfaction across cultures. Further, although ID, ND, and VD have been used, by Garrett [23], they have not been statistically validated. A third goal of the current research is to validate these three design constructs.

A final goal of the current investigation is to examine the relative strength of the relationship of trust *versus* satisfaction to loyalty across cultures. In previous work, Flavián et al. [20] found both trust and satisfaction resulted in loyalty. Yoon [55] tested both trust and satisfaction and found trust was more related to Web site security whereas satisfaction was related to design elements such as ease of navigation. This is an interesting distinction, although research has not examined this possible dichotomy related to different elements of Web site design with diverse cultural groups.

To achieve the research goals, a model was developed (see Figure 1) to examine characteristics of culture and design (namely, ID, ND, and VD) as antecedents to Web site trust, Web site satisfaction, and e-loyalty in a three-country sample (Canada, Germany, and China). The model will be tested in two ways. First, the model will be evaluated for each country separately in order to determine cross-cultural differences. Second, the model will be tested using a robust sample (571 participants) from three cultures to determine if previous research using smaller samples of homogeneous respondents is confirmed. The various hypotheses are elaborated in the literature review that follows.

Designing for E-Loyalty Across Cultures

In online settings, "understanding how or why a sense of loyalty develops in customers remains one of the crucial management issues of our day" [36, p. 156]. Online loyalty, or e-loyalty, has been conceived as a "consumer's intention to buy" from a Web site, and that consumers will not change to another Web site [20]. In a study in which Web site design was investigated as a precursor to e-loyalty across cultures, Cyr et al. [16] define e-loyalty as intention to revisit a Web site, or to consider purchasing from it in the future. In a business-to-business service context, Lam et al. [34] test customer satisfaction to loyalty, where loyalty is both the patronage of an online vendor,

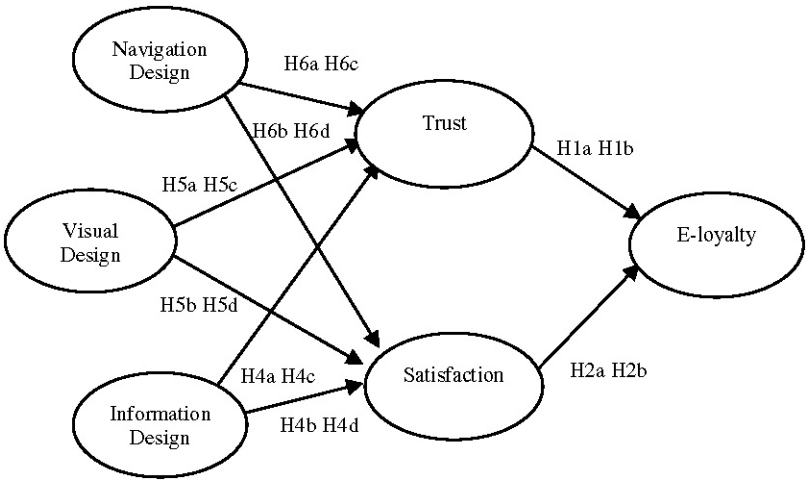

Figure 1. Proposed Research Model

as well as confidence in recommending the vendor. Consistent with the preceding, in the current investigation, e-loyalty is defined as perceived intention to visit or use a Web site in the future and to consider purchasing from it in the future.

Culture affects user attitudes toward the Internet, including perceptions of loyalty. Chau et al. [7] found differences between collectivist consumers in Hong Kong (who prefer shared loyalty and relationships) and individualistic Americans (who prefer competence and loyalty to self). Extrapolating from this finding, Chinese participants used the Internet mostly for social communication, whereas Americans used the Internet primarily for information search.

Trust and E-Loyalty

In online environments, researchers have endeavored to unravel the complexities of trust [6, 8, 24, 27, 33, 53].[2] Corritore et al. provide a definition of online trust that includes cognitive and emotional elements, with trust encompassing "an attitude of confident expectation in an online situation or risk that one's vulnerabilities will not be exploited" [12, p. 740]. Unlike the vendor–shopper relationship established in traditional retail settings, the primary communication interface with the vendor is an information technology artifact—the Web site. In line with Jarvenpaa et al., in this research, trust refers to consumer confidence in the Web site and "willingness to rely on the seller and take actions in circumstances where such action makes the consumer vulnerable to the seller" [31, p. 4]. In addition, and related to Web site design elements, the Web site is generally trusted. Consumer trust in the Web site is fundamental to e-loyalty, including online purchase intentions [20, 24] and willingness by consumers to buy from an online vendor [20, 27, 42].

Antecedents to Web site trust vary and have included Web site design characteristics [20], perceived vendor reputation [31, 33], service quality [24], and social presence

[26], among other things. In a study well aligned with the current research, Yoon [55] tested the relationship of Web site properties (which includes width of product selections, accuracy of online information, and firm's reputation) and navigation functionality to Web site trust, which in turn, was predicted to result in on/offline purchase intention (similar to e-loyalty). Results indicated that Web site properties and trust are related and influence online purchase intentions. In other work, perceived Web site usability directly influenced online consumer trust, which in turn influenced e-loyalty [20]. The relationship of trust to loyalty has been confirmed in this earlier work; in the current study, it is of interest to see if, in a very large sample of mixed cultures, the relationship of trust to e-loyalty prevails. This results in the first hypothesis:

Hypothesis 1a: Web site trust will result in e-loyalty for a mixed sample including all countries.

There is a need to conduct research on cross-cultural effects and trust [24], because in most studies when trust and culture are considered, the results are mixed or inconclusive [31, 37]. However, in one study, differences were found between collectivist (Chinese) and individualist (U.S.) cultures in which trust influenced perceived behavioral control, which in turn led to transaction intentions [43]. Further, in an investigation in which culture, trust, and e-loyalty were jointly examined for Canadian, American, German, and Japanese participants, similar perceptions of a local Web site were found concerning trust for Canadians and Americans, while there was a modest difference ($p < 0.1$) for Americans with Germans, and significant differences ($p < 0.01$) between American, Canadians, and Germans with Japanese. Similar results were found for e-loyalty [16].

Building on the conceptual foundation for culture and trust presented by Doney et al. [18], Gefen and Heart [25] examined online trust differences between the United States and Israel related to behavioral intention (inquiry intention and purchase intention, which are aligned to Web site loyalty). As trust was the focus of the investigation, the researchers considered ability, integrity, and benevolence as did McKnight et al. [40]. As predicted, only ability affected behavioral trusting intention, and more so for collectivist Israelis than for individualistic Americans.[3] In alignment with Gefen and Heart [25], the following hypothesis is offered although using different constructs and cultures:

Hypothesis 1b: Web site trust will result in e-loyalty for highly collectivist Chinese users but not for more individualistic Canadian and German users.

Satisfaction and E-Loyalty

An effectively designed Web site may engage and attract online consumers resulting in satisfaction with an online vendor [1, 33]. Artifacts of Web site design that contribute to satisfaction are numerous and varied. Palmer [41] validated design metrics for Web sites and found site organization, information content, and navigation important to Web site success, including intent to return to the site. In other research, Web site

design and the "ambience associated with the site itself and how it functions" is an antecedent to satisfaction [51, p. 313]. In this research, Web site satisfaction refers to overall contentment with the online experience [2, 20], including access to information, a positive navigation experience, and perception of a well-designed Web site [3].

Repeated satisfaction with a vendor eventually results in e-loyalty [20, 34, 35]. Anderson and Srinivasan [2] found that Web site satisfaction related to e-loyalty was moderated by trust. However, in other work and consistent with predictions in the current investigation, satisfaction was found to directly impact customer e-loyalty [20, 36, 55]. While there is evidence that Web site satisfaction results in loyalty, as a control in the research and using a sample comprised of three cultures, the following hypothesis is tested:

Hypothesis 2a: Web site satisfaction will result in e-loyalty for a mixed sample including all countries.

Concerning culture and Web site satisfaction, Evers and Day [19] tested a group of Asian students (from collectivist cultures such as China, Singapore, and Japan) and a group of Australian students (individualists) regarding satisfaction with technology adapted to their culture. Australians were more satisfied than Asians, but no link from satisfaction to loyalty was considered. In other research, Web site satisfaction was examined across cultures but, counter to the preceding, Asians were slightly more satisfied with the Web sites tested than Europeans or North Americans, and the relationship of satisfaction to e-loyalty was again not tested [47]. In only one study were satisfaction and e-loyalty examined across cultures related to Web site design [16]. Participant reactions to a local and foreign Web site of the same online vendor (using *t*-test comparisons) were evaluated, although the causal relationship of satisfaction to loyalty was not. Given the limited amount of research in this area, the following exploratory hypothesis is outlined. It is consistent with earlier work in which Web site satisfaction is expected to result in e-loyalty, although now tested in three countries:

Hypothesis 2b: For each country separately, Web site satisfaction will result in e-loyalty for Canadian, German, and Chinese users.

Few studies have examined the relative impact of trust versus satisfaction on e-loyalty. In one investigation, Web site trust and satisfaction were found to equally affect Web site loyalty [20]. Alternately, Luarn and Lin [36] found satisfaction to have a stronger impact on loyalty than trust in an e-service environment. Using a Korean sample, Yoon [55] tested trust and satisfaction related to Web site design and security and found ease of navigation was positively related to satisfaction, while trust was positively related to security. All of the previous research was conducted with single culture samples. Given the countries investigated in the current research, Germans score moderately on Hofstede's scale (65) along with China (60) for uncertainty avoidance. Canada is low in uncertainty avoidance (48). Because uncertainty avoidance is related to trust and security as investigated by Yoon, one might expect trust to be more of a concern to risk-avoiding Chinese and Germans than to Canadians. This gives rise to the following hypothesis:

Hypothesis 3a: Web site trust resulting in e-loyalty will be stronger than the relationship of Web site satisfaction to e-loyalty for Chinese and Germans more than for Canadians.

Finally, there is some research in which the relationship between Web site design elements and loyalty is mediated by trust and satisfaction [20, 55]. Flavián et al. [20] tested a direct relationship from design elements to loyalty with insignificant results. In the current research, it is similarly expected that satisfaction and trust are mediators between Web site design elements and loyalty, now tested in three cultures:

Hypothesis 3b: The relationship of Web site design to e-loyalty will be mediated by trust and by satisfaction in Canada, Germany, and China.

Culture and Web Site Design

If Web sites are culturally appropriate or "localized,"[4] then users are more likely to visit and remain at the Web site [4, 19]. To systematically test Web site differences across cultures, Cyr and Trevor-Smith [15] examined design elements for 30 municipal Web sites in each of Germany, Japan, and the United States (90 total). Use of symbols and graphics, color preferences, site features, language, and content were all considered. Significant differences were found in each of the listed categories and suggest distinctive design preferences across cultures. In other research, Web site design preferences also varied by culture [47, 50]. With reference to the cultures examined in this investigation, Singh et al. [48] compared domestic and Chinese versions of Web sites for 40 American-based companies and found differences in all cultural categories tested.

A broad range of Web site design categories and characteristics have been used in work to date. In the current research, one objective is to systematically examine key design categories, to test them for construct validity, and to causally map these design constructs to Web site trust and Web site satisfaction. To achieve this goal, design categories suggested by Garrett [23] for ID, ND, and VD were selected for anticipated appropriateness for cultural comparisons. While these design characteristics are not exhaustive, they do represent key elements of Web site usability. These same categories were used by Cyr and Bonanni [14] in exploratory research in which gender differences and design were examined, and have been generally represented in other work [1, 15, 20, 47]. Garrett's categories are outlined below, along with supporting evidence that each characteristic is expected to vary by culture.

Information Design

Information design refers to Web site elements that convey accurate or inaccurate information about products or services to a user. The location of an icon on the screen would be the domain of information architecture, while whether or not that icon or text conveys the right information to a user is ID [23]. Information is considered an important prerequisite to trust [20, 54] and satisfaction [17, 20, 51]. In some of these

studies [20], ID is one component of a larger construct termed *usability* that includes other aspects of design such as navigation or Web site structure. In the current study a new construct is created for validation that refers to information only. As McKinney et al. describe, "customers dissatisfied with web site information contents will leave the site without making a purchase" [39, p. 308]. Tested here with a multiple country sample, it is expected ID will result in both Web site trust and Web site satisfaction.

Hypothesis 4a: ID will result in Web site trust for a mixed sample including all countries.

Hypothesis 4b: ID will result in Web site satisfaction for a mixed sample including all countries.

Research comparing user preferences in Canada, the United States, Germany, and Japan for perceived access and presentation of product information uncovered few significant differences between the United States, Canada, and Germany, but significant differences ($p < 0.01$) between these countries and a highly collectivist culture such as Japan [16]. Based on qualitative comments from the study, there appeared a desire on the part of Canadians, Americans, and Germans for utility—at least as far as obtaining site information is concerned [16]. Germans and Chinese score moderately on Hofstede's scale for uncertainty avoidance. This suggests both German and Chinese users prefer to avoid risk when shopping on the Internet. Sun [50] confirms that Germans value hierarchy and verbal components of a Web page that result in certainty about the information presented. Alternately, Canadians score in the low category for uncertainty avoidance.

Admittedly, work in this area is in an early stage, however, one might expect that Germans and Chinese are more concerned with the information as presented by online vendors than Canadians. To this end, some exploratory hypotheses concerning ID are outlined for Canada, Germany, and China:

Hypothesis 4c: ID will result in Web site trust for Canadian users but not for German and Chinese users.

Hypothesis 4d: ID will result in Web site satisfaction for Canadian users but not for German and Chinese users.

Visual Design

Elements of *visual design* deal with balance, emotional appeal, aesthetics, and uniformity of the Web site overall graphical look. This includes colors, photographs, shapes, or font [23]. In some research, a relationship between the "aesthetic beauty" of a Web site and trust was established [32], whereas in other studies, VD of the Web site did not significantly affect trust [54]. Further, Web site aesthetics was considered related to the "overall enjoyable user experience" [52, p. 12]. While research in this area is limited and results are mixed, in this study, it is posited that for a multiple country sample, VD will result in both trust and satisfaction for the user:

Hypothesis 5a: VD will result in Web site trust for a mixed sample including all countries.

Hypothesis 5b: VD will result in Web site satisfaction for a mixed sample including all countries.

Color is a common differentiator by culture and connotes different meaning [4, 47]. Red means happiness in China but danger in the United States. Users from collectivist cultures such as China have a strong preference for visuals, whereas users from more individualistic cultures such as Germany prefer a logical and structured page layout [50]. In a study that compared Canadian, U.S., German, and Japanese users, Japanese favored a more visual approach which could also appeal to user "emotion" [16]. Once again, there is no research in which the relationship of VD to trust and satisfaction has been modeled across cultures. Based on the preceding, it expected that VD will be more important to Chinese users (who score 20 or very low on Hofstede's scale for individualism) and will result in trust and satisfaction, compared to Canadian (80) or German (67) users:

Hypothesis 5c: VD will result in Web site trust for Chinese users but not for Canadian or German users.

Hypothesis 5d: VD will result in Web site satisfaction for Chinese users but not for Canadian or German users.

Navigation Design

Navigation design refers to the navigational scheme used to help or hinder users as they access different sections of a Web site [17, 23]. "No matter how thorough the information content of a site is, a customer who has difficulty in searching and getting the needed information is likely to leave the site" [39, p. 308]. Yoon [55] found ND resulted in Web site satisfaction. It is expected that for multiple countries, users expect to effectively navigate a Web site and, in doing so, will experience trust and satisfaction:

Hypothesis 6a: ND will result in Web site trust for a mixed sample including all countries.

Hypothesis 6b: ND will result in Web site satisfaction for a mixed sample including all countries.

Preferences for the form of navigational scheme are expected to vary by culture [38]. Simon [47] found that Europeans and individualist North Americans prefer navigation that enhances movement and makes the site simpler to use. Alternately, Asian/Latin and South Americans (generally collectivists) desire navigation aids to change the appearance of the site without particular concern for movement. Germans, who are moderately high on uncertainty avoidance, "feel anxiety about uncertain or unknown matters" [38, p. 39], and therefore prefer "navigation schemes intended to

Table 1. Country Comparisons

Country dimension	Canada	Germany	China
Power distance	Low (39)	Low (35)	High (80)
Uncertainty avoidance	Low (48)	Medium (65)	Medium (60)
Masculine	Medium (52)	Medium (66)	Medium (50)
Individualism	High (80)	Medium (67)	Very low (20)
Long-term orientation	Very low (23)	Medium (31)	Very high (118)

Source: Based on Hofstede [30].

prevent users from becoming lost" [38, p. 41]. Like Germans, Chinese are moderate on Hofstede's [30] scale for uncertainty avoidance, while Canadians are least risk averse. The preceding suggests differences in ND may exist between Canadians with German or Chinese users. These initial findings lead to the final exploratory hypotheses proposed in the current investigation:

Hypothesis 6c: ND will result in Web site trust for Canadian users but not for German or Chinese users.

Hypothesis 6d: ND will result in Web site satisfaction for Canadian users but not for German or Chinese users.

Method

Participants

A TOTAL OF 571 PARTICIPANTS LOCATED IN Canada, Germany, or China completed an experimental task and online survey (n = 230 in Canada, 118 in Germany, and 223 in China). These countries are chosen to represent diverse cultural characteristics as per Hofstede [30] for power distance, uncertainty avoidance, masculinity–femininity, individualism–collectivism, and long-term orientation (see Table 1).

To ensure participants are "of the culture" it was determined that each had lived in the country the majority of their lives and spoke the native language as their primary language. Participants were recruited from a wide range of sources, including universities, institutes, and companies. Average age across countries is very close with an overall average of 25.6 years. Participants are experienced online shoppers and well educated. Most had completed either a university degree or postgraduate education.[5] An overview of participants for each country appears in Table 2.

Task and Web Site Design

This research targets user impressions of business-to-consumer (B2C) Web pages. For the research treatment, participants responded to the local version of the SonyStyle Web site represented in their native language. Users were requested to initially view

Table 2. Participant Demographics

Demographic	Canada	Germany	China	Total
Gender				
Male	106	57	114	277
Female	124	61	109	294
Mean age	25.5	26.2	25.2	25.5
Education level				
High school	95	4	35	134
University	101	90	99	290
Master's/doctorate	25	21	78	124
Technical	9	3	11	23
Mean number of years shopping online	3.0	4.1	2.7	3.3
Mean number of online purchases last year	7.7	10.2	8.4	8.9
Previously shopped at Sony Web site				
Yes	18	5	39	62
No	212	113	184	509
Prefer to buy known brands from recognized online company				
Yes	217	86	121	424
No	13	32	102	147

the home page of the local Web site, followed by navigation of the Web site to choose a cell phone they would hypothetically purchase. Once participants concluded this task, each completed an online survey. Background information to the study, and all other written content, including the survey, were translated and back-translated into each required language. As an incentive to participate in the study, participants could enter their name in a drawing for a $250 gift certificate for Amazon.com.

The SonyStyle Web site was chosen after an extensive search for a well-localized vendor Web site. A design expert rated each Web site on various characteristics, including main and secondary color, interaction, menu position, use of local symbols, ratios of text to graphics, use of multimedia, and visual style. Country variations in the areas of ID, VD, and ND were detected. The Canadian Web site has product information presented on the home page with similar, simple navigation through product links. Regarding VD, the Canadian site features a large group picture with red, blue, and white as predominant colors. In Germany, information is simply presented and well spaced, and navigation is parsimonious through various links on the home page. White is predominant and no pictures of people appear. In contrast, the Chinese home page has information represented in multiple locations on the page, with two small pictures of users. The predominant color is blue, and multiple menus and points of navigation appear on the home page.

Table 3. Principal Components Analysis and Reliability

	1	2	3	4	5	6
ND1	**0.841**	0.159	0.148	0.074	0.131	0.175
ND2	**0.807**	0.252	0.183	0.137	0.084	0.202
ND3	**0.622**	0.196	0.249	0.141	0.170	0.284
VD1	0.112	0.225	0.143	0.024	**0.853**	0.199
VD2	0.229	0.065	0.272	0.378	**0.660**	0.039
ID1	0.273	0.205	0.137	0.069	0.102	**0.838**
ID2	0.394	0.148	0.180	0.273	0.209	**0.652**
T1	0.284	**0.769**	0.216	0.119	0.110	0.127
T2	0.185	**0.796**	0.190	0.055	0.115	0.111
T3	0.104	**0.782**	0.194	0.207	0.127	0.141
S1	0.053	0.128	0.233	**0.841**	0.055	0.200
S3	0.321	0.274	0.166	**0.620**	0.302	0.023
L1	0.205	0.161	**0.715**	0.309	0.111	0.028
L2	0.176	0.210	**0.837**	0.107	0.174	0.120
L3	0.172	0.297	**0.773**	0.110	0.154	0.217
Alpha	0.824	0.830	0.836	0.633	0.753	0.643
AVE	0.584	0.612	0.603	0.546	0.582	0.592

Notes: ND = navigation design, VD = visual design, ID = information design, T = trust, S = satisfaction, L = loyalty. Elements of a common construct (as designated in the left-hand column) appear together in boldface.

Instrument Validity and Reliability

Content validity ensures construct items are representative and drawn from a universal pool [13]. Definitions for ID, ND, and VD come from existing literature, including Garrett's [23] classifications, however, the items as constructs have not been previously validated. Items for trust, satisfaction, and e-loyalty come from existing literature and already exhibit strong content validity.[6] All items are assessed on a seven-point Likert scale ranging from "strongly disagree" to "strongly agree." The survey was pretested with 62 undergraduate students. Categories were evaluated for item validity and reliability and several items were revised for better fit.

Construct validity is demonstrated when there are relatively high correlations between measures of the same construct (convergent validity) and low correlations between measures of constructs that are expected to be different (discriminant validity) [49]. To assess convergent validity of the measurements, Fornell and Larcker [22] proposed examining (1) the item reliability of each measure, (2) the composite (construct) reliability of each construct, and (3) the average variance extracted (AVE) for each construct. Item reliability of each measure was assessed through a principal components factor analysis as recommended by Straub [49]. Table 3 shows the results of the principal component analysis with varimax rotation for the constructs. As a rule, items in a construct load highly if the loading coefficient is above 0.6, and do not load highly if the coefficient is below 0.4 [29]. The constructs in the survey demonstrate discriminant validity.

Table 4. Discriminant Validity Tests

	Loyalty	Trust	Satisfaction	ND	VD	ID
Loyalty	**0.777**					
Trust	0.561	**0.783**				
Satisfaction	0.546	0.478	**0.739**			
Navigation design	0.532	0.539	0.490	**0.763**		
Visual design	0.513	0.437	0.525	0.469	**0.763**	
Information design	0.481	0.484	0.474	0.656	0.465	**0.751**

Note: Diagonal elements in boldface represent the square root of AVE.

Construct reliability was assessed using Cronbach's alpha. In Table 3, alpha values ranged from 0.633 (for satisfaction) to 0.836 (for loyalty). The Cronbach alpha of a scale should be greater than 0.5 for items used together and ideally higher than 0.7 [45]. Therefore, all constructs possess construct reliability. The AVE for a construct should exceed 0.5 [22]. In Table 3, this criterion is satisfied for all constructs, and the constructs used in this study possess convergent validity. Discriminant validity was determined to ensure constructs differed from each other. Correlations between items in any two constructs should be lower than the square root of the average variance shared by items within a construct [22]. In Table 4, the square root of the variance shared between a construct and its items is greater than the correlations between the construct and other constructs in the model, therefore satisfying criteria for discriminant validity. As such, the above results confirm the survey instrument has construct validity.

Results

A STRUCTURAL EQUATION MODELING APPROACH was used to measure relationships from ID, ND, and VD to trust and satisfaction, and also trust and satisfaction to loyalty. This method was applied as it tests structural and measurement models and provides a complete analysis for interrelationships in a model [21]. A variance-based partial least squares (PLS) method was chosen over covariance-based methods such as LISREL, as it supports both exploratory and confirmatory research [28].[7] PLS does not generate an overall goodness-of-fit index (as with LISREL), so model validity is assessed by examining structural paths and R^2 values [10]. Bootstrapping was performed to test statistical significance of each path coefficient using *t*-tests [9].

Canada, Germany, and China Combined

All path coefficients of the hypothesized causal links for the overall model (combined countries, $n = 571$) are highly significant ($p < 0.001$) as shown in Figure 2. Thus, H1a, H2a, H4a, H4b, H5a, H5b, H6a, and H6b are supported. Approximately 41 percent of

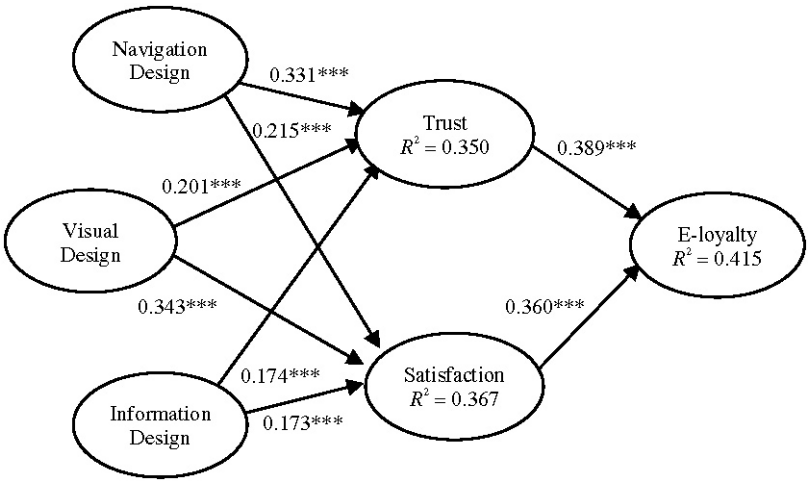

Figure 2. PLS Structural Model (All Countries) ($n = 571$)
* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

the variance in loyalty to the Web site is captured by the variables in the model ($R^2 = 0.415$). Table 5 provides the *t*-values of path coefficients and summarizes hypothesis testing for the mixed country sample.

Canada, Germany, and China Separately

Figures 3, 4, and 5 show the results of the PLS analysis for each country separately. For Canada, all but two causal paths are highly significant with the exceptions of ID to satisfaction ($p < 0.05$) and VD to trust, which is not significant. Variance captured by e-loyalty in this model is high ($R^2 = 0.477$).

For the German model, causal paths from trust to loyalty and satisfaction to loyalty are both highly significant ($p < 0.001$). About 37 percent of the variance in loyalty is accounted for by variables in the model ($R^2 = 0.372$). All design elements (ID, ND, VD) are significantly related to satisfaction ($R^2 = 0.412$), but none of the relationships of the design elements to trust is significant ($R^2 = 0.173$). The R^2 value of the three design elements to trust is the lowest for all of the endogenous constructs in any of the models, however, it exceeds the 10 percent recommended benchmark [11].

For China, the relationships in the model are significant with the exception of ID to trust. Variance captured by e-loyalty in this model is approximately 36 percent ($R^2 = 0.368$). Table 6 provides *t*-values of path coefficients for each of the country models tested separately.

In H1b, it is predicted the relationship of trust to loyalty would occur for China but not for Canada and Germany. However, in all countries a very significant relationship exists ($p < 0.001$), so this hypothesis is not supported. H2b predicts a positive relationship between satisfaction and e-loyalty in all three countries and is strongly supported ($p < 0.001$) in all cases.

Table 5. Results of Hypothesis Testing (Canada/Germany/China Combined)

Hypothesis	Causal path	Path coefficient	*t*-value	Supported
H1a	All countries trust → loyalty	0.389	8.203***	Yes
H2a	All countries satisfaction → loyalty	0.360	8.180***	Yes
H4a	All countries ID → trust	0.174	3.563***	Yes
H4b	All countries ID → satisfaction	0.173	3.540***	Yes
H5a	All countries VD → trust	0.201	4.476***	Yes
H5b	All countries VD → satisfaction	0.343	7.253***	Yes
H6a	All countries ND → trust	0.331	6.243***	Yes
H6b	All countries ND → satisfaction	0.215	3.963***	Yes

*** $p < 0.001$.

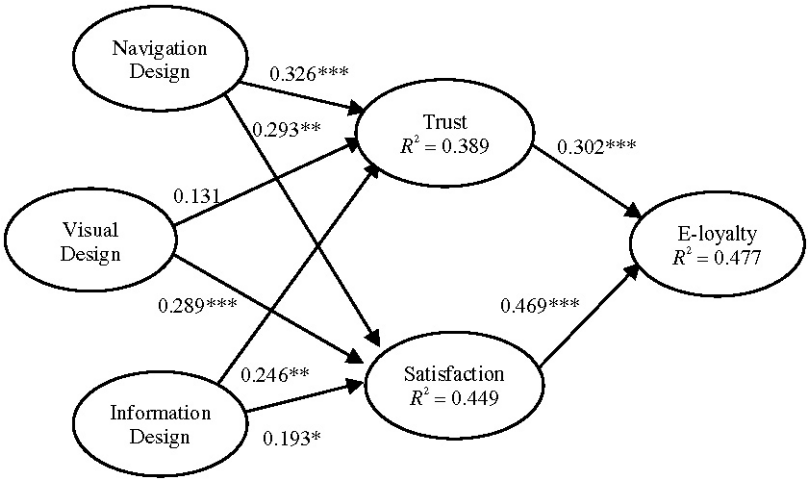

Figure 3. PLS Structural Model (Canada) ($n = 230$)
* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

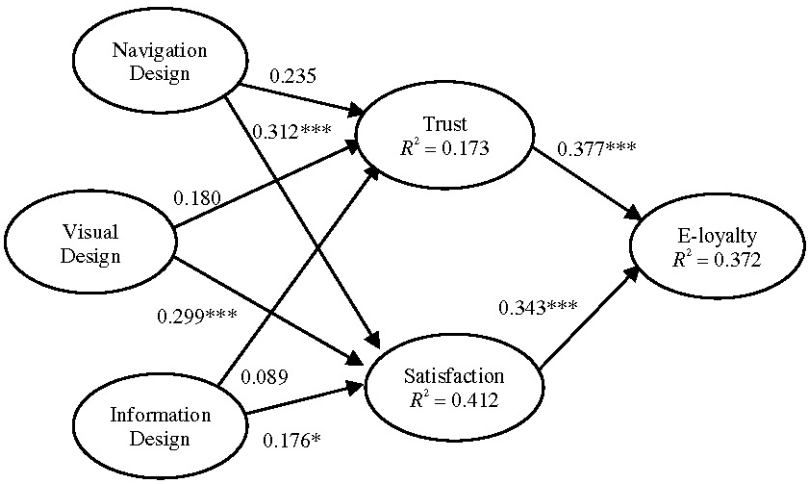

Figure 4. PLS Structural Model (Germany) ($n = 118$)
* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Concerning the various design elements, H4c predicts that ID results in trust for Canadians but not for Germans and Chinese and is supported. H4d predicts that ID results in satisfaction for Canadians but not for Germans and Chinese and is partially supported. Along with Canadian users, German and Chinese users demonstrate ($p <$ 0.05) that ID of the Web site results in satisfaction. It is expected VD results in trust (H5c) and satisfaction (H5d) for Chinese but not Canadian and German users. H5c is supported, and H5d received partial support with VD resulting in satisfaction for all countries. Finally, it is expected that ND leads to trust (H6c) and satisfaction (H6d) for

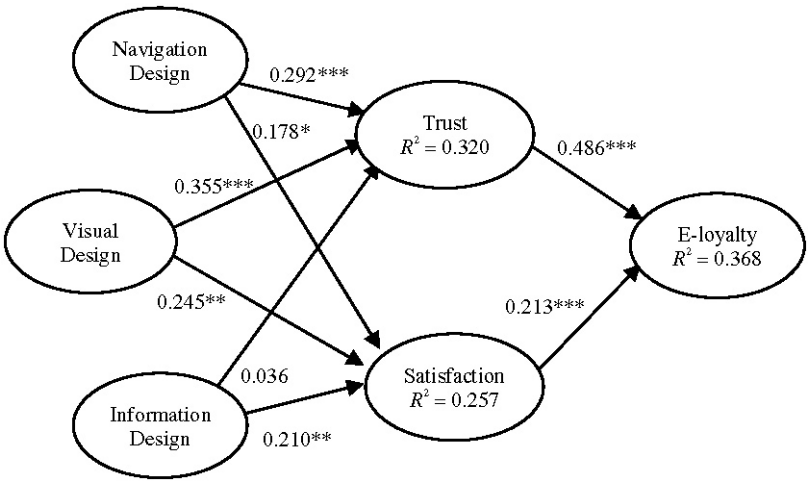

Figure 5. PLS Structural Model (China) ($n = 223$)
* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Canadians but not for Germans and Chinese. Both hypotheses received partial support. ND leads to trust for Canadians and also for Chinese, and ND resulted in satisfaction for all countries. Overall, for ID, VD, and ND, a relationship to satisfaction exists for all countries. For trust, no significant relationship existed between each design category and trust in at least one country. Refer to Table 6 for a summary of hypothesis testing between countries and whether there is support for each hypothesis.

Analysis of Effect Size of Trust and Satisfaction on Loyalty

It was predicted in H3a that the relationship of trust to loyalty would be stronger than the relationship of satisfaction to loyalty for German and Chinese participants more than for Canadian participants. To test this, Chin [9] states the effect size of independent variables on a dependent variable can be determined by comparing the R^2 of the dependent variable with and without the presence of each independent variable. The calculation for effect size (f^2) is as follows:

$$f^2 = \frac{R^2_{\text{included}} - R^2_{\text{excluded}}}{1 - R^2_{\text{included}}}.$$

Cohen [11] provides the following criteria for interpreting effect size: (1) for small effect size, $0.02 < f^2 \leq 0.15$; (2) for medium effect size, $0.15 < f^2 \leq 0.35$; and (3) for large effect size, $f^2 > 0.35$.

Results generally support H3a. In China, trust (medium effect $f^2 = 0.31$) has a larger effect on loyalty than satisfaction (small effect $f^2 = 0.06$); in Germany, the effect size is the same for trust (medium effect $f^2 = 0.26$) and satisfaction (medium effect $f^2 = 0.28$);

Table 6. Results of Hypothesis Testing (Canada/Germany/China Separately)

Hypothesis	Causal path		Path coefficient	*t*-value	Supported
H1b	Trust → loyalty for China but not Canada or Germany	Canada	0.302	4.269***	No
		Germany	0.377	4.290***	
		China	0.486	6.963***	
H2b	Satisfaction → loyalty for Canada, Germany, and China	Canada	0.469	7.175***	Yes
		Germany	0.343	3.887***	
		China	0.213	3.478***	
H4c	ID → trust for Canada but not Germany and China	Canada	0.246	2.574**	Yes
		Germany	0.089	0.785^{ns}	
		China	0.036	0.482^{ns}	
H4d	ID → satisfaction for Canada but not Germany and China	Canada	0.193	2.131*	Partial (Canada)
		Germany	0.176	2.190*	
		China	0.210	2.456*	
H5c	VD → trust for China but not Canada and Germany	Canada	0.131	1.174^{ns}	Yes
		Germany	0.180	1.720^{ns}	
		China	0.355	4.664***	
H5d	VD → satisfaction for China but not Canada and Germany	Canada	0.289	4.716***	Partial (China)
		Germany	0.299	5.520***	
		China	0.245	2.856**	
H6c	ND → trust for Canada but not Germany or China	Canada	0.326	3.565***	Partial (Canada and Germany)
		Germany	0.235	1.658^{ns}	
		China	0.292	3.556***	
H6d	ND → satisfaction for Canada but not Germany or China	Canada	0.293	3.213**	Partial (Canada)
		Germany	0.312	3.913***	
		China	0.178	2.018*	

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$; ns = not significant.

Table 7. Mediating Effects of Trust and Satisfaction on Loyalty

Causal path	Simple model beta weights	Mediated model beta weights
Canada		
ID → loyalty	β = 0.272**	β = 0.153*
VD → loyalty	β = 0.226***	β = 0.009^{ns}
ND → loyalty	β = 0.212*	β = 0.033^{ns}
Germany		
ID → loyalty	β = 0.157^{ns}	β = 0.087^{ns}
VD → loyalty	β = 0.201**	β = 0.162^{ns}
ND → loyalty	β = 0.220*	β = 0.090^{ns}
China		
ID → loyalty	β = 0.074^{ns}	β = 0.053^{ns}
VD → loyalty	β = 0.324***	β = 0.201**
ND → loyalty	β = 0.403***	β = 0.306***

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$; ns = not significant.

and in Canada, satisfaction (medium effect $f^2 = 0.27$) has a greater effect size than trust (small effect $f^2 = 0.11$).

Analysis of Mediating Effects

In H3b, it is proposed that the relationship of Web site design to loyalty is mediated by trust and satisfaction for each of the three countries in the study. Overall, this hypothesis is generally supported for Canada and Germany but not for China. Mediation is tested following the approach outlined by Baron and Kenny [5]. First, a simple model is tested with direct paths between ND, VD, ID and e-loyalty (eliminating trust and satisfaction). This is then compared to the model when trust and satisfaction are added. For Canada, for the simple model (without trust and satisfaction), ID, VD, and ND to loyalty are all significant. When mediating variables are added, ID to loyalty remains significant while VD and ND become insignificant. Moreover, the variance explained in the loyalty variable is higher ($R^2 = 0.506$) compared to the simple model ($R^2 = 0.381$). This suggests that for the Canadian sample, trust and satisfaction are partial mediators between design constructs and loyalty (see Table 7).

For Germany, for the simple model ID to loyalty is insignificant and VD and ND are significant. In the mediated model, ID remains insignificant and VD and ND to loyalty become insignificant. Variance explained in the loyalty variable was higher ($R^2 = 0.415$) compared to the simple model ($R^2 = 0.287$). For Germans, trust and satisfaction are partial mediators between the design constructs and loyalty. For the simple model, for the Chinese sample, ID to loyalty is insignificant and VD and ND are significant. When mediating variables are added, the relationships remain the same. Variance explained in the loyalty variable is not much higher ($R^2 = 0.498$) compared

to the simple model ($R^2 = 0.432$). Therefore, trust and satisfaction are not mediators between the design constructs and loyalty for China.

Theoretical and Practical Contributions

THIS RESEARCH IS A PRELIMINARY STEP INTO UNCHARTED conceptual territory, and achieves all proposed goals as set out in the introduction of this paper, including (1) validation of a model for Web site trust and Web site satisfaction to e-loyalty across cultures; (2) a comparison of trust versus satisfaction to e-loyalty across cultures with the discovery that trust is a more important predictor of loyalty in countries where uncertainty avoidance is higher; (3) confirmation of constructs for ID, VD, and ND as key antecedents to Web site trust and Web site satisfaction across cultures; and (4) ID, VD, and ND are statistically validated as Web site design constructs for use in future research.

With the evolution of the Internet as a platform for e-commerce, recent attention by researchers has been focused on e-loyalty [2, 20, 34]. Using the full sample of participants from mixed cultures, the relationship of trust to e-loyalty is confirmed and supports earlier work concerning online purchase intentions [20, 24], and willingness by consumers to buy from an online vendor [20, 36, 42]. This finding serves as a control to the cultural comparisons in this work, but also verifies these relationships as determined in single cultures.

Focusing on cultural differences in trust to e-loyalty, earlier research has shown mixed results or no cultural effects [37]. Jarvenpaa et al. [31] predicted that trust would be greater in collectivist than individualist cultures but this was unconfirmed, while Gefen and Heart [25] found that ability (as a form of trust) would affect behavioral intention to purchase from a Web site more in collectivist than in individualist cultures. In this investigation, a similar line of thinking is proposed that trust would result in e-loyalty for collectivist Chinese but not for Canadians or Germans. In fact, trust is significantly related to e-loyalty ($p < 0.001$) for all three countries separately. This signals the importance of trust leading to behavioral intentions including e-loyalty, regardless of culture. As with trust, satisfaction is found to have a significant relationship to e-loyalty in the mixed sample and in each country separately in support of earlier work [20, 34, 36].

In this study, the relative strength of trust and satisfaction to e-loyalty across cultures is also examined. In alignment with Hofstede's cultural categories with a focus on uncertainty avoidance, it was expected that trust would be more important for more risk-averse Chinese or Germans than for Canadians. Results confirm that trust leading to e-loyalty is more important than satisfaction in China, equally important in Germany, and less important in Canada. An interesting point is that differential effects occur in different countries, and this is the first study to examine these distinctions. The results differ from those of Flavián et al. [20], who found Web site trust and satisfaction to equally affect e-loyalty, and Luarn and Lin [36], who found satisfaction to have a stronger impact than trust on e-loyalty—although both investigations were in a single culture. On a practical level, this signals the importance to Web designers that in

countries where uncertainty avoidance is high, improving trust is especially important, perhaps through Web site localization as well as enhancing Web site security.

Different researchers have considered Web site design elements as antecedents to trust and satisfaction, and in almost every study, the elements of design differ. The current research takes into account this earlier work, but also incorporates a framework for design adopted from the design community. Categories proposed by Garrett [23] and used in other work by the present author are confirmed for their validity, as well as for the relationship each design construct has with trust and satisfaction across countries. It appears that ID, VD, and ND are useful constructs for present as well as future research, and differ from more general constructs for usability as used by some researchers.

More specifically, and as predicted, ID is important to Web site trust and satisfaction for the mixed country sample and supports earlier work [17, 20, 51, 54]. Across cultures, it was expected and confirmed that ID would result in trust and satisfaction for more risk-taking Canadians, but not for Germans and Chinese, who are higher in uncertainty avoidance. This finding suggests information may be a sufficient characteristic of Web site design to instill confidence in the user—but only in certain countries.

Little work has previously considered VD as a prerequisite to trust and satisfaction in either a single culture, or a cross-cultural context. Once again, previous results have been mixed with some researchers finding that "aesthetic beauty" of the Web site contributes to trust [32] whereas others did not [54]. In this investigation, in the mixed sample, a strong relationship is determined between VD and both trust and satisfaction. Across cultures, it is further confirmed that VD results in trust for users from collectivist cultures such as China but not for Germans or Canadians. These are interesting findings that support the importance of well-designed and aesthetically pleasing Web sites. Further, in collectivist countries the VD of the site is of special importance. For example, if as some researchers indicate, color has different meanings for different cultures [4, 50], then this is just one element to take into account when evolving a well-designed Web site. Other elements to consider are photographs, shapes, and type of icons to name a few. Alternately, VD resulted in satisfaction for all cultures in this study.

As with the other design elements, ND results in trust and satisfaction in the mixed culture sample, and supports work by Yoon [55] that ND is positively related to satisfaction. Concerning uncertainty avoidance, it was predicted that ND results in trust and satisfaction for Canadians but not for Germans or Chinese. In fact, ND was positively related to trust and satisfaction in all cases, with the exception of ND to trust for Germans. Therefore, some support is offered that navigation varies across cultures as outlined by Marcus and Gould [38].

In sum, it appears that Web site design features for ID, VD, and ND offer an initial set of constructs for future investigations related to trust and satisfaction. Of importance, all causal relationships between design (ID, VD, ND) and satisfaction are significant. As such, these design elements have the ability to elicit satisfaction in the user, including across cultures. Alternately, for the relationship of trust to e-loyalty,

only four of nine paths are significant. This finding suggests perceptions of Web site design leading to trust vary by culture, and may be anchored in characteristics of the Web site other than ID, ND, and VD. Additional elements that instill trust in the user, such as the presence of security symbols, may better serve to indicate to online shoppers that the Web site is trustworthy—more so than the design of the Web site. This would be a prominent consideration in Germany, for example, where none of the design characteristics resulted in trust.

The mediating effects of trust and satisfaction between design elements and e-loyalty are also examined. Findings indicate that trust and satisfaction are partial mediators for Canada and Germany but not for China. Therefore, overall, the model fit is superior with satisfaction and trust included. However, there is evidence that design has strength as a direct predictor of e-loyalty, and especially in China for ND and VD. This result is counter to Flavián et al. [20], who tested a general construct of usability directly to e-loyalty with insignificant results. It appears that separate design categories (for ID, VD, and ND) as used here may each have specific causal effects on e-loyalty, especially because ID was not significant for the simple or the mediated model in four of six possible instances.

The relevance of this work for online consumer behavior is evident. Given that there were over 1 billion Internet users in 2007, online vendors are well advised to search for Web site design criteria appropriate for different countries. There is huge scope for continued systematic research in the area of Web site design related to e-loyalty. Further, an enhanced appreciation of localization requirements of culturally diverse users will be especially important for companies that aim to compete successfully in the increasingly competitive e-global economy. As conceptual knowledge about Web site design expands, this will likely lead to the development of better "design tools" such as Web site templates for diverse cultures.

While effective Web site design should be central for e-commerce vendors, findings from research in this domain can be applied in other areas such as online education. The application of Web site design to facilitate learning preferences across cultures remains mostly unexplored, although it is proposed that knowledge regarding design is transferable to online course development and delivery for universities, colleges, or corporations. Further, it is expected that Web site design in education can also relate to trust, satisfaction, or other learning outcomes with implications for online program success. This may include factors such as ease of learning, efficiency of use, and problem-solving capability. Further, in educational institutions where Web site design criteria are considered related to learning outcomes, sustained markets with repeat consumers are more likely to be developed.

Limitations and Directions for Future Research

A MAJOR STRENGTH OF THIS RESEARCH IS THE sample population. Data were collected in three diverse countries with a relatively large number of participants. Because China is quickly becoming a site for economic trade, it is useful to examine user reactions in this emerging economy. As noted in the introduction, Chinese-speaking Internet

users are already second only to English speakers. Further, participants are from a variety of sources, including universities, institutes, and companies, which lends generalizability to the findings.

There are several limitations to the research. All Web sites used in the investigation are for SonyStyle. Even though using a single vendor provides greater consistency across the different country Web sites, response biasing could occur if respondents are previously aware of the company name and reputation. Further, the research task was a search for a desirable cell phone for hypothetical purchase and no actual purchase was required. Although we might expect that loyalty is best assessed through actions such as repeat visits or actual purchases, the operationalization of the construct is consistent with information systems research where perceptions often serve as surrogates for actions. However, a caution is raised that the absence of actual purchases may limit the transferability of the findings to real e-commerce situations. A single task is used on a product-based Web site. Future research will ideally expand to include a larger sample of Web sites, Web sites with no specific branding, and a greater variety of tasks on both service and product Web sites. Comparisons and contrasts across additional countries in differing stages of e-commerce will be essential as Internet consumers increase globally.

As noted in the literature review, a single dimension of trust was used in the current research and there is justification for this choice [27, 33]. However, in other research, trust has been examined as a multidimensional construct. In future research, it is expected alternate conceptualizations of trust might be used across cultural boundaries. This may build on earlier studies in which trust was considered in the context of vendor reputation [31] or social presence [26]. Although Jarvenpaa et al. [31] examined vendor reputation across cultures, the results were largely inconclusive. Further, there is no research on social presence in Web site design and culture. These topics are worthy of exploration related to in a complex, multinational environment.

Building on this exploratory study, further research can be undertaken in a controlled laboratory setting in order to determine which Web site characteristics contribute to trust, satisfaction, and e-loyalty across cultures. Web site characteristics such as color, use of images, or level of detail can be experimentally manipulated and tested to study how these design characteristics are perceived in different cultures. Further, it would be interesting to determine if differences in Web site design, trust, satisfaction, and e-loyalty exist between genders in different cultures. Using a single country sample, Cyr and Bonanni [14] found men and women differed regarding their attitudes toward ID and ND with men more satisfied with the Web site. Concerning VD of the Web site, significant differences occurred between genders related to degree of interaction with the Web site and whether animations were considered meaningful. Work on gender could be applied across different cultures.

To conclude, the current research demonstrated the importance of design elements as they impact Web site trust, Web site satisfaction, and e-loyalty across cultures in a B2C environment. The model as presented and tested demonstrates cultural diversity and is a reasonable starting point for future investigations. While both trust and satisfaction are important precursors to success for online vendors, it appears these constructs vary across

cultures. Future investigations that relate Web site design and culture offer numerous opportunities for how to enhance the experience of international online shoppers.

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Notes

1. Internet World Stats. Internet usage statistics, 2007 (available at www.internetworldstats.com/stats.htm).

2. A thorough review of trust in offline and online settings is not feasible within the scope of the present paper. However, the reader may wish to refer to Rousseau et al. [46] for a critique of offline trust and Gefen et al. [27] for a summary of online trust. In research in which online trust is the primary focus, it is recognized a multidimensional construct for trust is most appropriate. Trust may result from a consumer's belief that an online vendor demonstrates ability, benevolence, or integrity [40]. Alternately, in studies such as this one, when trust is one element included to better understand a more comprehensive user reaction to a Web site, then trust as a single construct has been used [27, 33].

3. The work by Hofstede outlines five cultural dimensions [30]. (1) Power distance—the extent to which a society accepts unequal distributions of power in organizations and institutions. (2) Uncertainty avoidance—how societies accommodate high levels of uncertainty and ambiguity in the environment. (3) Masculinity–femininity—in feminine societies, there is an emphasis on quality of life and relationships; cultures that focus on material success and assertiveness are considered more masculine in orientation. (4) Individualism–collectivism—in an individualist society, individuals are expected to consider personal interests over interests of the group and individual decision making is valued; in a collectivist culture the good of the group is more likely to be considered. (5) Time orientation—whether the focus in on short-term versus long-term considerations. For a further elaboration of Hofstede's cultural dimensions, refer to Hofstede [30] or Simon [47].

4. Localization is the process of adapting a product or service to a particular language, culture, and desired local "look and feel." In localizing a product, in addition to language translation, details such as currency, color sensitivities, product or service names, images, gender roles, and geographic examples are considered.

5. To determine if significant differences existed across cultures based on demographics, analysis of variance tests were run for gender, age, education, and Internet and online shopping experience. Overall, no differences occurred between cultures that would influence the constructs tested in this research.

6. The survey instrument may be obtained from the author (cyr@sfu.ca).

7. Chin [9] and Gefen et al. [28] advise the minimum sample size for a PLS analysis should be the larger of (1) 10 times the number of items for the most complex construct, or (2) 10 times the largest number of independent variables affecting a dependent variable. In the research model, the most complex construct (for ND, trust, and loyalty) each has three items, and the largest number of independent variables estimated for a dependent variable is 3. The total sample size for this study was 571, with $n = 230$ participants in Canada, $n = 223$ in China, and $n = 118$ in Germany. These sample sizes are more than adequate for PLS estimation procedures used in this paper for the overall model and for the separate country models.

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