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How the Website Usability Elements Impact Performance

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ABSTRACT

This research builds on the results of a large scale study in which participants performed an informational task on one of 59 websites spanning various industries to examine how the website usability elements (graphical attractiveness, information, interactivity, trust, and ease of use) drive users' attitudes and intentions toward the website and how these effects vary according to site experience and end product tangibility. Results show that while the effects of site interactivity and graphical attractiveness were more influential for services sites, the effects of site information and trust were stronger for tangibles sites. Alternatively, compared to returning site visitors, first-time visitors perceived the website as less easy to use, needed more time to accomplish the online task, and based positive attitudes and intentions more strongly on the site information and interactivity. The results of a second study performed in a proximate culture largely corroborate these findings.

Keywords

Website usability, website experience, product tangibility, usability elements, electronic commerce, cultural research

INTRODUCTION

Websites with the fastest learning curves receive more visits and realize better business results by achieving higher levels of customer lock-in (Johnson, Bellman, and Lohse, 2003). Focusing on the process of customer lock-in, Zauberaman (2003) highlights that learning and using the website increases switching costs and suggests that customers are not aware of the mechanism that lock them in. Alternatively, research in general affirms the focal role of ease-of-use on the decision to learn and use technology applications (Davis, 1989; Nielsen, 2000). Controlling for extrinsic factors such as perceived usefulness and company-related factors, a website that is easier to learn and to use (Nielsen, 2000) and delivers a "compelling" experience (Novak, Hoffman, and Yung, 2000) motivates visitors to use and return to the website. Nonetheless, need still exists for research that carefully evaluates the parameters that render the IT artifact useful, easy to use, and hence successful (Benbasat and Barki, 2005) and examines the relationships between usability elements and users' attitudes and behaviors toward the IT artifact (Benbasat and Barki, 2007). Indeed, little research investigates the role played by the website usability elements on performance while considering the role of user site experience and the end product the site offers (Venkatesh and Agarwal, 2006). That is, how do different usability elements affects consumers' attitudes and behavioral intentions toward the website? And do these effects change according to customer site experience or the end product the site offers? This research addresses these questions by developing and testing a set of hypotheses in two proximate cultures (English vs. French-speaking Canadians).

LITERATURE AND HYPOTHESES

Researchers developed measures for website usability and found that sites with better usability and quality perceptions deliver the highest performance (Lee and Kozar, 2006). Poddar, Donthu, and Wei (2006) cite a lack of research in the field and find purchase intentions to emanate from site quality. The role of the site usability captured by its different elements (site graphical design, information, interactivity, trust, and ease-of-use) in driving users' attitude and intentions is examined in this work. According to the Theory of Reasoned Actions TRA (Fishbein and Ajzen, 1975), usability elements as perceived by customers should have a formative role on consumer beliefs and attitude toward the website; attitude, in turn, is a major driver of behavioral intentions. This research additionally postulates that the latter effects will be influenced (moderated) by both the user level of site experience as well as the site's end product tangibility (services vs. tangibles). The following discusses these usability elements and their expected impact on attitude and intentions.

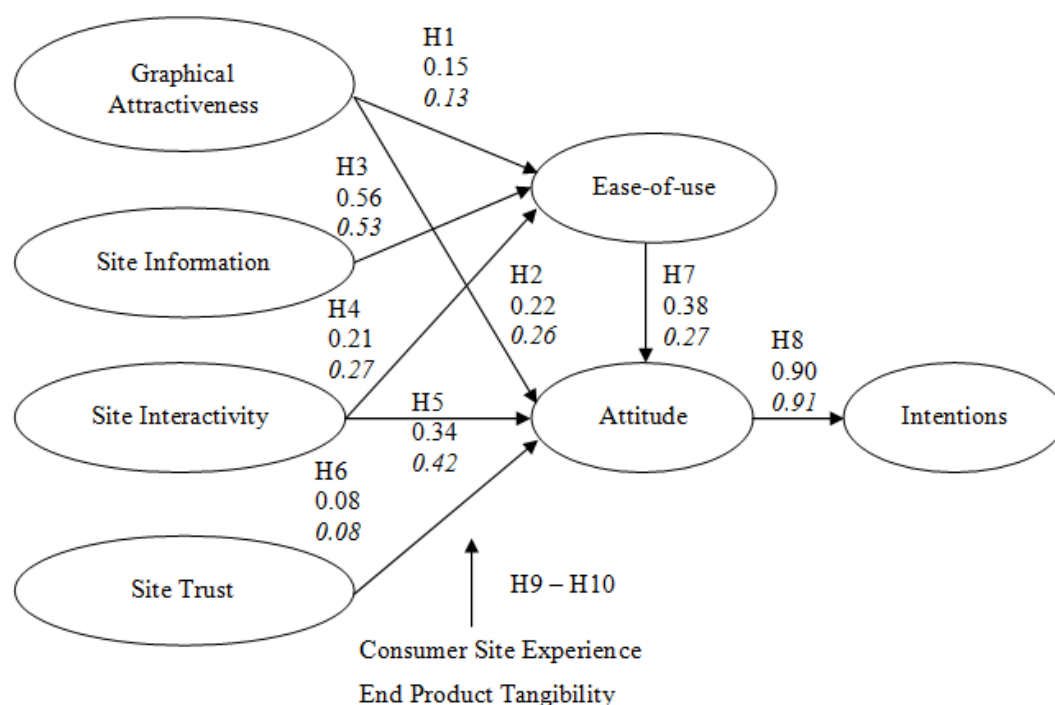
Site Graphical Attractiveness. To enjoy an experience, consumers seek sensations on multiple sensory channels (Holbrook and Hirschman, 1982). Graphical attractiveness is affected by the site templates, animated images, colors and associated themes. Enhanced by multimedia content and colors, site design and creativity form one site quality dimension (Yoo and Donthu, 2001). Graphical design affects ease-of-use in different ways; for example, design professionals consider images to be stepping stones that help the eye jump between textual elements (Garcia, 1993). Images encourage reading and enhance the comprehension of accompanied textual materials (Wolf and Grotta, 1985). Colors also play a role in site usability. While

the artistry of a wallpaper design is acknowledged, a solid background color is generally recommended to enhance usability (Garcia, 1993). Certain colors were found to improve perceived download quickness as well as satisfaction by inducing relaxed feelings (Gorn et al. 2004). Visually attractive systems score higher on ease-of-use (van der Heijden, 2004). (see Figure 1 for a schematic representation of research hypotheses).

Hypothesis 1. Site graphical attractiveness associates positively with ease-of-use.

Bart et al. (2005) find site presentation and navigation experience to strongly predict intentions (to purchase and recommend the site to others). The website graphical attractiveness and appeal shape consumers' behavior by reducing purchase risk and conveying a trustworthy dealer (Schlosser, White, and Lloyd, 2006). A significant relation between design elements and an important site success measure (site traffic) is found (Bucy et al. 1999). Poor style, flaws, and incompleteness inversely relate to behavioral intentions (Everard and Galletta, 2005; Schlosser et al. 2006). According to TRA, usability elements influence intentions by impacting attitude.

Hypothesis 2. Site graphical attractiveness associates positively with attitude toward the site.



* Standardized path coefficients of the first and second study are shown (in italics for the second study)

** All paths are significant (smallest t-values of 8.94 and 9.02 for the models of first and second study, respectively).

Figure 1. Research Hypothetical Model and SEM Results

Site Information. Underlying the back-end integration of data onto the website, site information is a vital success determinant (Liu and Arnett, 2000). Research regards the construct as the quality of content offered by the website and defines it as the extent to which the information is detailed, precise, and pertinent (Nelson, Todd, and Wixom, 2005). Novak et al. (2000) indicate that information quality, site security, and easy-to-perform actions contribute to delivering a compelling experience. Site functionality, adequate product description, and security are found to enhance intentions (Francis and White, 2002). The literature hence implies a strong role for pertinent, detailed, and tailored information (Yoo and Donthu, 2001) on ease-of-use rather than attitude formation (Chang et al. 2005; Lee and Lee, 2004).

Hypothesis 3. Site information associates positively with ease-of-use.

Site Interactivity. Underpinned by the strong relationship between interactivity and personalization perceptions, interactivity is defined as “the extent to which users can participate in modifying the form and content of a mediated environment in real time” (Steuer 1992, p.84). Interactivity is also seen as the degree to which a dialogue can be generated between the consumer, the website, and the company (Sullivan, 1999). Loiacono, Watson, and Goodhue (2002) find that interactivity predicts intentions. Personalization results in richer media that help create a better virtual experience and stronger attitude; in addition, interactivity and vividness are strong predictors of telepresence, a precursor of flow, productivity, and satisfaction (Coyle and Thorson, 2001; Mathwick and Rigdon, 2004). Interactivity and personalization also impact ease-of-use by enhancing learning capabilities (Liu and Arnett, 2000; Suh and Lee, 2005).

Hypothesis 4. Site interactivity associates positively with ease-of-use.

Interactivity elements on the website homepage are significantly related to the traffic generated by the website (Bucy et al. 1999). Hyperlinks, multimedia, discussion forums, community groups, polls, e-mail contacts, processing speed, and timely, personalized communication are elements of the website that enhances its perceived interactivity (Song and Zinkhan, 2008; Yoo and Donthu, 2001). Captured by navigation and role playing, site interactivity, along with customer service interactivity are shown to predict attitude and intentions (Schlosser and Kanfer, 2001). Personalization level is associated with interactivity and is shown to have a linear relationship with intentions (Song and Zinkhan, 2008). Personalization is also found to predict consumers’ online loyalty (Srinivasan, Anderson, and Ponnnavolu, 2002).

Hypothesis 5. Site interactivity associates positively with attitude toward the site.

Site Trust. Site trust is the consumers’ perceptions of the level of privacy and security a website offers. Some consensus exists about considering site trust an important site feature and quality determinant (Chang et al. 2005). Wolfinbarger and Gilly (2003) find security and privacy items to form a distinct factor representing the perceived security and confidentiality of personal data on the website. Similarly, Yoo and Donthu (2001) conclude that site trust forms a unique site quality dimension and named the construct security/confidentiality of personal and financial information. Kim et al. (2003) found trust to be a distinct site quality dimension with positive correlation with attitude toward the site. Site trust is a concept that is distinct from, although can correlate to, trust in each the retailer, service employees, and general online transactions. Consumers are particularly sensitive to privacy and security because of various fears ranging from spam to online identity theft; the process of building and enhancing site trust is thus distinct from that of building dealer or employee trust (Wolfinbarger and Gilly, 2003). Consumers trust a website because of certain cues the site exhibits, such as privacy assurance, third-party seals of approval, customer referrals and testimonials (Urban, Sultan, and Qualls, 2000), as well as perceived security of transactions and certain site properties (Yoon, 2002). The literature however does not imply a relationship between trust and EOU.

Hypothesis 6. Site trust associates positively with attitude toward the site.

Site Ease of Use. Ease-of-use represents the cognitive effort needed to learn and use an application and, as discussed, is cited to have an important impact on the consumers’ decision to learn, use, and revisit the website. Consumers infer ease-of-use shortly after a brief, direct interaction with the application (Venkatesh and Davis, 1996). Ease-of-use is studied from different angles (site usability in Agarwal and Venkatesh 2002, retailer site quality dimensions in Yoo and Donthu 2001, website success factors in Liu and Arnett, 2000) and is considered a salient belief in driving the application acceptance and use (Davis 1989). Research suggests that ease-of-use is crucial in driving online intentions (Moon and Kim, 2001). Venkatesh and Agarwal (2006) show ease-of-use as a major driver of the decision to use the website across four sectors (books, auto manufacturers, car rental, and airlines). Ease-of-use is an important belief the consumer formulates based on other usability elements and the navigation experience they deliver (Davis, 1989; Fishbein and Ajzen, 1975).

Hypothesis 7a. Ease-of-use associates positively with the attitude toward the site and (b) mediates the relations between graphical attractiveness, information, and interactivity with attitude.

Attitude and Behavioral Intentions. Attitude toward the site indicates the consumers’ predisposition to respond favorably or unfavorably to a website during a particular exposure (Chen and Wells, 1999). Attitude, as a construct, has received extensive coverage and validation by researchers. The characteristics of the websites and products encountered in browsing significantly influence the level of arousal and pleasure the consumer experience (Menon and Kahn, 2002). According to TRA, attitude mediates the relation between consumer beliefs about the application and intentions. Alternatively, intentions predict actual behavior (Fishbein and Ajzen, 1975). Research generally supports a strong relationship between perceptual measures of intentions and actual behavior (e.g., correlation of 0.86 between purchase intention and actual site visits in Poddar et al. 2006).

Hypothesis 8a. Attitude toward the site associates positively with behavioral intentions and (b) mediates the relation between ease-of-use and intentions.

Site Experience. Although the literature considers the level of user skills an important factor that influence online behavior (Novak et al. 2000), studies investigating the role of experience in website use and online shopping are rare and inconclusive (Chang et al. 2005). Johnson et al. (2003) postulate and found that behavior change according to consumer site visit history. These authors found that consumers spend more time on e-commerce sites during initial visits and less time in later visits. This implies that the cognitive effort associated with learning and using the site diminishes as visitors become more proficient in using the website. In a goal-oriented environment (specific task accomplishment), the time the consumer spends navigating the website can be considered an objective proxy of the cognitive effort encountered in a session. Therefore, consumers with higher levels of site experience will need less time to perform their online tasks. In addition, these consumers should perceive and report higher levels of site ease-of-use than consumers with low levels of site experience (first-time visitors).

Hypothesis 9a. Perceived ease-of-use is lower for consumers with low versus high level of site experience.

Hypothesis 9b. Task accomplishment time is higher for consumers with low versus high level of site experience.

Investigating how the level of site experience affects the relations between usability elements and performance (Figure 1) sheds light on changing consumers' needs from the website. In developing a website service quality measure, Parasuraman, Zeithaml, and Malhotra (2005) find quality determinants to vary for customers with routine versus non-routine encounters with the website. It is plausible to expect that the impact of usability elements will vary according to site experience. Visitors with low level of site experience need more elaborate and detailed, or quality information in order to learn the site and construct their attitude and usage intentions. Alternatively, visitors with high level of site experience are expected to be affected more by site trust because trust increases with site interaction frequency (Gefen, 2000; Yoon, 2002).

Hypothesis 9c. Site experience moderates the relation between information and ease-of-use so that site information will be more influential for consumers with low level of site experience.

Hypothesis 9d. Site experience moderates the relation between trust and attitude so that site trust will be more influential for consumers with high level of site experience.

Services versus Tangibles. Tangibility is a key product characteristic that shapes consumers' information search and purchasing behavior. Theory proposes differentiating websites based on the end product tangibility level (Laroche et al. 2005; Peterson et al. 1997). Indeed, researchers stress the need to distinguish the design, management, and delivery of services from those of tangibles, and underscore the particularity and complexity of managing services along with the prominence of service customizability (Fitzsimmons and Fitzsimmons, 2004; Rust and Chung, 2006). Services criteria (intangibility and complexity) are thus postulated to extend to its communication or ordering medium—the website. Therefore, attaining tasks on services sites will require more cognitive effort, and customers will thus perceive lower levels of the website ease-of-use and spend more time on these sites compared to tangibles sites.

Hypothesis 10a. Perceived ease-of-use is lower for services than for tangibles sites; likewise, (b) task accomplishment time is higher for services than for tangibles sites.

Interactivity and personalization are particularly vital in a service setting (Song and Zenkhan, 2008). As interactivity and personalization at services shopping increase efficiency, enhance perceptions of responsiveness, and augment delivered value and satisfaction (Ball, Coelho, and Vilares, 2006; Fitzsimmons and Fitzsimmons, 2004), these elements are expected to be more salient for services sites. Alternatively, when customers search and shop for tangibles, information quality is essential as it helps form attitude by reducing perceived risk and acting as a substitute for the inability to directly observe and physically touch the product (Peck and Childers, 2003; Weathers, Sharma, and Wood, 2007).

Hypothesis 10c. End product tangibility moderates the relations of interactivity with ease-of-use and attitude so that site interactivity effects will be more influential for services than for tangibles sites.

Hypothesis 10d. End product tangibility moderates the relation of information with ease-of-use so that site information will be more influential for tangibles than for services sites.

Role of Culture. Although culture is an important contingent factor, few studies have attempted to corroborate hypotheses or investigate online cultural differences (Schepers and Wetzels, 2007). Because the premise in any research is that the supported hypotheses predict the behavior of another sample within the same as well as proximate population, the above hypotheses are expected to hold true on French-speaking customers. In addition, culture is expected to moderate the relations between usability elements with attitude and intentions (i.e., H1 through H8).

Hypothesis 11a. Research hypotheses hold true for consumers in a proximate culture (French-speaking Canadians); additionally, (b) culture will moderate the relations between usability elements with attitude and intentions (H1 through H8).

METHOD

Data Collection, Tasks, and Measure

A nationwide study was performed in collaboration with a leading market research company in Canada. The company had a consumer panel of over 350,000 participants at the time of data collection. Data were collected in the period between September 2004 and September 2006. To reflect the studied phenomenon globally and reduce the salient effects of industry and company-related variables such as brand loyalty, site accessibility and awareness (Yoon, 2002), various industries as well as multiple websites representing different organizations were included (Table 1). Sample random selections and data collection were performed separately, for approximately two months per industry. Differences in the task to be performed in each industry necessitated the latter step. Table 1 shows the samples size, the websites examined, and the informational tasks assigned for each industry. Data sets were then compiled for analysis. For the second study (which input was used to test H11), the same steps were followed but the samples were randomly selected from a panel of French-speaking consumers (residing mainly in Canada French province, i.e., Quebec) and the task and measure were offered in French. In addition, the French version of the website was assigned and several websites active in the French regions were added (Table 1).

For each industry (task), sample selection was randomly performed following an iterative process. If a randomly selected sample showed high bias to certain consumer groups (based on gender, age, spoken language, and location), part of the selected entries were deleted and replaced by a new set of randomly selected entries. When the sample was deemed representative, the email list was used to send selected panel members an invitation to participate in the study. Response rates were close to that of previous research projects of the company (20 percent). The market research company constructs its consumer panel mainly through its website and periodically updates the panel through a set of procedures. Panel members that enter personal and contact information have a chance to win monthly monetary prizes; and their chance to win increases when participating in a study. Upon reception of the invitation email, panel members could choose to participate by clicking on the link provided. The link opened a window that contains an interactive link to the company's server. This window provided an explanation of the task to be performed and a link to the randomly assigned website.

As consumers are generally goal-oriented during their navigation at e-commerce sites (Wolfenbarger and Gilly, 2003) and as this work studies usability in goal-oriented (rather than experiential) environment, task assignment was necessary. Tasks had comparable difficulty levels, were identical within each industry, and consisted in finding a piece of information on the assigned website (see Table 1 for tasks). Another purpose of assigning a specific task was to ensure sufficient interaction with the website, hence better control and variable measurement. After completing the task (one task on one website per participant, i.e., between-subject), participants returned to the window to click the continue button, which started the questionnaire. When participants submitted their questionnaires, data were coded automatically and saved. Compiling the data sets of the twelve industries (tasks) resulted in a final sample of 7,253 responses used in the analysis (and 5,882 responses for the second study used in testing H11). The time elapsed between opening the initial window and moving to next step (task accomplishment time) was recorded (time was not available for the auto manufacturer task due to technical difficulties).

In the questionnaire (see appendix for items), the first item asked the participant to respond to the question concerning the task. The difference in task accomplishment time for participants that successfully entered the task correct response and those who did not was small and insignificant (3.40 vs. 3.25 min.; $F = 1.57$, NS). We hence conclude that participants generally spent enough time interacting with the assigned website, and, while searching for the required information, expended equal effort to learn and navigate on the website. The next set of items reflected the latent variables. Site usability elements' subscales were identical or similar to those in the literature (Bressolles, 2004; Loiacono et al. 2002; Szymanski and Hise, 2000; Wolfenbarger and Gilly, 2003; Yoo and Donthu, 2001) and were pretested (α 's > 0.90). Three items reflected the attitude toward the site (I like this Web site, I think this is a good Web site, I think it is a pleasant Web site; $\alpha = 0.96$) and three items reflected positive behavioral intentions (I will visit this Web site again in the future, this Web site is my reference to my needs of [industry specific phrase], I will recommend visiting this Web site to a friend, family member, or colleague; $\alpha = 0.92$). The last set of items pertained mainly to site experience (was it the first time you visit this website) and demographics. Matching the obtained demographics with those of the census leads to conclude that the sample is roughly representative of the adult consumer population (for English and French Canadians).

Task (Industry)	English Sample	French Sample	Website/Company
Looking for the availability of a condominium at a given size and price range in a given city (Real Estate)	410	575	Century 21, Remax, Royal LePage, Sutton
Finding the principal headline in the economy section published online at time of visit (Media**)	689	609	CBC.ca, Canada.com, Canoe Money, Radio Canada*, Canoe Argent*, CyberPresse*
Finding whether the site includes entries offering a certain product (i.e., winter tires) (Classifieds)	672	547	Classified Extra, eBay, Craigs List, Occasion Buysell, LesPac*
Finding the retail price of a given dictionary (Books)	490	620	Amazon.ca, Chapters-Indigo, Archambault, Renaud-Bray
Finding the possibility to obtain a home insurance quote using the assigned site (Insurance Services**)	668	474	President's Choice Insurance, Wawanesa, RBC Insurance, AXA Canada, ING Insurance, Belair Direct
Finding the suggested retail price of the selected car model (Auto Manufacturers)	713	352	GM Canada, Daimler-Chrysler Canada, Ford Canada, Toyota Canada, Honda Canada
Finding the civic address of the closest store (Department Stores)	748	290	The Bay, Sears, Wal-Mart, Zellers
Finding the monthly cost of the lowest priced plan offering unlimited weekends calling (Communication Service**)	617	457	Rogers, Bell Canada, Fido, Telus
Finding the brand/model of the lowest priced digital camera at a given resolution (Electronics)	526	484	Future Shop, Best Buy, The Brick, Dumoulin, The Source (Circuit City)
Finding the interest rate for a one-year fixed rate mortgage (Banking**)	553	461	Toronto Dominion, Desjardins, ING Direct, Scotia Bank, RBC, CIBC, Bank of Montreal, National Bank
Finding the lowest price of a certain tool (Home Renovation)	586	448	Canadian Tire, Home Hardware, Home Depot, Rona
Finding the airfare cost for two adults to a specific destination at a given departure and return dates (Travel**)	581	505	Expedia.com, Travelocity.ca, Destina.ca, Exitravel.com

* denotes the websites that was added in the French study; ** denotes industries with intangible end product (i.e., services).

Table 1. Sample Size, Websites, and Tasks in the English and French Studies

Model Validation

We used confirmatory factor analysis (LISREL 8.51), which has a distinctive advantage over other methods in that it accounts for all covariance in data, and thus allows the simultaneous examination of correlations, shared variance, path coefficients, and their significance (Bollen, 1989). In validating the model, we randomly divided the data into two equal portions, used one portion (50% of sample) to test the model (calibration sample), and cross-validated the model on the other portion (validation sample). A maximum likelihood rotation was performed and LISREL calculations were based on the covariance matrix. Discriminant and convergent validity of latent variables are further confirmed when individual items load high (> 0.5) on intended factor and low (< 0.4) on other factors. All items, except one (Q14 with a loading of .38 on intended factor, see Appendix), clearly met this criterion. As fit indices were satisfactory, this item was retained to insure face validity. The model obtained from the calibration sample showed good fit to data (CFI = 0.97, GFI = 0.93, AGFI = 0.90, RMSEA = 0.064 with 90% confidence interval of [0.062-0.065]). The root mean square error of estimation RMSEA is below the cutoff value for models with acceptable fit (0.08). The chi-square index was significant and large; Bentler (1991) indicates that this index inflates for larger samples. Average variance extracted (AVE) of each latent variable was well above the threshold

value of 0.50 (Fornell and Larcker, 1981) with the smallest AVE at 0.66 for interactivity and the highest at 0.89 for attitude. The latent variables showed discriminant validity because the AVE of each variable was greater than the shared variance with other variables (with the exception of AVE of intention which equaled its shared variance with attitude) (Fornell and Larcker, 1981) and because clearly none of the confidence intervals of variable covariance (e.g., $\Phi \pm$ two standard errors) included the value of 1 (Bagozzi and Yi, 1988).

For cross-validation (simultaneous invariance check for the calibration with the validation sample), parameters should be estimated simultaneously because in multi-group SEM models the fitting function represents a weighted combination of model fit across groups (Bollen, 1989). The accompanied model fit the data well (CFI = 0.97, GFI = 0.93, RMSEA = 0.062 [0.061-0.063]). We checked for the invariance of the structural model and found it to be invariant, as the change in chi-square between the constrained model (structural paths between latent variables set to be equal) versus the unconstrained model was insignificant ($\Delta\chi^2 = 13.1$, $\Delta df = 8$). This result insures the model predictive validity. The measurement model showed acceptable invariance as well ($\Delta\chi^2 = 31.4$, $\Delta df = 16$). Standardized coefficients of the invariant structural paths are shown in Figure 1. As a larger sample size contributes to type-I error (increases power), the model was applied on smaller randomly selected samples (n 's = 350) and the associated structural patterns were found to replicate the pattern one. Supporting the argument for the moderating role of ease-of-use (H7b), a model that regarded ease-of-use as an exogenous variable (i.e., a variable that load directly on attitude and do not moderate usability elements' effects) showed clear misspecification highlighted by insignificant relations between site information with the rest of variables.

As predicted, site information, graphical attractiveness, and interactivity associated positively with ease-of-use. Attitude toward the site (which associates positively to graphical attractiveness, site interactivity, and site trust) fully mediates the relationship between ease-of-use and behavioral intentions. Alternatively, attitude was influential in forming intentions (Fishbein and Ajzen, 1975), explaining 81 percent of its variance. No constrained structural paths were significant, indicating that all significant relations between the variables were already freed. All model parameters were significant, lending support to Hypotheses 1 through 8. As expected, the direct path from information to attitude was insignificant, while ease-of-use fully mediated the relationship between information and attitude. This reflects the importance of detailed, pertinent, and precise information of the site in determining attitude, although indirectly by improving ease-of-use.

Moderating Variables

To test for the moderation effects, LISREL univariate statistical test was applied (following Byrne, 1998, 259-341; Jöreskog and Sörbom, 2001, 277-296). This test individually examines relations invariance across groups. In a stringent test of the hypotheses dealing with relation invariance and unless differently stated, each group was first randomly divided into two portions (calibration and validation) to test relations invariance (similar to what was performed in testing the above model). The model solution was then obtained simultaneously for groups' calibration samples, and the model fit indices were examined. When the measurement model was not invariant, it was freely estimated; otherwise it was constrained equal across groups. The difference in chi-square for each of the structural paths, freely estimated versus constrained equal (i.e., $\Delta df = 1$), was then tested for significance at $p < .05$. In testing the hypotheses with latent variable means, the difference in the structured means based on the extended LISREL model was inspected for its significance (Byrne, 1998; Jöreskog and Sörbom, 2001, 299-310). However, group means' tests (mean calculated as items average) were performed and reported for comparison (same results were obtained following both methods).

Site Experience. Supporting H9a, the difference in the structured latent means of ease-of-use EOU for low versus high site experience consumers was significant as hypothesized ($t_{\alpha}=2.6$). (In line with the means difference results of EOU items; 4.59 vs. 4.98 min.; $F=84.3$, $p=.000$). Investigating the rest of structured means showed all usability elements to be significantly higher for consumers with high site experience. Structured means of attitude and intentions were also higher for these consumers. H9b was supported; as predicted, task accomplishment time for low experience (3.60 minute) was higher than that of the high experience consumers (2.51 minute) and the difference was significant ($F=76.66$, $p=.000$). Results support H9c and H9d; the invariance check of each path was associated with a significant change in chi-square. Differences in the accompanied standardized coefficients (provided in the brackets next to chi-square difference) were substantial and in the predicted direction ($\Delta\chi^2$ info-EOU = 7.2 [0.10]; $\Delta\chi^2$ trust-attitude = 7.4 [0.07]). Invariance checks were also performed for the rest of the relations and show the following results ($\Delta\chi^2$ EOU-attitude = 4.6 [0.05]; $\Delta\chi^2$ interactivity-EOU NS; $\Delta\chi^2$ interactivity-attitude = 6.7 [0.09]; $\Delta\chi^2$ design-EOU NS; $\Delta\chi^2$ design-attitude NS).

End Product Tangibility. Services websites (end product was intangible) included the insurance, banking, communication services, travel, and media industries; tangibles sites group comprised the rest of industries (57 percent of observations; Table 1). H10a is supported; structured latent mean for EOU of services was significantly lower than that of tangibles sites ($t_{\alpha}=9.7$). (This result also met items' means test; 4.44 vs. 4.90; $F=136.3$, $p=.000$). H10b was also supported; the difference in

task accomplishment time means for services versus tangibles sites was significant (3.45 vs. 3.17 min.; $F=6.83$, $p=.009$). Hypotheses 10c, d were supported with substantial standardized path coefficients' differences ($\Delta\chi^2$ interactivity-EOU = 10 [0.13]; $\Delta\chi^2$ interactivity-attitude = 13.4 [0.12]; $\Delta\chi^2$ info-EOU = 20.7 [0.11]). Invariance checks were also performed for the rest of the relations and show the following results ($\Delta\chi^2$ EOU-attitude = 6.5 [0.04]; $\Delta\chi^2$ design-EOU = 14.1 [0.04]; $\Delta\chi^2$ design-attitude NS; $\Delta\chi^2$ trust-attitude = 10.1 [0.06]).

Findings Replication and the Role of Culture. The input of the second study was used to test H11a (findings replications) and H11b (the moderating role of culture). All the hypotheses supported in the first study were also supported in the second study (results are summarized in the Appendix and standardized path coefficients appear in Figure 1). An invariance check for the French sample with the English sample was performed to examine the moderating role of culture (for the relations H1 through H8). Results show a moderating role for culture. While the paths from interactivity (to EOU and attitude) were significantly more influential for French-speaking consumers, the paths information-EOU and EOU-Attitude were stronger for English-speaking consumers. The rest of the paths were group-invariant.

DISCUSSION AND IMPLICATIONS

The application usability is a key to success: "on the Web, users experience usability first and pay later" (Nielsen, 2000, p. 11). To date, researchers have been reticent to theorize about the effect of the IT artifact usability elements on performance (Benbasat and Barki, 2007). The IT artifact's perceived usefulness and ease-of-use "have largely been treated as black boxes that very few have tried to pry open" (Benbasat and Barki, 2007, p. 212). This research investigated the link between the website usability elements and attitudes and intentions toward the site, and examined the role of consumer site experience and end product tangibility. Enriching the literature of website usability, the findings imply that consumer decision to learn and use a website is affected by both the perceptions of ease-of-use and other elements associated to this important belief. Results however show that the influence of usability elements on consumer attitude and intentions is affected by customer site experience and the end product the website offers. According to both their direct and indirect structural weights, ease-of-use, information, and interactivity appear to be prominent elements in driving customers' attitude and intentions for informational tasks. Ease-of-use is a central factor in driving attitude and intentions that can be seen as a consumer belief of the website that is determined by the extent to which the website provides detailed, pertinent and precise information, offers features that enhance interactivity and allow personalized communication, and exhibits an attractive and aesthetic design. Findings further show a consistent convergence between a subjective measure (perceived ease-of-use) and an objective measure (task accomplishment time) of the cognitive effort encountered in a session.

Findings of hypotheses 9a and 9b collectively indicate that the cognitive effort required when accomplishing the online task is highest at the first interaction with the site. Findings of Hypotheses 9c, d support the notion that consumer needs from the website change according to site experience. Site information and interactivity were more influential for customers with low site experience, whereas site trust was more influential in determining attitude and intentions for customers with high site experience. Additionally, interactivity appears to have a stronger impact on the attitudes of customers with low site experience. Customers with high site experience notably perceived higher levels of site usability elements. Because site ease-of-use develops into a well structured construct for these customers, ease-of-use becomes a more feasible path for the indirect effects of usability elements on attitude and intentions (ease of use mediates these effects more strongly), resulting in higher levels of attitude and intentions. This provides an explanation for the process whereby learning the site contributes to locking-in customers.

Findings show that services sites were generally perceived as less easy to use and participants needed more time achieving tasks on these sites. This implies that the cognitive effort to accomplish the task was higher for services sites. The complexity of services appears to extend to their websites. In addition, both site interactivity and graphical attractiveness appear to be more influential for services than for tangibles sites. In contrast, site information and site trust were more influential for tangibles than for services sites.

Developers should benefit from the findings, including the notion that ease-of-use, a focal factor in determining the decision to learn and use the application, is closely related and affected by other usability elements of the website. Usability elements are a result of the actual ones. For example, perceived interactivity mediates the relation between actual or delivered interactivity and the attitude toward the site (Wu, 2005). Similarly, research shows that website features can be controlled by increasing or reducing the quantity of some elements and that such manipulation impacts performance measures (Coyle and Thorson, 2001). As usability elements are manageable, developers of retailing and other utilitarian websites can implement results to improve usability perceptions hence customers' attitude and intentions toward the website. Findings indicate that the focus should be on enhancing the site ease-of-use, information, and interactivity because these factors were prominent in driving consumers' attitude and behavioral intentions.

Findings further indicate that a resource allocation approach in website design can benefit from considering the differences in requirements for customers with different levels of site experience and by considering the product offered at the website (services vs. tangibles). Internet technology advances render it possible to track customer site visit history and to deliver personalized pages with different content and features to each customer (Kalczynski, Senecal, and Nantel, 2006). The findings regarding the role of site experience favors a dynamic rather than static website structure. The focusing should be on site information and interactivity elements for first-time visitors, and on trust building for returning customers. Results also imply that more difficult applications should be introduced in later interactions, once the visitor has learned and better mastered the website. Alternatively, developers of services websites should pay particular attention as the findings indicate that services sites are perceived as less easy to use and require more task accomplishment time than tangibles sites. The findings indicate that developers of services sites should focus on the site interactivity, ease-of-use, as well as graphical design. Additional measures such as implementing the service design onto the website design (Fitzsimmons and Fitzsimmons, 2004) might be required to improve the usability of these sites.

Limitations and Future Research

This research considered different websites spanning various industries to reduce the influence of attitude toward the organization, its brand strength and loyalty. Tasks varied according to industry and were informational rather than transactional. It should be noted that for transactional tasks, site trust is expected to be more influential. Participants were actual consumers randomly selected from a large consumer panel, and the final samples were deemed representative. Less Internet or computer savvy customers however participate less in panels, indicating that this segment might have been underestimated. Nonetheless, customers of particular interest to e-commerce organizations are the ones that use the Internet regularly. A similar discussion applies to customers with particular privacy and security concerns. This research focused on examining usability elements including ease-of-use and did not consider other site beliefs suggested in the literature, such as usefulness and enjoyment. While usefulness was considered to be captured by usefulness (Venkatesh and Agarwal, 2006), usefulness and enjoyment (and their antecedents) can delineate the topic of future work. This research also focused on utilitarian sites in a goal-oriented environment. Future work can verify the hypotheses on hedonic sites and environments. A hedonic website mainly provides self-fulfilling rather than instrumental value, is connected to leisure activities, and anticipates prolonged rather than productive use (van der Heijden, 2004). Examples are virtual communities, social networking, and gaming sites (e.g., secondlife.com, facebook.com, yahoogames.com). For instance, the literature suggests enjoyment to be prominent in shaping consumer attitude and intentions for hedonic sites (van der Heijden, 2004). Moreover, site enjoyment appears to be a concept that can be employed to enhance the learning and use of e-commerce and other utilitarian websites and applications (Chang et al. 2005; Liu and Arnett, 2000). This topic forms a potential research avenue.

APPENDIX

Appendix: Results Replications Using the Input from the Second Study (H12a)	
H1 through H8	Model fit indices (CFI= 0.97, GFI= 0.93, AGFI= 0.91, RMSEA= 0.061). Fornell and Larcker (1981) and Bagozzi and Yi (1988) criteria are met. All paths (H1-8) are significant (smallest t at 9.02 for trust-attitude). Associated path coefficients appear at Figure 1.
Site Experience (high site experience vs. low site experience)	
H9a	(t α = 2.41); EOU means (4.67 vs. 5.02, F = 45.52, p = .000)
H9b	(3.77 vs. 3.12 min., F = 18.55, p = .000) (In line with the results of the English study; however, navigation time is generally higher in the French study).
H9c	$\Delta \chi^2$ info-EOU = 4.6 [0.05]
H9d	$\Delta \chi^2$ trust-attitude = 3.88 [0.04]
End Product Tangibility (services vs. product-oriented sites)	
H10a	(t α = 7.59), EOU mean (4.61 vs. 5.02, F = 82.81, p = .000)
H10b	(3.74 vs. 3.32 min., F = 8.76, p = .003)
H10c	$\Delta \chi^2$ interactivity-EOU = 11.66 [.08]; $\Delta \chi^2$ interactivity-attitude NS.
H10d	$\Delta \chi^2$ info-EOU = 6.72 [0.05]

Appendix: Measure Subscales, internal consistency, items' means and SD*		M	SD
	<i>Site Graphical Design</i> ($\alpha = 0.913$)		
Q1	This Web site is pretty	4.22	1.40
Q2	This Web site shows creativity	4.36	1.43
Q3	This Web site is visually appealing	4.57	1.49
	<i>Site Ease-of-Use</i> ($\alpha = 0.939$)		
Q4	This Web site is easy to use	4.73	1.78
Q5	It is easy to find information on this Web site	4.66	1.69
Q6	It is easy to browse and find what you're looking for on this Web site	4.71	1.66
	<i>Site Information</i> ($\alpha = 0.921$)		
Q7	This Web site offers detailed information on products or services	4.80	1.55
Q8	The information on this Web site is pertinent	5.06	1.43
Q9	The information on this Web site is precise	4.90	1.48
	<i>Site Trust (Perceived Security/Privacy)</i> ($\alpha = 0.950$)		
Q10	Overall, I trust this Web site's security measures	4.65	1.49
Q11	This Web site guarantees that I can surf safely	4.59	1.50
Q12	I think that my private life is protected on this Web site	4.47	1.52
Q13	I trust this Web site not to use my personal information indiscriminately	4.52	1.61
	<i>Site Interactivity</i> ($\alpha = 0.909$)		
Q14	I can interact with this Web site and receive personalized information	4.57	1.52
Q15	This Web site personalizes my needs	4.31	1.46
Q16	This Web site has interactive features that help me with navigating	4.67	1.49
Q17	This Web site saves my preferences and offers me additional services or information based on these preferences	4.49	1.46
*Items are seven Likert-type strongly disagree/strongly agree; latent variables were measured in the order shown.			

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