Uncertainty Avoidance and Consumer Perceptions of Global e-Commerce Sites: A Multi-Level Model

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Abstract

Online purchasing is a decision-making process that involves inherent uncertainty. Yet consumer tolerance for uncertainty differs across cultures, requiring e-vendors to decide whether to adapt websites to different cultures when operating globally. We examine the effect of Hofstede's cultural dimension of uncertainty avoidance (UA) on consumer perceptions of e-loyalty. Viewing information quality, trust, and system quality as uncertainty reduction mechanisms, UA is hypothesized to moderate relationships involving these constructs in a recognized model of IS success. Specifically, we posit that relationships involving these constructs will be stronger for consumers from high UA cultures. Using data drawn from over 3,500 actual consumers from 38 different countries, and controlling for the impact of other cultural dimensions, results suggest that UA moderates the effects of information quality on perceived usefulness, and of trust on e-loyalty, but not system quality relationships. We discuss practical implications of our research, in regard to designing websites intended for global use.

Introduction

Online purchasing entails a decision-making process where consumers visit websites to gather information, compare alternatives, and make a decision as to what to purchase, what features to include, at what price, and from which vendor. Each of these actions aims to reduce uncertainty about product features, alternatives, prices, quality, delivery, service, and vendor trustworthiness. Due to the computer-mediated nature of such transactions, consumers must rely on the website to reach their decision rather than on actual, physical interactions with the product and vendor. Thus, the decision-making process may entail substantial uncertainty in regard to product characteristics and their fit to one's needs (especially for non-commodity products or services), and whether a vendor is trustworthy and will deliver the product as promised. Poorly structured websites that are difficult to navigate may also create uncertainty regarding how to locate relevant information and complete a transaction.

Given the centrality of uncertainty (product, vendor, and website) in the online purchasing process, the cultural dimension of uncertainty avoidance (UA) (Hofstede, 2001) is likely to be an important factor influencing how consumers in different countries behave on e-commerce websites. UA refers to "the extent to which members of a culture feel threatened by uncertain or unknown situations" (Hofstede, 2001, p.116), and reflects a culture's tolerance for ambiguity. One would expect that in high UA cultures, factors related to uncertainty reduction (such as high quality information for assessing product features, trust in the e-vendor, and a logically organized website) would be more important determinants of e-loyalty than in low UA cultures. Thus, given that countries differ on their levels of UA, e-vendors may need to take this into account when designing websites for global use.

Despite the obvious importance of developing a better understanding of how UA and other cultural dimensions impact online consumer behavior in a global marketplace, rigorous theory-based research is still in its infancy. Most B2C research has focused on testing theory in a single (often Western) country, or on a very small set of countries. As a consequence, it becomes difficult to untangle and isolate distinct effects of each cultural dimension, or to generalize findings beyond a particular country.

We contribute to the literature by examining the impact of UA on relationships in an established model of IS success that we adapt to an e-commerce setting. By viewing online purchasing as a decision-making process fraught with uncertainty, we posit that UA moderates those model relationships that are relevant to uncertainty reduction. Specifically, we suggest that (a) information quality, reflecting the breadth, depth, and relevance of information available on the website, serves to reduce product uncertainty; (b) trust serves to reduce vendor uncertainty, and (c) system quality, reflecting the ease of navigation and logical organization of the website, as well as prior experience with the site, serve to reduce uncertainty associated with the site itself. As such, relationships involving these three constructs are expected to be more important for individuals from high UA countries. Our analysis utilizes a random sample of 577 drawn from over 3,500 actual consumers from 38 different countries who visited the website of a large multinational hotel chain on their own accord. The large number of countries in our dataset allows us to isolate effects of UA while controlling for effects of other cultural dimensions.

The paper proceeds as follows. We begin by spelling out the practitioner's stake in cross-cultural research. Next, we define UA and review the relevant e-commerce literature. Then, we present our research model, and describe our research method, analyses, and findings. We close with a discussion of our results, contributions, and implications for research and practice.

The Importance of Cross-Cultural Research

We identify three reasons why cross-cultural research is important to practitioners today. First, global companies are challenged with the need to market and sell to diverse cultures. Yet it is cost prohibitive and operationally difficult, if not impossible, to conduct proper market research, customer segmentation, interface design, and user acceptance testing for each individual culture and country. The result would be thousands of segments of people, requiring an army of marketers and technologists to manage, and an unrealistic overhead budget. Therefore, it is valuable to uncover cultural principles that can guide an "educated guess" approach to e-commerce website design, allowing companies to segment the world rather than having to segment each country and culture individually.

Second, mature industries such as hospitality have few sea changes. Much of the marketing battle is for "basis points" gains, which mean marginal improvements over prior year

performance. Given the inability to manage each country and culture individually, companies are left to naively attempt marketing efforts to many countries which do not have the potential sales volume to justify the dedicated resources that larger markets (e.g., the US, UK, China, and Japan) receive. "Test and learn" approaches can be useful, but are time-consuming and often inconclusive. Thus, a guiding principle that can provide even a small improvement over naive efforts, and that can be applied quickly and easily without cost, is valuable especially if it can be applied globally or to substantial numbers of smaller cultures and countries.

Finally, determining how to manage diverse cultures and countries presents a unique technology challenge. The information technology department ("IT") is often focused on whether a technology works, rather than on how the technology is understood by various cultures. This cultural understanding traditionally falls within the marketing and human resource functions. Thus, while IT can ensure that a website is being used by various cultures, it is often beyond the IT remit to understand how the website is being interpreted culturally, and how that interpretation reflects on the company and its products. This implies that IT can benefit from guiding cultural principles as well. For example, if a given cultural principle suggests that there are three broad types of cultures in the world, then IT can envision developing possibly three different website designs, and find appropriate website testers for each. If IT is simply told that a website needs to work globally, with no guiding principles, they are likely to focus only on operational functionality, leaving at least some global consumers dissatisfied.

Literature Review

We focus on the cultural dimension of uncertainty avoidance (UA), defined as "the extent to which the members of a culture feel threatened by uncertain or unknown situations" (Hofstede, 1991, p.113). The high UA culture "seeks clarity, structure and purity," whereas the low UA culture "is comfortable with ambiguity, chaos, novelty, and convenience" (Hofstede, 2001, p.161). UA is frequently but incorrectly conflated with risk avoidance. Uncertainty is a general feeling that is not associated with a particular object or event, nor assigned a likelihood of occurring, whereas risk is associated with a specific event and its probability. Thus, while people in high UA cultures will take known or familiar risks in order to reduce ambiguity or relieve stress, those in low UA cultures are more willing to take unknown risks (Hofstede, 1991, 2001). UA levels are reflected in a number of cultural tendencies. First, high UA cultures tend to have very clear classifications about what is dangerous, whereas low UA cultures are more tolerant of the unknown. People in high UA cultures tend to seek efficiency and structure in their activities, recognizing the monetary value of time and desiring safety in financial matters. People in low UA cultures typically demonstrate more willingness to entertain unexpected or unorthodox ideas, and are open-minded in searching for information and considering innovations (Hofstede, 2001).

Uncertainty Avoidance and Online B2C Purchasing Behavior

Most prior e-commerce studies incorporating UA (see Appendix A) fall into one of four broad categories. First, adoption studies view online shopping as involving inherent risks, and examine how UA impacts risk perceptions. Second, web design studies investigate how cultural dimensions such as UA may affect adaptation and localization. A third group of studies explores the impact of UA on perceptions of, and satisfaction with, a website. Finally, trust studies explore how UA impacts the formation of online trust, overall trust levels, and the relationship between trust and e-loyalty. We now discuss each of these four themes in more detail, focusing on how our own research builds upon each.

Adoption of Online and Mobile Shopping

Technology adoption studies have found individuals from high UA cultures to be less innovative and to perceive new technologies as less useful, resulting in lower levels of adoption, experimentation, and use (Leidner & Kayworth, 2006). Early studies on the role of culture in e-commerce adoption (e.g., Choi & Geistfeld, 2004; Jarvenpaa & Tractinsky, 1999; Lim et al., 2004) found that individuals from high UA cultures had higher perceptions of risk related to shopping online, which lead to lower levels of adoption. While e-commerce is much more pervasive today, individuals must still decide whether to buy a product or service online, or use some other channel for finding information and completing the transaction. Thus, these early studies can inform us as to how UA influences the impact of product, vendor, and site uncertainty on online consumer behaviors.

Website Design and the Importance of Localization

Studies focusing on the IT artifact have investigated whether websites from a particular country tend to share particular design characteristics. Website content analysis studies have found that culture-specific website design features do exist, but results are nevertheless inconclusive. For example, while sites from countries high in UA do tend to possess certain cultural markers intended to reduce uncertainty, many sites from lower UA countries also possess these same markers (Singh, Zhao, & Hu, 2003). Further, some studies (e.g., Callahan, 2005; Robbins & Stylianou, 2001-2002) have found expected UA-specific cultural markers to be absent from sites in high UA countries. Finally, the impact of country-level differences in website design on satisfaction (a key antecedent of e-loyalty) is unclear. Cyr et al. (2005) found that in some situations, individuals actually preferred a website designed for another country, and that localization did not influence trust, satisfaction, or loyalty. Thus, our study provides an opportunity to investigate, on a large scale, whether there are differences today in how individuals from different countries perceive a single (non-localized) e-commerce website that is intended for global use.

Website Perceptions and Satisfaction

Few cross-cultural studies have explicitly examined perceptions of website quality and their impact on site satisfaction, as proposed in IS success models (e.g., DeLone & McLean, 2003; Rai et al., 2002; Seddon, 1997). Tsikriktsis (2002) investigated website quality expectations across a broad range of geographic regions, in a hypothetical online banking system using the WEBQUAL instrument (Loiacono, Watson, & Goodhue, 2007). UA did not have any impact on quality expectations, although other cultural dimensions (masculinity and long-term orientation) did result in higher quality expectations.

Cyr (2008) used a comprehensive model to investigate website quality indicators across three countries with low to moderate UA scores. No significant differences were found in the impact of information design (i.e. perceived site navigation and information organization) on satisfaction. Navigation design was important to satisfaction for all three countries, with the effect size smallest for China (the country with the lowest UA score). This implies that site layout may be an important factor for reducing uncertainty in purchasing decisions. However, other studies (e.g., Simon, 2001) have found no differences in perceptions of site appropriateness or satisfaction when incorporating country-level culture scores.

Collectively, results in this stream of research are fragmented and inconsistent, hampering the development of a cumulative research tradition. Specifically, it is not clear how UA influences perceptions of quality, usefulness, and satisfaction or how it affects the relationships between

these constructs and e-loyalty. This implies a need for further large-scale studies.

Trust and Its Consequences

Half of the UA studies listed in Appendix A focus on trust. Several studies (e.g., Jin et al., 2008; Lundgren & Walczuch, 2003) have investigated the factors and processes by which individuals from high UA cultures come to form trust in an e-vendor. This is important as increased trust results in greater willingness to transact online. However, conflicting findings exist as to whether antecedents like vendor reputation result in greater levels of trust for high UA individuals.

Research has also produced conflicting findings regarding the role UA plays in moderating the relationship between trust and website usage/transaction intentions, implying that both the specific research context and the operationalization of trust can impact results. For example, while Yoon (2009) found that trust had a weaker effect on intentions to use an online shopping mall for high UA individuals, Gefen and Heart (2006) found that only the trusting belief of "vendor ability" was moderated by UA in determining intentions to inquire and purchase from an online bookseller, with the relationship stronger for individuals from high UA countries.

A closely related theme is the impact of UA and trust on e-loyalty. Consumers from high UA countries are more loyal to domestic retailers, as they are viewed as more predictable and "less risky" (Straughan & Albers-Miller, 2001). Individuals from high UA cultures are also less likely to switch e-vendors or complain even when they are not satisfied, presumably due to the uncertainty inherent with switching (Jin et al., 2008). However, results are mixed in regard to whether trust or satisfaction is more important in predicting e-loyalty for these consumers. This implies the need for further research to understand the exact interplay between UA, trust, and satisfaction in determining e-loyalty.

Observations Emerging from the Literature Review

Four observations emerge from our literature review. First, many of the findings are based on studies that examined only a small number of countries (often three or less). The focus of these studies was usually not on understanding UA per se, but rather on pinpointing differences among the sample of countries selected, taking several cultural dimensions into account. Depending on the countries sampled, the effects of UA can be very difficult to isolate from the effects of other cultural dimensions such as individualism/collectivism and power distance. This is especially true when the countries selected for a study do not have maximally different UA scores, or have scores on other cultural dimensions that also vary across the countries examined. It also becomes difficult to generalize findings beyond the context of the study (Tsang & Williams, 2012). This implies a need for studies that look at individuals from a much larger sample of countries (see Jiang et al., 2011), representing a wide range of UA values (Cyr et al., 2009), and that control for other cultural dimensions to effectively isolate the effects of UA.

Second, some researchers have questioned the value of national culture measures such as Hofstede's due to individual-level variations within a single country, and argue instead for capturing individual-level espoused culture (Gefen & Heart, 2006; Hwang, 2009; Kim et al., 2010). In fact, results are inconsistent when comparing studies measuring espoused culture with studies using Hofstede's scores. However, given the confounding effects of other cultural dimensions, it is difficult if not impossible to make a valid comparison between studies using different UA measures. We argue that country-level studies continue to be important, as national culture is "one of the prime sources of an individual's identification" (Gefen & Heart, 2006, p.13) and of their espoused cultural values (Straub et al., 2002). We also note that some recent studies (e.g., Rai et al., 2009) have found that despite variation in espoused cultural

values between individuals from the same country, the pattern of differences across countries is still consistent with what Hofstede has reported. With a large sample of countries and individuals, multi-level modeling techniques can enable researchers to isolate country-level effects from individual-level determinants.

Third, the majority of e-commerce studies incorporating UA have utilized surveys and experiments with student subjects, where respondents were presented with specific (sometimes hypothetical) websites and asked about their perceptions and intended behavior. We are not aware of any prior cross-cultural studies in which participants were engaged in a real, voluntary purchase (that is, visiting a website in the actual process of purchasing a product or service, such that the decision had real monetary implications). Thus, though these prior studies have yielded valuable insights, generalizability of findings to perceptions and behaviors of online consumers in the midst of an actual purchasing decision is not clear.

Finally, it is clear that a cumulative basis for advancing research into the effects of UA has yet to emerge. Though extant studies have enhanced our understanding of how UA influences online commerce, results remain fragmented and inconsistent, pointing to the need for additional research in this domain.

The current study extends extant research in several ways. First, we use a well-known model of IS success, tailored to the online context by adding trust and website experience, to examine the effect of UA on the key relationships. We view online purchasing as a decision-making process fraught with uncertainty about the product, vendor, and website to hypothesize effects of UA. We believe that such an effort can form the basis of a cumulative research tradition. Second, using a large sample of respondents from 38 different countries, we employ multi-level modeling to isolate the impact of UA. Third, our respondents are online consumers engaged real time in an actual purchasing decision, thus providing valuable insights as UA's effect on salient perceptions and behaviors of actual online consumers. Finally, we use a single set of websites accessed by all consumers worldwide (i.e., the hotel company's actual global websites), so we avoid possible confounding with website design and localization features. Our ultimate objective is to understand the cross-level effects of national culture on individual behavior.

Research Model

We begin with an established model of IS success (Seddon's (1997) IS Success model as amended in Rai et al. (2002)).[1] This model has been frequently cited in e-commerce research (e.g., Brown & Jayakody, 2008; Landrum et al., 2008), and thus provides a recognized framework from which to investigate the effects of UA on decision-making related to online shopping. We further adapt the model to the e-commerce context by adding the "trust" and "website experience" constructs (Figure 1). We have selected this theoretical framework since its core constructs (information quality, system quality, and trust) correspond to the three sources of uncertainty that we have identified (product, site, and vendor), and thus provide an appropriate base on which to test the effects of UA.[2]

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[1] Seddon's model is itself an amended version of DeLone and McLean's well-known (1992) IS Success model.

[2] We recognize that there are many other constructs that could potentially be included in a model of online consumer behavior. Further, one could argue for modeling additional relationships beyond those we have shown here. However, one of our goals is to encourage development of a cumulative research tradition by grounding our work in an established theoretical framework. We therefore extend the IS Success model only to the extent necessary to incorporate the major sources of product, site, and vendor uncertainty that have emerged in the literature.

According to the Rai et al. model, information quality (IQ) and system quality (SQ) are important determinants of perceived usefulness (PU) and user satisfaction with a system. PU in turn influences satisfaction, and together they influence system dependence. We use e-loyalty, defined as "the online consumer's preference towards using and loyalty to the site," as our measure of system dependence (see Bansal et al., 2004; Luna et al., 2002).

We extend this model by adding the construct of "trust." The original IS Success model focused solely on perceptions of the technology itself, but this is not adequate for understanding consumer behavior in an online context. A website is not just a technology; it is also an interface with an e-vendor (D. Gefen, Karahanna, & Straub, 2003). Consumer trust in the e-vendor has been consistently shown to predict e-loyalty as well as a website's PU (see Cyr, 2008; Flavian et al., 2006; Gefen, 2002; Gefen et al., 2003; Kim, 2008; McKinney et al., 2002). This is because "part of the guarantee that consumers will gain their expected usefulness from the Web interface depends on the people behind the Web site" (Pavlou, 2003, p.110). A website that does not respect the consumer's privacy (one aspect of trust) will be considered less useful, since "detrimental consequences" may result. A consumer who lacks trust in the e-vendor may also consider its site to be a less convenient and effective way of accomplishing tasks, such as searching for information or placing an order (Gefen et al., 2003).
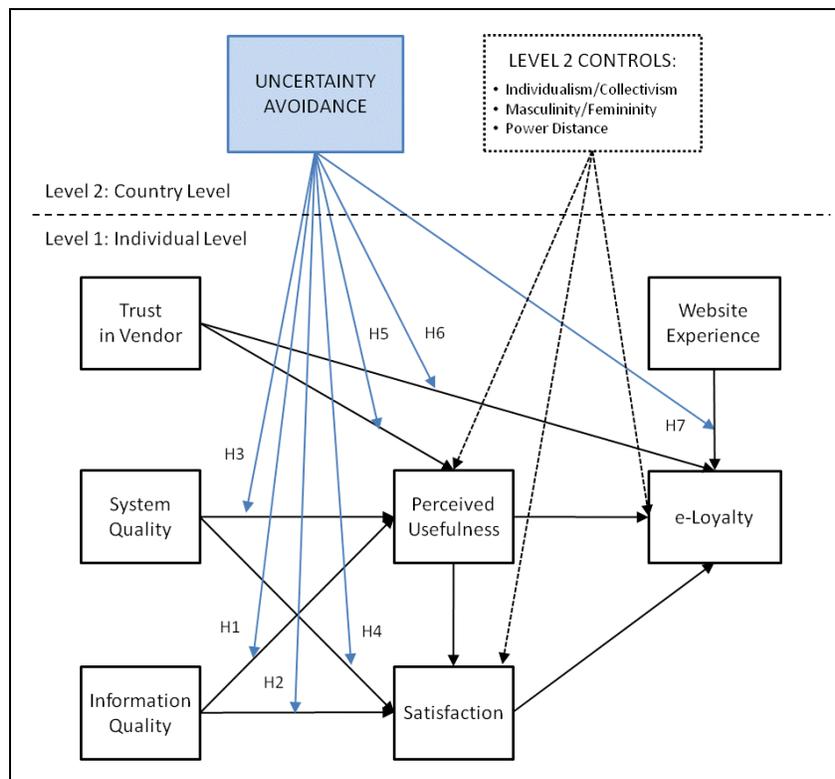

Figure 1. Research model.

Finally, we extend the Rai et al. model by including experience with the website. While technology acceptance studies often include experience as a control variable, the marketing literature indicates that experience plays an important role in consumers' decision-making processes. Thus, experience with a particular website can be an important predictor of loyalty to

that site. Website experience leads to a level of familiarity, knowledge, and expertise with its features that encourages individuals to continue using it in the future so as to avoid the cognitive costs of switching to something else (Flavian et al., 2008; Murray & Häubl, 2007; Rodgers et al., 2005).

Given these direct relationships have all been justified in prior research, we focus our hypothesizing solely on the moderating effects of UA on the relationships in the model. It is important to emphasize that we posit only those moderating effects we believe are theoretically justified. Our analysis also explicitly controls for the effects of Hofstede's other cultural dimensions.

Information Quality and Product Uncertainty

Perceptions of IQ are critical in e-commerce since consumers cannot physically examine items before purchase. Given the uncertainty that exists regarding a product's quality and features, site content becomes the primary source for consumers to judge both product and vendor attributes (Pavlou & Fygenson, 2006). When consumers perceive IQ to be high (i.e., the site contains relevant information in sufficient detail to enable them to assess the product and reduce uncertainty), PU as well as satisfaction with the site should increase. UA has previously been shown to influence the types of, and relative importance attributed to, information used in making online purchasing decisions (Dawar et al., 1996; Reimann et al., 2008). Since individuals from high UA cultures desire more, and richer, information, they can be expected to collect more information and do more site exploration (Kralisch et al., 2005; Straub et al., 2002). Further, since they seek clarity and predictability and eschew ambiguity, they will place higher importance on site IQ to help them assess the product and compare options. All of this means that in assessing how useful a website is and whether they find it satisfactory, people in high UA cultures will weigh more heavily those aspects of the site that help them confidently assess the product they are buying and thereby reduce product uncertainty. Thus we posit:

H1: Uncertainty Avoidance will moderate the relationship between IQ and PU such that the relationship will be stronger for individuals from countries high in uncertainty avoidance.

H2: Uncertainty Avoidance will moderate the relationship between IQ and Satisfaction such that the relationship will be stronger for individuals from countries high in uncertainty avoidance.

System Quality and Site Uncertainty

A website's design elements aid consumers in their decision-making process. Features of SQ such as ease of use and navigability allow for smoother, problem-free website interaction that in turn leads to higher levels of PU and satisfaction (Flavian et al., 2006; Gefen & Straub, 2000; Wolfinbarger & Gilly, 2003; Yoon, 2002). While SQ is generally considered important to all consumers, individuals from high UA cultures especially prefer simplicity, responsiveness, clear and controlled navigation structures, and redundant cues in the sites they visit (Marcus & Gould, 2000; Park & Weidenbeck, 2005; Tsikriktsis, 2002). These features make the site clearly interpretable and predictable (reducing uncertainty related to finding / accessing information, and executing transactions).

Empirical support for the moderating effect of UA on the SQ-satisfaction relationship is mixed. In the B2B context, Reimann et al. (2008) found that UA moderates the relationship between website quality assessments and satisfaction. Cyr (2008) investigated the impact of information design (ID) and navigation design (ND), two constructs similar to SQ, on satisfaction. While not hypothesized, her pattern of results indicated a stronger ND-satisfaction relationship for users

from higher UA countries. Despite the lack of clear empirical evidence, theoretical arguments suggest that a site that is easy to navigate and logically structured will make interaction with that site clear and predictable rather than unstructured and ambiguous. Since predictability and structure reduce site uncertainty, it follows that SQ should be a more important determinant of PU and site satisfaction for consumers from high UA cultures. Thus we posit:

H3: *Uncertainty Avoidance will moderate the relationship between SQ and PU such that the relationship will be stronger for individuals from countries high in uncertainty avoidance.*

H4: *Uncertainty Avoidance will moderate the relationship between SQ and Satisfaction such that the relationship will be stronger for individuals from countries high in uncertainty avoidance.*

Trust and Vendor Uncertainty

Trust can be conceptualized as a set of beliefs regarding the e-vendor's integrity, benevolence, ability, and predictability (Gefen et al., 2003; McKnight et al., 2002). It has been shown to be a significant predictor of both website PU and intentions to return to a site and make purchases in the future (Awad & Ragowsky, 2008; Flavian et al., 2006; Pavlou, 2003). Trust reduces uncertainty, in that the consumer needn't worry whether information exchanged with the e-vendor will be kept secure and private, the product will be as described, and the vendor will deliver it as promised without acting opportunistically or exploiting the transaction (Gefen et al., 2003). Thus, through trust in the e-vendor, online consumers reduce the perceived risk of undesirable opportunistic behaviors by the e-vendor. This in turn reduces perceived social complexity and uncertainty of the transaction (Luhmann, 1979), which enhances perceptions of the instrumentality of the site. UA has previously been shown to positively moderate the relationship between consumers' overall perceptions of risk and the situational use of a particular vendor offering (Broderick, 2007), and to influence the process of trust formation when assessing known risks (Lundgren & Walczuch, 2003). Since high UA individuals are more averse to unfamiliar risks, we would expect them to view uncertainty reduction through trust in the e-vendor to be an important factor in determining PU and e-loyalty. Thus we posit:

H5: *Uncertainty Avoidance will moderate the relationship between Trust and PU such that the relationship will be stronger for individuals from countries high in uncertainty avoidance.*

H6: *Uncertainty Avoidance will moderate the relationship between Trust and e-Loyalty such that the relationship will be stronger for individuals from countries high in uncertainty avoidance.*

Website Experience and Uncertainty

Familiarity with a product that comes from lengthy experience using it has been shown to lead to greater loyalty for individuals from high UA cultures. For instance, new immigrants coming to the US from Latin America (where UA is high) continue using brands from their native experience, in part due to "risk avoidance" (Palumbo & Herbig, 2000). Uncertainty reduction can also occur based on the consumer's experience with an e-vendor and its website. Prior satisfactory experience will act as an uncertainty reduction mechanism in the purchasing decision process, as it enhances familiarity with the vendor, products, and website, thereby reducing unknown risk. Since this is more important for individuals from high UA countries, we posit:

H7: Uncertainty Avoidance will moderate the relationship between Website Experience and e-Loyalty such that the relationship will be stronger for individuals from countries high in uncertainty avoidance.

Methodology

Study Context and Sample

Our data were collected via a web-based survey administered to a random sample of visitors to the websites of the InterContinental Hotels Group (IHG®). One of the world's leading hotel companies, IHG has a rich heritage and broad portfolio of over 4,600 hotels and 678,000 rooms in nearly 100 countries and territories. The scale and diversity of IHG's brand family means that its hotels can meet guests' needs whatever the occasion – whether an overnight getaway, a business trip, a family celebration, or a once in-a-lifetime experience. The company has a broad portfolio of nine hotel brands, including InterContinental® Hotels & Resorts, Hotel Indigo® Hotels, Crowne Plaza® Hotels & Resorts, Holiday Inn® Hotels and Resorts, Holiday Inn Express® Hotels, Staybridge Suites® Hotels, Candlewood Suites® Hotels, EVEN™ Hotels and HUALUXE™ Hotels & Resorts and the industry's first and largest customer loyalty program, IHG® Rewards Club, with 74 million members. Individuals can make online reservations and gather information via the company's website, the loyalty program website, the mobile app, or any of the individual brand websites. The data were gathered as part of a study conducted by IHG.

All respondents visited the same company websites, that is, IHG (in line with many global B2C vendors today) does not have sites designed specifically for each country or region, but rather the same websites are accessed by all visitors regardless of country of origin. For research purposes, the existence of identical websites eliminates the threat that observed effects are due to differences in website design or objective quality of the website. The IHG survey was administered in English and in an identical manner to respondents across all countries. This helps to ensure equivalence in survey administration, as well as to reduce item and method biases that can confound the analysis of cross-cultural differences (Hui & Triandis, 1985; Karahanna et al., 2002; van de Vijver & Leung, 1997).

Our sample included 3,575 respondents from 38 countries (Appendix B).[3] Of these, 2,593 respondents were from the United States, 380 from the United Kingdom, and 158 from Canada. The remaining countries had anywhere from 1 to 67 respondents. To avoid biasing of results due to the large disparities in sample size for these three countries, we randomly selected 70 respondents each from the United States, United Kingdom, and Canada to include in the analysis. Robustness analysis using 100 random samples achieved consistent results. This produced a final sample of 577 respondents from 38 countries with an average of 15 respondents per country. The Hofstede UA scores for the 38 countries (Appendix B) range from a low of 8 to a high of 112. Table 1 shows demographic characteristics of the respondents.

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[3] Respondents selected their home country from a drop-down list as part of the survey.

Demographic	Full Sample	Analysis Sample
Sample Size	3,575	577
Age:		
Under 18 years old	3(0.08%)	0 (0.00%)
18-24 years old	90(2.52%)	10 (1.73%)
25-34 years old	751(21.01%)	142 (24.61%)
35-44 years old	1,171(32.76%)	190 (32.93%)
45-54 years old	1,054(29.49 %)	157 (27.21%)
Over 55 years old	505(14.13%)	78 (15.52 %)
Gender:		
Male	2,666(74.59%)	466 (80.76%)
Female	908(25.41 %)	111 (19.24%)
Experience:		
1 - First visit	476(13.32%)	70 (12.1%)
2 - 1-3 times / month	793(22.19%)	125 (21.7%)
3 - Once / week	1,354 (37.88%)	227 (39.3%)
4 - > once / week	868(24.29%)	140 (24.3%)
5 – Every day	83(2.32%)	15 (3.6%)

Table 1. Sample characteristics.

Operationalization of Constructs

Since the respondents were real visitors to IHG's website, the company deemed it critical to use a short questionnaire that would not alienate its customers (Table 2). As such, while we used multiple questions per construct whenever possible, satisfaction was measured using only one item. While not ideal, there is precedent in the literature for using a single-item measure of overall satisfaction (Wanous et al., 1997). We further believe that the realism of the sample and context (e.g. actual website consumers engaged in real purchases) is worth the tradeoff in terms of number of items per construct.

Based on your best online experience, to what extent do you value [website.com] as a site that…[1]		
Information Quality	Breadth	…covers the range of information you need?
	Depth	…gives you the amount of detail you need?
	Relevance	…has content that is relevant to the purpose of your visit?
Perceived Usefulness	Comparison	…facilitates your ability to compare hotels effectively?
	Convenience	…is the most convenient way to choose your hotel accommodations?
e-Loyalty	Channel	…is your preferred way of interacting with the organization?
	Loyalty	…has earned your loyalty?
	Starting Point	…you use whenever you plan a trip or event?
System Quality	Ease of Use	…is easy for you to navigate?
	Layout	…has a site design that is logical to you?
	Speed	…displays pages quickly?
Trust	Privacy	…respects your privacy?
	Trust	…establishes in you a feeling of trust?
Satisfaction[2]	Satisfaction	How satisfied are you with this site?
Experience[3]	Experience	How frequently do you visit this site?

[1] Measured on a 10-point Likert scale
[2] Measured on a 5-point scale from "not at all satisfied" to "completely satisfied"
[3] Measured on a 5-point scale from "first visit" to "everyday"

Table 2. Scale items.

Website quality has been conceptualized and measured in many different ways in the past. We assessed IQ via items tapping the breadth, depth, and relevance of information on the site (Agarwal & Venkatesh, 2002; DeLone & McLean, 2003), and measured SQ via items tapping ease of navigation, speed of the site, and site layout (DeLone & McLean, 2003; McKinney et al., 2002; Rai et al., 2002). PU was measured via items tapping comparative convenience and effectiveness, since popular PU items found in technology acceptance research (e.g., performance improvement and increased productivity; see Venkatesh et al., 2003) are not relevant to our context. Trust was assessed through perceptions of trust and privacy, while e-loyalty was assessed via items indicating preference for and loyalty to the site. Experience with the site was assessed by asking respondents the frequency of their past visits to the site. UA was measured using Hofstede's (2001) scores. We also included Hofstede's scores for individualism/ collectivism, power distance, and masculinity/femininity, in order to assess and isolate their effects from the effects of UA (Appendix B).

Data Analysis and Results

We used SmartPLS (Ringle et al., 2005) to assess the psychometric properties of the scales (see Gefen et al., 2011 for reporting guidelines), and Hierarchical Linear Modeling (HLM) to evaluate the multi-level structural model and to perform hypothesis testing.

Measurement Model

Construct Validity. To assess the measurement model, we evaluated reliability as well as convergent and discriminant validity. Results are presented in Tables 3 and 4. The reliability coefficients are all above the recommended level of 0.70 (Nunnally, 1967). Convergent validity was assessed by evaluating the t-values of item loadings for constructs and the AVE. All loadings were significant at 0.01 or greater and AVEs were greater than the recommended 0.5, demonstrating adequate convergent validity. Discriminant validity was evaluated by examining the cross-loadings of measurement items on the latent variables and by comparing the AVE for each construct with the squared correlation of that construct with all other constructs (Chin, 2010). While some high cross-loadings do exist, comparisons of construct AVE and squared correlations indicate adequate discriminant validity. Assessments of multicollinearity using VIF were also well within recommended guidelines.

Common Method Bias. Given our focus on cross-level impacts of national culture on individual level behaviors, common method bias is of less concern for two reasons. First, the data for UA are of a different type (secondary data) and derived from a completely different source than the survey responses, thus precluding method bias. Second, even if some method bias exists at the individual level of analysis, there is no reason to believe that this is systematically different across different countries. Thus, any cross-level moderating effects discerned (i.e. based on differences in cultural dimensions) would not be influenced by method bias introduced at the first level (i.e. individual responses). For this reason, method bias is not likely a threat to our results. We nevertheless used the marker-variable technique to assess the presence of method bias (Lindell & Whitney, 2001; Malhotra et al., 2006). We compared the uncorrected correlation matrix with the CMV-adjusted correlation matrix. We adopted a very conservative approach using the sixth lowest inter-item correlation from all variables in our dataset as a proxy for the marker variable. This correlation (0.013) between total nights per year and e-loyalty (sti3) would be the maximum possible variance due to common methods. We also re-ran the adjustment using other lower values of inter-item correlations. All results of these analyses show that the adjusted correlations do not significantly differ from the uncorrected correlations, providing further indication that common method bias is not a concern.

	Mean (S.D.)	Composite Reliability *	IQ	SQ	PU	Sat	Loyal	Trust	Exp
IQ	7.14 (1.68)	0.94	**0.84**						
SQ	6.90 (1.87)	0.91	0.58	**0.78**					
PU	6.9 (1.74)	0.92	0.64	0.52	**0.83**				
Sat	4.1 (0.86)	n/a	0.38	0.37	0.34	**n/a**			
e-Loyalty	7.1 (1.65)	0.91	0.60	0.55	0.59	0.32	**0.77**		
Trust	7.2 (1.57)	0.89	0.50	0.53	0.52	0.26	0.58	**0.81**	
Experience	2.84 (1.01)	n/a	0.01	0.00	0.01	0.01	0.05	0.01	**n/a**

Bolded values on the diagonal represent the construct AVE. IQ = Information Quality; SQ = System Quality; PU = Perceived Usefulness; Sat = Satisfaction; Loyal = e-Loyalty; Exp = Experience.

Table 3. Latent variable squared correlations.

Construct	Item	IQ	PU	Sat	SQ	Loyal	Trust	Exp
IQ	iq1	**0.93**	0.74	0.58	0.70	0.76	0.67	0.11
	iq2	**0.89**	0.72	0.55	0.71	0.68	0.65	0.09
	iq3	**0.92**	0.74	0.57	0.68	0.70	0.63	0.15
PU	pu1	0.74	**0.91**	0.51	0.65	0.65	0.62	0.04
	pu2	0.72	**0.91**	0.54	0.66	0.75	0.69	0.13
Sat	sat	0.62	0.58	**1.00**	0.61	0.57	0.51	0.08
SQ	sq1	0.72	0.67	0.60	**0.92**	0.68	0.66	0.04
	sq2	0.67	0.65	0.55	**0.88**	0.69	0.68	0.06
	sq3	0.63	0.57	0.48	**0.85**	0.58	0.58	-0.03
e-Loyalty	loy1	0.69	0.65	0.46	0.60	**0.87**	0.65	0.13
	loy2	0.73	0.70	0.56	0.73	**0.88**	0.73	0.20
	loy3	0.63	0.67	0.47	0.60	**0.87**	0.62	0.25
Trust	trust1	0.58	0.60	0.40	0.60	0.61	**0.89**	0.11
	trust2	0.69	0.69	0.51	0.70	0.75	**0.90**	0.10
Experience	exp	0.12	0.09	0.08	0.02	0.22	0.12	**1.00**

Note: IQ = Information Quality; PU = Perceived Usefulness; Sat = Satisfaction; SQ = System Quality; Loyal = e-Loyalty; Exp = Experience.

Table 4. Item loadings and cross-loadings.

HLM and Hypothesis Testing

Our sample involves individuals who are nested within countries. As such, multilevel modeling is an appropriate technique to model the variation of individual level effects nested within countries. We represent the country level effects through Hofstede's four cultural dimensions. Thus, we are testing individual level effects, controlling for the direct effects of the four cultural dimensions, and positing cross level interactions by UA. Appendix C shows the equations for specifying the multilevel models for the three dependent variables of e-loyalty, PU, and

satisfaction. The data were grand-mean centered (Gelman & Hill, 2006) and adjusted for skewness using the Box Cox (1964) power transformation prior to estimation.

As a first step, we estimated a null model excluding individual- and country-level predictors. This model did not indicate significant between-country variations in the three outcome variables (e-loyalty: $\chi^2 = 40.45$, df=37, p=0.321; PU: $\chi^2 = 33.74$, df=37, p=0.999; satisfaction: $\chi^2 = 11.685$, df=37, p=0.999), implying that multilevel modeling may not be necessary (Gelman & Hill, 2006; Raudenbush & Bryk, 2002). We nevertheless proceeded with a multilevel model for two reasons. First, multilevel and classical single-level models coincide only when between-group variation is zero. A conservative approach suggests that we should still not treat between-group variation as zero. When the multilevel estimate is close to the classical single-level estimate, it still allows for variation between countries, and assessing this between-country variation is the goal of our study. Second, when level-two units have unequal sample size (as is the case here), the multilevel estimate performs well (Gelman & Hill, 2006).

We estimated the single-level and multilevel models using ordinary least squares (OLS) and maximum likelihood after testing for normality of residuals and equal variances. Results (Table 5) indicate that all individual-level relationships but one are significant as expected. The effect of PU on satisfaction is not significant. In terms of the hypothesized cross-level effects, UA moderates the effect of trust on e-loyalty and the effect of IQ on PU, thus providing support for hypotheses H1 and H6. As posited in H7, UA also moderates the effect of experience on e-loyalty; however, the moderating effect is in the opposite direction as hypothesized. The hypothesized moderating effects of UA on the relationships of IQ and SQ on satisfaction, SQ on PU, and trust on PU were not significant, indicating no support for H2, H3, H4, and H5. Finally, the only significant country-level direct effect was the effect of masculinity/ femininity on e-loyalty. The interaction graphs for the significant moderating effects are presented in Appendix D.

Variable	e-Loyalty	Satisfaction	Perceived Usefulness
Intercept	**52.704 (.665)** ***	**18.254 (.325)** ***	**50.369 (.864)** ***
Individualism/Collectivism	0.049 (.038)	.012 (.018)	-0.005 (.046)
Masculinity/Femininity	**0.064 (.036) ***	-.014 (.017)	0.018 (.043)
Uncertainty Avoidance	0.023 (.037)	.006 (.016)	0.039 (.045)
Power Distance	-0.024 (.046)	.018 (.021)	-0.040 (.054)
Trust	**5.389 (.640) ***		**4.169 (.569)** ***
System Quality		**1.214 (.213)** ***	**1.843 (.591)** ***
Information Quality		**1.068 (.249)** ***	**6.164 (.670)** ***
Perceived Usefulness	**4.456 (.497) ***	.377 (.249)	
Satisfaction	**2.704 (.801) ***		
Website Experience	**2.802 (.514) ***	.067 (.204)	0.038 (.561)
UA*Trust	**0.039 (.023) ***		-0.036 (.027)
UA*Experience	**-0.055 (.028) ***		
UA*System Quality			-0.040 (.029)
UA*Information Quality			**0.088 (.031) ***
Deviance	4509.6	3441.0	4607.0

Note: * = p-value<0.05; ** = p-value<0.01; ***= p-value<0.001. All tests are one-tailed.

Table 5. HLM results.

Limitations

Prior to discussing our findings, we need to acknowledge limitations of the study. First, IHG's requirement that the survey be kept brief meant that some construct scales included fewer items than desired. For example, as previously discussed, overall satisfaction with the site was measured with only one item. Further, while we used three items apiece for measuring IQ and SQ, some researchers have conceptualized and operationalized these constructs as multidimensional in nature. Nonetheless, we believe that the items used capture the essence of the constructs and that the realism of the sample was a worthwhile tradeoff. Second, since this is a cross-sectional study, we cannot test the time-ordering of the constructs in the model and causal inferences are based on the underlying theory. Third, since the survey was administered to actual website visitors and was voluntary, we could not test for non-response bias.

Finally, as the vendor's brands are very well-known, the role of trust may have been reduced. One could argue that using respondents who are interested in, and perhaps already very familiar with, the IHG brands might lead to a sample bias. Specifically, users familiar with the brands and aware of their good reputation may have lower uncertainty in dealing with them. However, as previously discussed, vendor uncertainty is only one type of uncertainty. Whereas vendor uncertainty can be mitigated by using a reputable vendor's website, product uncertainty remains. In the context of our study, the consumer may have uncertainty regarding the type of room, type of bed, available amenities, hotel location and proximity to sites of interest. This is true even if they have booked with a particular IHG brand many times in the past. No two hotel sites are the same in key aspects (i.e., this is not a commodity product), nor are all properties owned and managed directly by IHG. So while the vendor or its individual brands may be well-known, it is not always clear whether a particular hotel / room will fit the consumer's needs.

Discussion

Our basic premise has been that online purchasing is a decision-making process where individuals are motivated to reduce uncertainty with respect to product and vendor attributes before purchasing, and that they do so by interacting with the vendor's website. We have argued that the depth, breadth, and relevance of information available on the site allow individuals to assess products and services more confidently, thus reducing product uncertainty. We have also argued that a well-organized website that is easy to navigate will increase predictability and facilitate uncertainty reduction, by allowing individuals to easily locate the needed information. Finally, vendor uncertainty is reduced to the extent to which individuals form trusting perceptions towards the e-vendor. Framing this decision-making process as an uncertainty reduction endeavor, we have argued that the cultural dimension of uncertainty avoidance would influence the effects of the three uncertainty reduction mechanisms (IQ, SQ, and trust) on their respective consequences. Specifically, we posited that the relationships between these uncertainty reduction mechanisms and their consequences would be stronger for individuals from high UA countries.

Information Quality and Product Uncertainty Reduction

Our findings suggest that UA plays a significant moderating role on the IQ-PU relationship (H1). As expected and as clearly indicated by the interaction graph in Appendix D, IQ has a stronger effect on PU for individuals from countries high in UA. This is perhaps not surprising given the key role that information plays in uncertainty reduction, and given that a purchasing decision requires information in order to assess product or service attributes and whether the consumer's needs will be met. What is surprising, however, is the lack of a moderating effect of UA on the IQ-satisfaction relationship (H2). Given that satisfaction is an affective post-consumption response (Oliver, 1980), it may be that better information reduces uncertainty primarily through cognitive mechanisms. As such, one would expect UA to moderate the effect of antecedent uncertainty reduction mechanisms on cognitive evaluations of the website's efficacy rather than on affective reactions. The demonstrated moderating influence of UA on the IQ-PU relationship supports this reasoning and interpretation of our findings. This also presents a promising avenue for future research to explore the influence of UA on the relationships of other uncertainty reduction mechanisms on both cognitive and affective factors involved in website evaluations.

System Quality and Website Uncertainty Reduction

Contrary to expectations, the SQ-PU (H3) and SQ-satisfaction (H4) relationships were not influenced by UA. The reasoning supporting these hypotheses centered on the extent to which website design parameters increased predictability of site structure and navigation. If website design creates consumer confusion, SQ would be expected to influence PU and satisfaction to a greater extent in high UA cultures. One possible explanation for the non-significant findings is that the IHG websites were all well-designed, well-structured and easy to navigate. Good design eliminated the primary sources of ambiguity such that uncertainty and lack of structure may not have been salient, thus rendering UA less relevant.

Trust and Vendor Uncertainty Reduction

The effects of UA on the relationships involving trust were mixed. While the effect of trust on e-loyalty was significantly stronger for individuals from high UA countries (H6; see the interaction plot in Appendix D), its effect on PU did not vary as a function of UA (H5). Risk perceptions may help explain this finding. Specifically, high UA individuals are willing to pursue known risks. Trust

in the e-vendor helps to shift the inherently risky activity of online purchasing into the category of a known risk.

It is interesting to note that UA influences the IQ-PU relationship but not the trust-PU relationship. We therefore conclude that the primary uncertainty reduction mechanism for assessing a website's usefulness is the depth, breadth, and relevance of information that it provides. However, the primary uncertainty reduction mechanism for determining whether or not to be loyal to the website appears to be one's level of trust in the e-vendor. This finding is perhaps not surprising, since PU reflects a website's utility for assessing the product, while being loyal involves vulnerability with respect to the relationship with the e-vendor – that is, the former focuses on reducing product uncertainty, whereas the latter focuses on vendor uncertainty. This implies a need for future research designed to test different uncertainty reduction mechanisms for different aspects of the nomological network: some focused on product uncertainty (IQ), and others focused on vendor uncertainty (trust).

Website Experience and Uncertainty Reduction

The finding regarding the moderating influence of UA on the experience-e-loyalty relationship (H7) was most unexpected, as UA moderates this relationship in the opposite direction as hypothesized (see Appendix D). Specifically, the relationship between experience and e-loyalty is stronger for low UA individuals. Keep in mind that experience was operationalized as the frequency of visits to IHG's websites. Thus, a possible explanation could be the difference between experience in terms of site visit frequency and frequency of actual transactions (i.e. room bookings). The former represents experience related to the website and its functionality (e.g., searching for and booking a room), while the latter represents actual experience with the vendor and product. Prior research has related the influence of UA on loyalty to the vendor, with vendor loyalty being derived from satisfying, repeat product/service use (Palumbo & Herbig, 2000; Reimann et al., 2008). Thus, the influence of UA on the experience-e-loyalty relationship may still be important but experience may need a more nuanced conceptualization. Future research should seek to clarify different types of experience (website, vendor, and product use) and how UA influences each.

The Impact of Other Cultural Dimensions

Finally (and quite surprisingly), with one exception we did not find significant direct effects of the other three cultural dimensions on PU, satisfaction, or e-loyalty. The only exception is the effect of masculinity/ femininity on e-loyalty, where we found that masculine cultures are more likely to show loyalty to specific websites. Post-hoc analyses also indicated a lack of moderating effects of these three cultural dimensions on the various relationships in our model.

Conclusion

Contributions to Research

In addition to the findings previously discussed, our study makes several important contributions to cross-cultural e-commerce research. First is the realism of our sample. Our analyses are based on the inputs of real customers, actively engaged real-time in making actual hotel reservations. Thus, neither the sample nor the task was contrived. To our knowledge, this is the first study using actual consumers in the act of making a purchase in order to assess the factors involved in the online buying process. This permits us to effectively tap into the cognitive and affective influences on consumers at the time of purchase.

Second, while most prior IS cross-cultural studies sample only a handful of countries to assess cultural effects, we have included data from 38 different countries. Thus, results are not idiosyncratic to a specific narrow set of countries – enhancing generalizability of our findings. Third, our multilevel analysis explicitly accounts for the fact that our individual respondents were nested within countries, thus controlling for the effect of the other cultural dimensions while isolating the effects of UA. This is significant because we were able to determine cultural effects on individual behavior without committing an ecological fallacy, and without confounding effects of different cultural dimensions.

Our final contribution relates to the need for a cumulative research tradition in studying cultural impacts on online consumer behavior. Given the fragmented and contradictory nature of extant cross-cultural research, we believe that the present study can serve as the basis for building a cumulative research tradition by (1) adapting a well-established model, and (2) isolating effects of each cultural dimension. Overall, our analysis supports the appropriateness of the IS Success model for studying B2C e-commerce by confirming all but one of its previously established direct effects.

Implications for Practice

Our study has important practical implications. The depth, breadth, and relevance of information presented through a website are shown to be critical to perceptions of usefulness, satisfaction, and ultimately consumer loyalty to the site. Information quality becomes an even more important consideration in high UA cultures. As such, e-vendors expanding their operations worldwide must invest in ensuring the quality of information on their websites, and in determining the type of information their customers around the world need to reduce their uncertainty to a level that encourages online purchasing. In the context of hotel reservations, for example, it may imply defining terms (such as different types of rooms) that may be taken for granted in one country, providing maps and directions, providing information about proximity to various sites of interest, and providing current pictures of the hotel and various types of rooms and accommodations.

The absence of a moderating influence of UA on system quality suggests that effective layout and logical navigation may render cultural differences at least with respect to UA irrelevant. This may suggest that efforts to tailor websites to culture may need to focus less on navigation structures and logical organization and more on information content.

We close by considering two related questions: "Does national culture still matter in e-commerce today?" and "Do e-vendors really need to create localized versions of their websites for customers living in different countries or regions?" While some of our findings indicate that national culture does still matter, others suggest that it may be of less importance today – at least insofar as the e-vendor has taken pains to create a well-designed, well-structured site containing high quality information. This will reduce both product and site uncertainty, and may possibly even increase trust, thereby reducing vendor uncertainty. Our study, in conjunction with other recent cross-cultural website design research (e.g., Cyr et al., 2005; Singh et al., 2003), suggests that many consumers around the world have adapted to global e-shopping to the extent that localization of certain website features may no longer be necessary. This may be due, in part, to the trend toward standardization in how large companies within the same industry design their sites. Nevertheless, some cross-cultural research (e.g., Sia et al., 2009) has found that certain types of information (e.g., portal affiliations versus peer endorsements) may improve trust more for consumers from certain cultures. Future research should thus seek to develop a better understanding of which features of website localization are most useful, and the best design for an "all-inclusive" global site.

References

Agarwal, R., & Venkatesh, V. (2002). Assessing a firm's web presence: A heuristic evaluation procedure for the measurement of usability. *Information Systems Research, 13*(2), 168-186.

Awad, N. F., & Ragowsky, A. (2008). Establishing trust in electronic commerce through online word of mouth: An examination across genders. *Journal of Management Information Systems, 24(4)*, 101-121.

Bansal, H. S., McDougall, G. H. G. , Dikolli, S. S., & Sedatole, K. L. (2004). Relating e-satisfaction to behavioral outcomes: An empirical study. *Journal of Services Marketing, 18(4)*, 290-302.

Box, G.E.P., & Cox, D.R. (1964). An analysis of transformations. *Journal of the Royal Statistical Society, Series B, 26(2)*.

Broderick, A. (2007). A cross-national study of the individual and national–cultural nomological network of consumer involvement. *Psychology & Marketing, 24(4)*, 343–374.

Brown, I., & Jayakody, R. (2008). B2C e-commerce success: A test and validation of a revised conceptual model. *The Electronic Journal of Information Systems Evaluation, 11(3)*, 167-184.

Callahan, E. (2005). Cultural similarities and differences in the design of university web sites. *Journal of Computer-Mediated Communication, 11(1)*, 239-273.

Casalo, L., Flavian, C., & Guinaliu, M. (2008). The role of perceived usability, reputation, satisfaction and consumer familiarity on the website loyalty formation process. *Computers in Human Behavior, 24*, 325-345.

Chin, W.W. (2010). How to write up and report PLS analyses. In V. Esposito Vinzi, W. W. Chin, J. Henseler & H. Wang (Eds.), *Handbook of Partial Least Squares* (pp. 655-690). Berlin: Springer-Verlag.

Choi, J, & Geistfeld, L.V. (2004). A cross-cultural investigation of consumer e-shopping adoption. *Journal of Economic Psychology, 25*, 821-838.

Chung, I.K., & Adams, C.R. (1997). A study on the characteristics of group decision making behavior: Cultural difference perspective of Korean vs. U.S. *Journal of Global Information Management, 5(3)*, 18-29.

Cyr, D. (2008). modeling web site design across cultures: Relationships to trust, satisfaction, and e-loyalty. *Journal of Management Information Systems, 24(4)*, 47-72.

Cyr, D., Bonanni, C., Bowes, J., & Ilsever, J. (2005). Beyond trust: Website design preferences across cultures. *Journal of Global Information Management, 13(4)*, 24-52.

Cyr, D., Head, M., Larios, H., & Pan, B. (2009). Exploring human images in website design: A multi-method approach. *MIS Quarterly, 33(3)*, 539-566.

Dawar, N., Parker, P. M., & Price, L. J. (1996). A cross-cultural study of interpersonal information exchange. *Journal of International Business Studies, 27(3)*, 497-516.

DeLone, W. H., & McLean, E. R. (1992). Information systems success: The quest for the dependent variable. *Information Systems Research, 3(1)*, 60-95.

DeLone, W. H., & McLean, E. R. (2003). The DeLone and McLean model of information systems success. *Journal of Management Information Systems, 19(4)*, 9-30.

Downing, C.E., Gallaugher, J.M., & Segars, A.H. (2003). Information technology choices in dissimilar cultures: Enhancing empowerment. *Journal of Global Information Management, 11(1)*, 20-39.

El Said, G. R. (2005). *Cultural effect on electronic consumer behaviour: The effect of uncertainty avoidance on online trust for the Egyptian Internet users*. (PhD), Brunel University.

Flavian, C., Guinaliu, M., & Gurrea, R. (2006). The role played by perceived usability, satisfaction and consumer trust on website loyalty. *Information & Management, 43*, 1-14.

Garfield, M.J., & Watson, R.T. (1998). Differences in national information infrastructure: The reflection of national cultures. *Journal of Strategic Information Systems, 6(4)*, 313-337.

Gefen, D. (2002). Customer loyalty in e-commerce. *Journal of the Association for Information Systems, 3*, 27-51.

Gefen, D., & Heart, T. (2006). On the need to include national culture as a central issue in e-commerce trust beliefs. *Journal of Global Information Management, 14(4)*, 1-30.

Gefen, D., Karahanna, E., & Straub, D. W. (2003). Trust and TAM in online shopping: An integrated model. *MIS Quarterly, 27(1)*, 51-90.

Gefen, D., & Straub, D. W. (2000). The relative importance of perceived ease-of-use in IS adoption: A study of e-commerce adoption. *Journal of the Association for Information Systems, 1(8)*, 1-30.

Gefen, D., Rigdon, E. E., & Straub, D. (2011). An update and extension to sem guidelines for administrative and social science research. *MIS Quarterly, 35(2)*, iii-xiv.

Gelman, A., & Hill, J. (2006). *Data Analysis Using Regression and Multilevel/Hierarchical Models* (1st ed.): Cambridge University Press.

Hasan, H., & Ditsa, G. (1999). The impact of culture on the adoption of it: An interpretive study. *Journal of Global Information Management, 7(1)*, 1-19.

Ho, K.K.W., Yoo, B., Yu, S., & Tam, K.Y. (2007). The effect of culture and product categories on the level of use of buy-it-now (BIN) auctions by sellers. *Journal of Global Information Management, 15(4)*, 1-19.

Hofstede, G. (1991). *Cultures and Organizations: Software of the Mind*. New York, New York: McGraw-Hill.

Hofstede, G. (2001). *Culture's Consequences: Comparing Values, Behaviors, Institutions, and Organizations Across Nations* (2nd ed.). Thousand Oaks, CA: Sage Publications.

Hui, H., & Triandis, H. (1985). Measurement in cross-cultural psychology. *Journal of Cross-Cultural Psychology, 16(2)*, 131-152.

Hwang, Y. (2009). The impact of uncertainty avoidance, social norms and innovativeness on trust and ease of use in electronic customer relationship management. *Electronic Markets, 19*, 89-98.

Jarvenpaa, S.L., & Tractinsky, N. (1999). Consumer trust in an internet store: A cross-cultural validation. *Journal of Computer Mediated Communication, 5(2)*, 1-35.

Jiang, Y., Wen, Z, Adamic, L. A., Ackerman, M. S., & Lin, C. (2011). *Collaborating Globally: Culture and Organizational Computer-Mediated Communication*. Paper presented at the 32nd International Conference on Information Systems, Shanghai, China.

Jin, B., Park, J. Y., & Kim, J. (2008). Cross-cultural examination of the relationships among firm reputation, e-satisfaction, e-trust, and e-loyalty. *International Marketing Review, 25(3)*, 324-337.

Johns, S.K., Smith, L.M., & Strand, C.A. (2002). How culture affects the use of information technology. *Accounting Forum, 27(1)*, 84-109.

Karahanna, E., Evaristo, J.R., & Srite, M. (2002). Methodological issues in MIS cross-cultural research. *Journal of Global Information Management, 10(1)*, 48-55.

Keil, M., Tan, B.C.Y., Wei, K., Saarinen, T., Tuunainen, V., & Wassenaar, A. (2000). A cross-cultural study on escalation of commitment behavior in software projects. *MIS Quarterly, 24(2)*, 295-325.

Kim, D. (2008). Self-perception-based versus transference-based trust determinants in computer-mediated transactions: A cross-cultural comparison study. *Journal of Management Information Systems, 24(4)*, 13-45.

Kim, H.J., Choi, H., & Kim, J. (2010). A comparative study of the effects of low and high uncertainty avoidance on continuance behavior. *Journal of Global Information Management, 18(2)*, 1-29.

Kralisch, A., Eisend, M., & Berendt, B. (2005, July 22-27). *The Impact of Culture on Website Navigation Behaviour*. Paper presented at the Proceedings of the 11th International Conference on Human-Computer Interaction, Las Vegas, NV.

Landrum, H. T., Prybutok, V. R., Strutton, D., & Zhang, X. (2008). Examining the merits of usefulness versus use in an information service quality and information system success web-based model. *Information Resources Management Journal, 21(2)*, 1-17.

Lee, I., Choi, B., Kim, J., & Hong, S. J. (2007). Culture-technology fit: Effects of cultural characteristics on the post-adoption beliefs of mobile Internet users. *International Journal of Electronic Commerce, 11(4)*, 11-51.

Leidner, D.E., & Kayworth, T. (2006). A review of culture in information systems research: Toward a theory of information technology culture conflict. *MIS Quarterly, 30(2)*, 357-399.

Lim, K.H., Leung, K., Sia, C.L., & Lee, M.K.O. (2004). Is ecommerce boundary-less? Effects of individualism-collectivism and uncertainty avoidance on internet shopping. *Journal of International Business Studies 11(3)*, 51-87.

Lindell, M. K., & Whitney, D. J. (2001). Accounting for common method variance in cross-sectional research designs. *Journal of Applied Psychology, 86(1)*, 114-121.

Loiacono, E., Watson, R., & Goodhue, D. (2007). WebQual: An instrument for consumer evaluation of web sites. *International Journal of Electronic Commerce, 11(3)*, 51-87.

Luhmann, N. (1979). Trust and Power. Chichester, UK: Wiley.

Luna, D., Peracchio, L. A., & deJuan, M. D. (2002). Cross-cultural and cognitive aspects of web site navigation. *Journal of the Academy of Marketing Science, 30(4)*, 397-410.

Lundgren, H., & Walczuch, R. (2003). Moderated Trust - The impact of power distance and uncertainty avoidance on the consumer trust formation process in e-retailing. *RSEEM*, 31-53.

Malhotra, N. K., Kim, S. S., & Patil, A. (2006). Common method variance in IS research: A comparison of alternative approaches and a reanalysis of past research. *Management Science, 52(12)*, 1865-1883.

Marcus, A., & Gould, E. W. (2000). Crosscurrents: Cultural dimensions and global web user-interface design. *Interactions*, 32-46.

McKinney, V., Kanghyun, Y., & Zahedi, F. (2002). The measurement of web-customer satisfaction: An expectation and disconfirmation approach. *Information Systems Research, 13(3)*, 296-315.

McKnight, D. H., Choudhury, V., & Kacmar, C. (2002). Developing and validating trust measures for e-commerce: An integrative typology. *Information Systems Research, 13(3)*, 334-359.

Milberg, S.J., Burke, S.J., Smith, J.H., & Kallman, E.A. (1995). Rethinking copyright issues and ethics on the net: Values, personal information privacy, and regulatory approaches. *Communications of the ACM, 38(12)*, 65-73.

Murray, K. B., & Häubl, G. (2007). Explaining cognitive lock-in: The role of skill-based habits of use in consumer choice. *Journal of Consumer Research, 34*, 77-88.

Nunnally, J. (1967). *Psychometric Methods*. New York, NY: McGraw-Hill.

Oliver, R.L. (1980). A cognitive model of the antecedents and consequences of satisfaction decisions. *Journal of Marketing Research, 17(4)*, 460-469.

Palumbo, F., & Herbig, P. (2000). The multicultural context of brand loyalty. *European Journal of Innovation Management, 3(3)*, 116-125.

Parboteeah, D.V., Parboteeah, K.P., Cullen, J.B., & Basu, C. (2005). Perceived usefulness of information technology: A cross-national model. *Journal of Global Information Technology Management, 8(4)*, 29-48.

Park, S. J., & Weidenbeck, S. (2005). *Research-in-Progress: Designing Online Trust Research in the Context of the U.S., Korean, and Japanese Culture*. Paper presented at the SIGCCRIS Pre-ICIS Workshop, Las Vegas, NV.

Pavlou, P. A. (2003). Consumer acceptance of electronic commerce: Integrating trust and risk with the technology acceptance model. *International Journal of Electronic Commerce, 7(3)*, 101-134.

Pavlou, P. A., & Fygenson, M. (2006). Understanding and predicting electronic commerce adoption: An extension of the theory of planned behavior. *MIS Quarterly, 30(1)*, 115-143.

Png, I.P.L., Tan, B.C.Y., & Wee, K.L. (2001). Dimensions of national culture and corporate adoption of IT infrastructure. *IEEE Transactions on Engineering Management, 48(1)*, 36-45.

Rai, A., Lang, S. S., & Welker, R. B. (2002). Assessing the validity of is success models: An empirical test and theoretical analysis. *Information Systems Research, 13(1)*, 50-69.

Rai, A., Maruping, L., & Venkatesh, V. (2009). Offshore information systems project success: The role of social embeddedness and cultural characteristics. *MIS Quarterly, 33(3)*, 617-641.

Raudenbush, S.W., & Bryk, A.S. (2002). *Hierarchical Linear Models*. Thousand Oaks, CA: Sage.

Reimann, M., Lunemann, U.F., & Chase, R.B. (2008). Uncertainty avoidance as a moderator of the relationship between perceived service quality and customer satisfaction. *Journal of Service Research, 11(1)*, 63-73.

Ringle, C. M., Wende, S., & Will, A. (2005). *SmartPLS, Version 2.0 Beta*. Hamburg, Germany: University of Hamburg. Retrieved from http://www.smartpls.de.

Robbins, S.S., & Stylianou, A.C. (2001-2002). A Study of cultural differences in global corporate web sites. *Journal of Computer Information Systems*, 3-9.

Rodgers, W., Negash, S., & Suk, K. (2005). The moderating effect of online experience on the antecedents and consequences of on-line satisfaction. *Psychology and Marketing, 22(4)*, 313-331.

Seddon, P. B. (1997). A respecification and extension of the Delone and McLean model of is success. *Information Systems Research, 8(3)*, 240-253.

Shore, B., Venkatachalam, A.R., Solorzano, E., Burn, J.M., Hassan, S.Z., & Janczewski, L.J. (2001). Softlifting and piracy: Behavior across cultures. *Technology in Society, 23(4)*, 563-581.

Sia, C. L., Lim, K. H., Leung, K., Lee, M. K. O., Huang, W. W., & Benbasat, I. (2009). Web strategies to promote internet shopping: Is cultural-customization needed? *MIS Quarterly, 33(3)*, 491-512.

Simon, S. J. (2001). The impact of culture and gender on web sites: An empirical study. *The DATA BASE for Advances in Information Systems, 32(1)*, 19-37.

Singh, N., Zhao, H., & Hu, X. (2003). Cultural adaptation on the web: A study of American companies' domestic and Chinese websites. *International Journal of Global Information Management, 11(3)*, 63-80.

Srite, M., & Karahanna, E. (2006). The role of espoused national cultural values in technology acceptance. *MIS Quarterly, 30(3)*, 679-704.

Steensma, H.K., Marino, L., Weaver, M.K., & Dickson, P.H. (2000). The influence of national culture on the formation of technology alliances by entrepreneurial firms. *Academy of Management Journal, 43(5)*, 951-973.

Straub, D., Loch, K., R., Evaristo. J., Karahanna, E., & Srite, M. (2002). Toward a theory-based measurement of culture. *Journal of Global Information Management, 10(1)*, 13-23.

Straub, D.W. (1994). The effect of culture on it diffusion: E-mail and fax in Japan and the U.S. *Information Systems Research, 5(1)*, 23-47.

Straub, D.W., Keil, M., & Brenner, W. (1997). Testing the technology acceptance model across cultures: A three country study. *Information & Management, 33*, 1-11.

Straughan, R.D., & Albers-Miller, N.D. (2001). An international investigation of culture and demographic effects on domestic retail loyalty. *International Marketing Review, 18(5)*, 521-541.

Thatcher, J.B., Srite, M., Stepina, L.P., & Liu, Y. (2003). Culture, overload and personal innovativeness with information technology: Extending the nomological net. *Journal of Computer Information Systems, 44(1)*, 74-81.

Tsang, Eric, & Williams, John N. (2012). Generalization and induction: Misconceptions, clarifications, and a classification of induction. *MIS Quarterly, 36(3)*, 729-748.

Tsikriktsis, N. (2002). Does culture influence web site quality expectations? *Journal of Service Research, 5(2)*, 101-112.

van de Vijver, F., & Leung, K. (1997). *Methods and Data Analysis for Cross-Cultural Research*. Thousand Oaks, CA: SAGE Publications.

Vance, A., Elie-Dit-Cosaque, C., & Straub, D.W. (2008). Examining trust in information technology artifacts: The effects of system quality and culture. *Journal of Management Information Systems, 24(4)*, 73-100.

Wanous, J. P., Reichers, A. E., & Hudy, M. J. (1997). Overall job satisfaction: How good are single-item measures? *Journal of Applied Psychology, 82(2)*, 247-252.

Wolfinbarger, M., & Gilly, M. C. (2003). eTailQ: Dimensionalizing, measuring and predicting eTail quality. *Journal of Retailing, 79(3)*, 183-198.

Yoon, C. (2009). The effects of national culture values on consumer acceptance of e-commerce: Online shoppers in China. *Information & Management, 46*, 294-301.

Yoon, S.-J. (2002). The antecedents and consequences of trust in online purchase decisions. *Journal of Interactive Marketing, 16(2)*, 47-63.

Appendix A. Representative UA Studies in the IS Discipline

We identified two groups of studies: one set of studies, directly relevant to the current research, that focuses on the effect of UA on online behaviors (Table A1) and one set of studies that focuses on the impact of UA on other IS phenomena (Table A2). We limit our review to the first set of studies while drawing on insights from the second set where appropriate.

Citation	Methodology and Countries / Regions	Relevant Independent Variables	Relevant Dependent Variables	Comments
Choi & Geistfeld, 2004	Undergraduate students in the US and Korea. Koreans scored lower than the US on the *self-report* UA scale, even though Korea has a higher UAI score (85) than the US (46).	UA, IDV→ perceived risk UA → perceived self-efficacy IDV → normative beliefs	Online purchasing intention	For Koreans, UA led to an increase in perceived risk, thereby lowering intentions. For Americans, UA led to an increase in perceived self-efficacy, thereby increasing intentions. Koreans also scored higher on a measure of belief in uncertainty in online shopping, but there was no difference between Koreans and Americans in the importance of these uncertainty beliefs.
Cyr, 2008	Experiment and survey of experienced online shoppers from Canada (UAI=48; PDI=39; INV=80; MAS=52), Germany (UAI=65; PDI=35; INV=20; MAS=66), and China (UAI=30, but reported in the study as 60; PDI=80; INV=20; MAS=66).	Information design (ID), Navigation design (ND), Visual design (VD)	H 3a: Trust → E-Loyalty link hypothesized as stronger than Satisfaction → E-loyalty link for individuals from the higher UA countries. H4c and 4d: ID → Trust and ID → Satisfaction both hypothesized as significant for individuals from the lower UA countries. H6c and 6d: ND → Trust and ND → Satisfaction both hypothesized as significant for individuals from the lower UA countries.	The study reported partial support for most hypotheses, indicating the importance of design characteristics for websites used across cultures. However, these findings were based on an improper UAI score for China (60, not 30). Further, many tests yielded significant results for all 3 countries, implying no differences across the 3 cultures, or differences related only to effect size. H3a: Reported as "basically supported," but in fact not supported when using the correct UAI score for China. H4c: Reported as "supported," but in actuality was only partially supported when using the correct UAI score for China (China path should have been significant but wasn't). 4d: Reported as "partially supported," however, all 3 relationships were significant and had similar effect sizes, which would indicate no support for the hypothesis of differences across cultures. H6c and 6d: reported as "partially supported," but all 3 relationships were significant, with the order of strength matching what one would expect if using the correct UAI score for China.
El Said, 2005	Survey of Egyptian internet users, in regard to a specific internet book store. Used a *self-reported* measure of UA.	Perceived reputation (PR) → Trust Perceived familiarity (PF) →	Trust → Attitude Attitude → Willingness to Buy	Uncertainty avoidance was found to have an impact on the PR → Trust and PF → Trust relationships.

Citation	Methodology and Countries / Regions	Relevant Independent Variables	Relevant Dependent Variables	Comments
		Trust (Moderated by UA)		
Gefen & Heart, 2006	Experiment and survey using students from the US (UAI=46; PDI=40; INV=91; MAS=62) and Israel (UAI=81; PDI=13; INV=54; MAS=47), to simulate book shopping on Amazon.com	Trust processes (familiarity and predictability) → Trust beliefs (ability, integrity, and benevolence)	Trust behavioral intentions (inquiry intentions and purchase intentions) (Moderated by national culture; Ability → BI hypotheses based on UA)	Ability was found to contribute more to behavioral trusting intention to (1) inquire online and (2) purchase online for subjects from Israel, which has a higher UAI score than the US.
Ho et al., 2007	422 eBay auction data points from France (UAI=86; PDI=68; INV=71; MAS=43), Germany (UAI=65; PDI=35; INV=20; MAS=66), Taiwan (UAI=69; PDI=58; INV=17; MAS=45), and US (UAI=46; PDI=40; INV=91; MAS=62)	National culture (UA, PDI, IDV), Product categories	Level of use of Buy It Now (BIN) auctions by sellers	Hypothesis that UA has a negative impact on the level of use of BIN auctions by sellers was supported. Results further indicated that use of BIN auctions increases when it is easier to judge product quality.
Hwang, 2009	Experiment and survey of 209 undergraduate students in the US., based on a simulated Amazon.com purchase.	UA (individual level)	Trust (Benevolence, Integrity, Ability)	UA positively influenced Benevolence and Ability, but not Integrity.
Jarvenpaa & Tractinsky, 1999	Survey of 198 undergraduate students from Israel (UAI=81; PDI=13; INV=54; MAS=47); 184 respondents from Australia (UAI=51; PDI=36; INV=90; MAS=61); 115 consumers from Finland (UAI=59; PDI=33; INV=63; MAS=26).	Perceived Size, Perceived Reputation → Trust in Store	Trust in Store → Risk Perception, Attitude Risk Perception, Attitude → Willingness to Buy	Discusses uncertainty and risk in an e-commerce context, but only hypothesizes cross-cultural moderation effects based on individualism/collectivism.
Jin et al., 2008	Survey of 385 shoppers in the US (UAI=46, PDI=40; INV=91; MAS=62) and Korea (UAI=85, PDI=60; INV=18; MAS=39), based on the e-tailer they shopped at most frequently	Firm reputation → Trust (moderated by UA, IDV)	Trust → Satisfaction, Trust → Loyalty Satisfaction → Loyalty (moderated by UA, IDV)	No support was found for the hypothesis that high UA / low IDV cultures would be more likely to transfer perceptions of firm reputation into trust in the vendor. Results did indicate that the Satisfaction → Loyalty link differs across the two countries. This is based on Liu et al. (2001), who found that in high UA / low IDV cultures such as Korea, consumers are less likely to switch or complain when receiving poor service.
Kim, 2008	Survey of university students in the US ("Type I" culture;	Security protection, privacy concern, system reliability,	Trust in e-vendor → Willingness to use	Compared the construct relationships across two cultural "types" (Type I = Individualism, weak uncertainty avoidance,

Citation	Methodology and Countries / Regions	Relevant Independent Variables	Relevant Dependent Variables	Comments
	UAI=46) and South Korea ("Type II" culture; UAI=85)	third-party seal, referral		short-term orientation, and low context; Type II = Collectivism, strong uncertainty avoidance, long-term orientation, and high context)
Kim et al., 2010	Online survey of mobile data services in Korea and Hong Kong. Focused on the impact of *individual-level*, rather than country-level, UA effects.	Extrinsic motivational factors (post-usefulness, post-monetary value) Intrinsic motivational factors (post-ease of use, post-enjoyment)	Satisfaction → Continuance intention	Proposed that UA would strengthen the IV → DV relationships for extrinsic factors and weaken them for intrinsic factors. Hypotheses were only partially supported. Specifically, high UA was associated with higher mean values of PU, value, PEOU, satisfaction, and continuance intention. Also, PU, Value, and PEOU affect satisfaction more significantly in high UA than in low UA groups. No differences were found for PU → continuance intention between low and high UA groups.
Kralisch et al., 2005	Analyzed 5,136 web sessions recorded in log files from a multilingual website	National culture (UAI, LTO, and polychronism)	Website navigation patterns	Members of high UA cultures were hypothesized to collect more information on a given website than members of low UA cultures. Results supported the view of culturally differentiated navigation behavior.
Lee et al., 2007)	Online survey of mobile internet users in Korea (UAI=85; PDI=60; INV=18; MAS=39), Hong Kong (UAI=29; PDI=68; INV=25; MAS=57), and US (UAI=46; PDI=40), and Taiwan (UAI=69; PDI=58; INV=17; MAS=45), and US (UAI=46; PDI=40)	Level 1: Uncertainty avoidance, individualism, context, time perception Level 2: PU, PEOU, Perceived enjoyment, perceived monetary value	Level 3: Satisfaction Level 4: Continuance intention	UA had a significant negative impact on all Level 2 constructs, for all 3 countries. Individualism, context, and time perception all had a significant positive impact on the Level 2 constructs for all 3 countries. All four cultural dimensions also had a significant indirect effect on Satisfaction and Continuance Intention in all 3 countries.
Lim et al., 2004	Data from 36 countries, derived from interviews with 42,742 people.	UA, IDV, Trust	Internet Shopping Adoption Rate (ISAR)	Study focused on the adoption rate of countries. UA and IDV interact to predict ISAR. Trust also mediates the relationship between UA and ISAR.
Lundgren & Walczuch, 2003	Data were collected from 348 university students in the US (UAI=46, PDI=40; INV=91; MAS=62) and Italy (UAI=75, PDI=50; INV=76; MAS=70).	National culture (UA, PDI)	5 trust formation processes (calculative, prediction, capability, intentionality, transference)	The hypothesized influence of UA was only supported for the calculative process. The authors found that high UA consumers are more likely to form trust in an e-retailer via the calculative process. The results also indicated that UA has an effect on the overall level of trust with low UA cultures being more generally trusting in e-retailing.
Robbins & Stylianou, 2001-2002	Content analysis of the websites of 90 large global corporations	National culture (language plus Hofstede's 5 dimensions)	Frequency of website cultural indicators for each of the cultural dimensions.	Investigated whether websites of global corporations exhibit differences based on national culture. The authors concluded that multinational organizations should continue to develop websites tailored to the language and cultures of the major countries in which they conduct business.

Citation	Methodology and Countries / Regions	Relevant Independent Variables	Relevant Dependent Variables	Comments
Simon, 2001	Student experiment using the Asia, Europe, Latin & South America, and North America cultural clusters	Interaction between Hofstede's cultural dimensions and gender	Degree to which the site is perceived as appropriate for their home country, Satisfaction with the site	"Uncertainty avoidance and time orientation were eliminated…since they failed to discriminate the subject groups, possibly because online purchasing, being a relatively new innovation for consumers, could be interpreted by the subjects as inherently uncertain and short-term in time orientation" (p.23).
Singh et al., 2003	Content analysis of 40 US and 40 Chinese Fortune 500 company websites	National culture (UAI, IDV, PDI, MAS, and high/low context)	Frequency of website cultural markers for each of the cultural dimensions.	Results indicated that country-specific websites had cultural markers indicating a look and feel unique to their local culture.
Tsikriktsis, 2002	Survey of 171 MBA students from North and South America; Western, Eastern, and Southern Europe, and Australasia, in regard to Web banking services.	National culture (UAI, IDV, LTO, MAS)	Website quality expectations (measured via WEBQUAL) Hypothesized that customers in high UA cultures would have *higher expectations* about a website's responsiveness, trust, and flow-emotional appeal, but *lower expectations* about interactivity, design, and visual appeal.	UA had no impact on website quality expectations. However, high MAS and LTO were associated with higher website quality expectations.
Vance et al., 2008)	Survey of 116 graduate students from France (UAI=86; PDI=68; INV=71; MAS=43) and 135 graduate students from the US (UAI=46; PDI=40; INV=91; MAS=62), in regard to mobile commerce portals	UA (proposed direct negative effect on Trusting beliefs) System quality perceptions (navigational structure [NS], visual appeal [VA])	Trusting beliefs in IT artifact (NS → Trusting beliefs and VA → Trusting beliefs relationships proposed as moderated by UA)	All hypotheses supported except for the moderating effect of UA on VA-Trusting beliefs, which was nonsignificant.
Yoon, 2009	Survey of 270 Chinese university students, in regard to use of an online shopping mall. Used a *self-reported measure of UA*.	PEOU → PU PEOU → Trust	PEOU → Intent to use (moderated by MAS) PU → Intent to use (moderated by UAI and MAS) Trust → Intent to use (moderated by UAI, PDI, LTO, and IDV)	UA moderates the relationships such that the higher UA, the lower the effect of both PU and trust on intentions. The author described UA as a quasi-moderator as it had a significant direct effect on intention along with significant moderating effects.

Note: UAI=Uncertainty Avoidance Index, PDI=Power Distance Index, IDV=Individualism/Collectivism Index, MAS=Masculinity/Femininity Index, LTO=Long Term Orientation Index. All indices are based on culture scores provided by Hofstede (1980).

Table A1. Representative studies regarding UA's effect on B2C e-commerce.

Citation	Methodology and Countries / Regions	Relevant Independent Variables	Relevant Dependent Variables	Comments
Callahan, 2005	Content analysis of university websites in Greece (UAI=112) and Denmark (UAI=23)	National culture (UA, PDI, IDV, MAS)	Number of links (-), frequency of horizontal pages (+), relative frequency of abstract images (+)	Study included 14 hypotheses correlating various website design features to Hofstede's cultural dimensions. Correlations were nonsignificant for all three hypotheses related to UA, with the last two correlations in the opposite direction as hypothesized.
Chung & Adams, 1997	Survey of US (UAI=46) and Korean (UAI=85) business firms	Group decision-making characteristics	Group decision-making process and outcomes (moderated by national culture)	No significant differences found across the two cultures in group decision-making behaviors. Authors discussed implications for group decision support systems.
Downing et al., 2003	Interpretive field study of US (UAI=46, IDV=91) and Japanese (UAI=92, IDV=46) organizations	National culture	Choice of IT for employee empowerment	Japanese organizations select information rich, socially present forms of media, whereas US organizations choose more lean forms of electronic media. Differences across the two cultures are attributed to both UA and IDV.
Garfield & Watson, 1998	Content analysis of government national information infrastructure (NII) archives across 7 countries	National culture (particularly focusing on UA and PDI)	Structure of NII	National culture was found to be important in NII development. Similar development models existed for countries with similar UAI and PDI scores.
Hasan & Ditsa, 1999	Interpretive field study of 10 organizations from the Middle East, Africa, and Australia.	National culture	Technology transfer outcome	Since technology is perceived as inherently risky, it is less readily adopted in cultures high in UA.
Johns et al., 2002	Survey of 78 multinational corporations (MNCs)	National culture (UA and IDV)	Patterns of IT utilization	MNCs from low UA cultures are more likely to embrace new technologies.
Keil et al., 2000	Experiments with participants from Finland, Singapore, and the Netherlands	Risk propensity, sunk cost, risk perception	Willingness to continue with a troubled IT project (moderated by national culture)	Low UA cultures such as Singapore perceive less risk, and therefore are more likely to continue a troubled project.
Milberg et al., 1995	Survey of 900 IS audit and control respondents from 30 countries	National culture	Regulatory approaches to privacy, nature of privacy concerns	Respondents from high UA and high PDI countries indicated higher levels of government involvement in privacy regulation. Impact of UA cannot be isolated from the impact of PDI.
Parboteeah et al., 2005	26,999 individuals from 24 countries.	Social institutions (degree of industrialization, religiosity, social inequity), National culture (UA, MAS, IDV)	Perceived usefulness (PU) of IT	Results support all hypotheses except those for religiosity and IDV. UA was found to be negatively related to the PU of IT.
Png et al., 2001	Survey of 153 org's in 23 countries	Organizational size, national culture (UA, PDI)	IT infrastructure adoption (frame relay)	Organizations from high UA countries were less likely to adopt; no significant impacts detected for PDI.

Citation	Methodology and Countries / Regions	Relevant Independent Variables	Relevant Dependent Variables	Comments
Shore et al., 2001	Survey of students from the US, New Zealand, Hong Kong, and Pakistan	Gender, usage, age, experience	Attitudes toward intellectual property rights (moderated by national culture)	Students from high UA countries did not perceive more of an ethical problem with software piracy violations.
Srite & Karahanna, 2006	2 separate studies (223 US undergraduate students and investigating PC use; 116 MBA students and investigating PDA use)	PU, PEOU, SN	Behavioral Intention to Use (moderated by espoused national culture, including espoused UA)	Espoused UA moderates the impact of SN on BI.
Steensma et al., 2000	Survey of SMEs from 5 countries	National culture (UA, MAS)	Propensity to form technology alliances	SMEs from Mexico (high UA, high MAS) had the greatest tendency to form alliances with others.
Straub, 1994	Multimethod study of US (UAI=46) and Japanese (UAI=92) workers	PU, PEOU	Media use (email and fax) (moderated by UA)	UA influences the diffusion rate of email technology. Japanese workers (high UA culture) prefer information rich, socially present communication forms, and are thus less likely to adopt and use email.
Straub et al., 1997	Survey of 393 knowledge workers from the US, Switzerland, and Japan, regarding acceptance of email technology.	PEOU, PU	System use	Predicted that the TAM model would hold for the US and Switzerland, but not for Japan, based on national culture scores (UAI, PDI, IDV, MAS, and an index composed of all four). Results supported the hypotheses.
Thatcher et al., 2003	Survey of 211 US college students	National culture, qualitative and quantitative work overload	Personal innovativeness with IT (PIIT)	Individuals high in UA and PDI may be less willing to innovate or experiment with IT.

Note: UAI=Uncertainty Avoidance Index, PDI=Power Distance Index, IDV=Individualism/Collectivism Index, MAS=Masculinity/Femininity Index (indices based on Hofstede culture scores.

Table A2. Representative studies regarding UA's effect in other areas of IS research.

Appendix B. Countries in Sample

Country	Cultural Dimension Score				N
	Uncertainty Avoidance	Individualism Collectivism	Masculinity Femininity	Power Distance	
Greece	112	35	57	60	2
Portugal	104	27	31	63	1
Belgium	94	75	54	65	14
El Salvador	94	19	40	66	2
Japan	92	46	95	54	38
Peru	87	16	42	64	1
Argentina	86	46	56	49	5
Costa Rica	86	15	21	35	2
France	86	71	43	68	17
Spain	86	51	42	57	8
Turkey	85	37	45	66	1
Mexico	82	30	69	81	28
Israel	81	54	47	13	7
Colombia	80	13	64	67	2
Brazil	76	38	49	69	8
Venezuela	76	12	73	81	2
Italy	75	76	70	50	22
Austria	70	55	79	11	6
Taiwan	69	17	45	58	1
Germany	65	67	66	35	67
Finland	59	63	26	33	9
Switzerland	58	68	70	34	14
Australia	51	90	61	36	38
Norway	50	69	8	31	8
New Zealand	49	79	58	22	7
South Africa	49	65	63	49	8
Canada	48	80	52	39	70*
Indonesia	48	14	46	78	2
United States	46	91	62	40	70*
Philippines	44	32	64	94	2
India	40	48	56	77	4
Malaysia	36	26	50	104	2
Ireland	35	70	68	28	13
United Kingdom	35	89	66	35	70*
Hong Kong	29	25	57	68	5
Sweden	29	71	5	31	6
Denmark	23	74	16	18	9
Singapore	8	20	48	74	6

* In the original sample, US, UK, and Canada have 2593, 380, and 158 observations respectively. We randomly selected 70 observations from each of these countries to include in the final analysis.

Appendix C. Multilevel Model Specification

e-Loyalty individual-level model:

$$loy_{ij} = \beta_{s0j} + \beta_{s1j} \cdot trust_{ij} + \gamma_{s2} \cdot pu_{ij} + \gamma_{s3} \cdot sat_{ij} + \beta_{s4j} \cdot \exp er_{ij} + \varepsilon_{sij}$$

e-Loyalty country-level model:

$$\beta_{s0j} = \gamma_{s00} + \gamma_{s01} \cdot IDV_j + \gamma_{s02} \cdot UAI_j + \gamma_{s03} \cdot MAS_j + \gamma_{s04} \cdot PDI_j + u_{s0j}$$

$$\beta_{s1j} = \gamma_{s10} + \gamma_{s11} \cdot UAI_j + u_{s1j}$$

$$\beta_{s4j} = \gamma_{s40} + \gamma_{s41} \cdot UAI_j + u_{s4j}$$

e-Loyalty cross-level model:

$$loy_{ij} = (\gamma_{s00} + \gamma_{s01} \cdot IDV_j + \gamma_{s02} \cdot UAI_j + \gamma_{s03} \cdot MAS_j + \gamma_{s04} \cdot PDI_j + u_{s0j})$$
$$+ (\gamma_{s10} + \gamma_{s11} \cdot UAI + u_{s1j}) \cdot trust_{ij}$$
$$+ \gamma_{s2} \cdot pu_{ij} + \gamma_{s3} \cdot sat_{ij}$$
$$+ (\gamma_{s40} + \gamma_{s41} \cdot UAI_j + u_{s4j}) \cdot \exp er_{ij} + \varepsilon_{sij}$$
$$= \gamma_{s00} + \gamma_{s01} \cdot IDV_j + \gamma_{s02} \cdot UAI_j + \gamma_{s03} \cdot MAS_j + \gamma_{s04} \cdot PDI_j$$
$$+ \gamma_{s10} \cdot trust_{ij} + \gamma_{s2} \cdot pu_{ij} + \gamma_{s3} \cdot sat_{ij} + \gamma_{s40} \cdot \exp er_{ij}$$
$$+ \gamma_{s11} \cdot UAI_j \cdot trust_{ij} + \gamma_{s41} \cdot UAI_j \cdot \exp er_{ij}$$
$$+ u_{s0j} + u_{s1j} \cdot trust_{ij} + u_{s4j} \cdot \exp er_{ij} + \varepsilon_{sij}$$

Perceived usefulness individual-level model:

$$pu_{ij} = \beta_{u0j} + \beta_{u1j} \cdot trust_{ij} + \beta_{u2j} \cdot sq_{ij} + \beta_{u3j} \cdot iq_{ij} + \gamma_{u4} \cdot \exp er_{ij} + \varepsilon_{uij}$$

Perceived usefulness country-level model:

$$\beta_{u0j} = \gamma_{u00} + \gamma_{u01} \cdot IDV_j + \gamma_{u02} \cdot UAI_j + \gamma_{u03} \cdot MAS_j + \gamma_{u04} \cdot PDI_j + u_{u0j}$$

$$\beta_{u1j} = \gamma_{u10} + \gamma_{u11} \cdot UAI_j + u_{u1j}$$

$$\beta_{u2j} = \gamma_{u20} + \gamma_{u21} \cdot UAI_j + u_{u2j}$$

$$\beta_{u3j} = \gamma_{u30} + \gamma_{u31} \cdot UAI_j + u_{u3j}$$

Perceived usefulness cross-level model:

$$pu_{ij} = (\gamma_{u00} + \gamma_{u01} \cdot IDV_j + \gamma_{u02} \cdot UAI_j + \gamma_{u03} \cdot MAS_j + \gamma_{u04} \cdot PDI_j + u_{u0j})$$
$$+ (\gamma_{u10} + \gamma_{u11} \cdot UAI_j + u_{u1j}) \cdot trust_{ij}$$
$$+ (\gamma_{u20} + \gamma_{u21} \cdot UAI_j + u_{u2j}) \cdot sq_{ij}$$
$$+ (\gamma_{u30} + \gamma_{u31} \cdot UAI_j + u_{u3j}) \cdot iq_{ij} + \gamma_{u4} \cdot \exp er_{ij} + \varepsilon_{uij}$$
$$= \gamma_{u00} + \gamma_{u01} \cdot IDV_j + \gamma_{u02} \cdot UAI_j + \gamma_{u03} \cdot MAS_j + \gamma_{u04} \cdot PDI_j$$
$$+ \gamma_{u10} \cdot trust_{ij} + \gamma_{u20} \cdot sq_{ij} + \gamma_{u30} \cdot iq_{ij} + \gamma_{u4} \cdot \exp er_{ij}$$
$$+ \gamma_{u11} \cdot UAI \cdot trust_{ij} + \gamma_{u21} \cdot UAI \cdot sq_{ij} + \gamma_{u31} \cdot UAI \cdot iq_{ij}$$
$$+ u_{u0j} + u_{u1j} \cdot trust_{ij} + u_{u2j} \cdot sq_{ij} + u_{u3j} \cdot iq_{ij} + \varepsilon_{uij}$$

Satisfaction individual-level model:

$$sat_{ij} = \beta_{t0j} + \beta_{t1j} \cdot pu_{ij} + \beta_{t2j} \cdot sq_{ij} + \beta_{t3j} \cdot iq_{ij} + \gamma_{t4} \cdot \exp er_{ij} + \varepsilon_{tij}$$

Satisfaction country-level model:

$$\beta_{t0j} = \gamma_{t00} + \gamma_{t01} \cdot IDV_j + \gamma_{t02} \cdot UAI_j + \gamma_{t03} \cdot MAS_j + \gamma_{t04} \cdot PDI_j + u_{t0j}$$

$$\beta_{t1j} = \gamma_{t10} + \gamma_{t11} \cdot UAI_j + u_{t1j}$$

$$\beta_{t2j} = \gamma_{t20} + \gamma_{t21} \cdot UAI_j + u_{t2j}$$

$$\beta_{t3j} = \gamma_{t30} + \gamma_{t31} \cdot UAI_j + u_{t3j}$$

Satisfaction cross-level model:

$$sat_{ij} = (\gamma_{t00} + \gamma_{t01} \cdot IDV_j + \gamma_{t02} \cdot UAI_j + \gamma_{t03} \cdot MAS_j + \gamma_{t04} \cdot PDI_j + u_{t0j})$$
$$+ (\gamma_{t10} + \gamma_{t11} \cdot UAI + u_{t1j}) \cdot pu_{ij}$$
$$+ (\gamma_{t20} + \gamma_{t21} \cdot UAI + u_{t2j}) \cdot sq_{ij}$$
$$+ (\gamma_{t30} + \gamma_{t31} \cdot UAI + u_{t3j}) \cdot iq_{ij} + \gamma_{t4} \cdot \exp er_{ij} + \varepsilon_{tij}$$

$$= \gamma_{t00} + \gamma_{t01} \cdot IDV_j + \gamma_{t02} \cdot UAI_j + \gamma_{t03} \cdot MAS_j + \gamma_{t04} \cdot PDI_j$$
$$+ \gamma_{t10} \cdot pu_{ij} + \gamma_{t20} \cdot sq_{ij} + \gamma_{t30} \cdot iq_{ij} + \gamma_{t4} \cdot \exp er_{ij}$$
$$+ \gamma_{t11} \cdot UAI_j \cdot pu_{ij} + \gamma_{t21} \cdot UAI_j \cdot sq_{ij} + \gamma_{t31} \cdot UAI_j \cdot iq_{ij}$$
$$+ u_{t0j} + u_{t1j} \cdot pu_{ij} + u_{t2j} \cdot sq_{ij} + u_{t3j} \cdot iq_{ij} + \varepsilon_{tij}$$

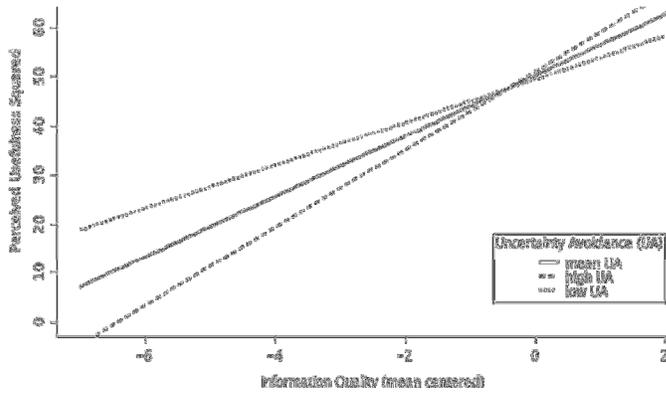# Appendix D. Interaction Plots for Significant UA Moderating Effects

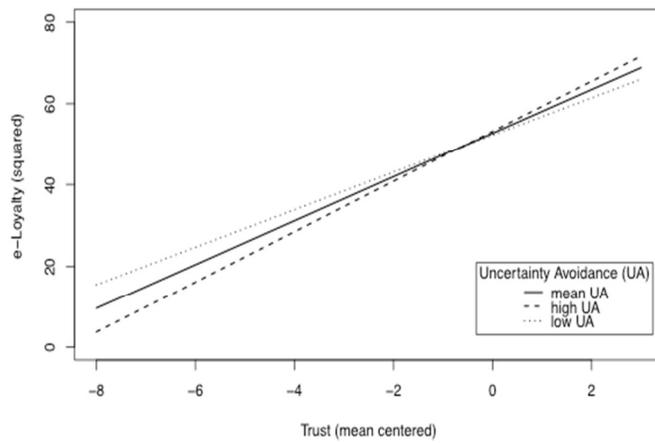*Figure D1. Moderating effect of UA on the relationship between IQ and PU.*

Figure D2. Moderating Effect of UA on the Relationship between Trust and e-Loyalty.
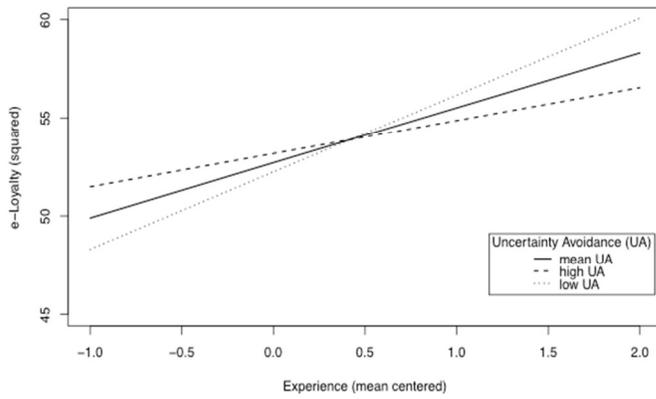
Figure D3. Moderating Effect of UA on the Relationship between Experience and e-Loyalty.