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# Measuring Web-based Service Quality: The Online Customer Point of View

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## Abstract

*In recognition of the expanding role of the web as a channel of conducting business, vast investments in web technologies have been witnessed. Using web technologies and their applications enables firms reaching more customers, trading with customers and offering them a smooth purchase transaction. However, firms cannot realize returns on their investments, unless they are offering superior web-based service quality to their customers. It is therefore, important to develop the appropriate instrument to measure web-based service quality. The current study proposes and tests a conceptual framework of web-based service quality by using the SERVQUAL measure as its starting point. In addition, the study examines the influence of identified dimensions of web-based service quality on overall service quality and loyalty intentions. Reformulating the generic dimensions of the SERVQUAL resulted in measuring web-based service quality on six dimensions: website usability, information quality, reliability, responsiveness, assurance and personalization. The analytical work of the study suggests that assurance and reliability are the most important factors that influence both overall service quality and loyalty intentions. The study ends providing implications for research as well as for practice. Limitations are also addressed.*

Keywords: IS success, service quality, SERVQUAL, E-commerce, Loyalty, scale development, structural analysis

## Introduction

In spite of some initial misgivings and considerable media hype, electronic retailing (e-retailing) has begun to take off. According to Forrester (2005), e-retailing is expected to grow from nearly \$172 billion in 2005 to \$329 billion in 2010. The U.S. Census Bureau in its 2004 quarterly report reported that despite the small fraction of online sales of all retail sales (under 2%), it has increased by 26.4% from 2002 to 2003, i.e. more than the increase in total retail sales which was only 5.3% for the same period (U.S. Census Bureau, 2004). On the customers' side, online shopping is considered as the third most frequent activity immediately following e-mail use and web browsing (Zhang & Li, 2002). A study by Jupiter (2006) estimated that 71% of Internet users go online to purchase products in 2010 compared to merely 56% in 2005. Not surprisingly, companies are becoming more aware of the importance of their web presence and the implications on their success and profitability (Aladwani & Palvia, 2002; Bhattacharjee, 2001). Increasing investments in web-based technologies and their applications that aim to provide high quality service have been reported (Aladwani & Palvia, 2002). However, a survey of 10,000 online shoppers of 16 leading US firms, found that 63% of shoppers were unsatisfied with the level of web-based service quality they experienced (Bhattacharjee, 2001; Lehman, 2000). Such dissatisfaction translates into the failure of about two thirds of online firms to achieve profitability (Huang, 2002). Industry reports as well as academic research show that firms face several problems in understanding the context of web-based service quality (Li et al., 2002; Parasuraman et al., 2005).

According to Zeithaml et al. (2000), web-based service quality is the extent the web facilitates effective shopping, purchasing and delivery of products and services. In contrast to web-based service quality that still lacks maturity in measurement, service quality in traditional stores has received extensive research attention providing a strong basis for defining and measuring service quality (Parasuraman et al., 2005). A combination of theoretical and empirical research on traditional service quality resulted in developing the SERVQUAL model. The SERVQUAL model has five dimensions: tangibles (appearance of physical facilities, equipment, personnel and communication materials), reliability (ability to perform the promised service dependably and accurately), responsiveness (willingness to help customers and provide prompt services), assurance (knowledge and courtesy of employees and their ability to convey trust and confidence) and empathy (the caring and individualized attention provided to the customers) (Parasuraman et al. 1988). The SERVQUAL instrument demonstrates a wide acceptance and high reliability across the spectrum of different industries such as traditional stores, healthcare, tourism, festivals, the automobile industry and information systems (Li et al., 2002).

Although past research on information system service quality has employed the SERVQUAL model by rewording its existing items (e.g., Pitt et al., 1995; Kettinger & Lee, 1995; Li et al., 2002), academic research has found that relevant aspects of service quality in traditional facilities (e.g., outlets, restaurants, etc), cannot simply be employed in the context of technology-based environments (Parasuraman & Grewel, 2000). Moreover, Lee and Lin (2005) suggest that SERVQUAL needs to be reformulated before measuring web-based service quality. As a result, this research re-structures the generic dimensions of SERVQUAL to be used effectively for measuring web-based service quality. Nevertheless, few studies have tested the influence of the dimensions of web-based service quality on loyalty intentions. Specifically, this study aims to do the following:

1. Identifying key dimensions of web-based service quality
2. Exploring the influence of web-based service quality-identified dimensions on overall service quality and loyalty intentions

The remainder of this paper is organized as follows. The second section provides the literature review on service quality and its role in measuring IS effectiveness. Next, the research model and hypotheses are presented. The fourth section explains the research methodology of the study. Results of analytical work are discussed in section five. The paper ends with conclusion and implications.

## Literature review

Business-to-consumer (B2C) electronic commerce can be viewed as innovative information systems (Bhattacherejee, 2001; Wigand, 2003 & 1997) and its service quality is one of the important dimensions of its effectiveness measures (Delone & McLean, 2003). Pitt et al. (1995) observed that “commonly used measures of IS effectiveness focus on the product rather than the service of the IS function. Thus, there is a danger that IS researchers will mismeasure IS effectiveness if they do not include in their assessment package a measure of IS service quality” (p. 173). As a result, several researchers cited the need for service quality measure to be a part of the IS success measure (DeLone & McLean, 2003; Pitt et al., 1995). Past research on IS service quality has applied the SERVQUAL model to measure IS based service quality (Jiang et al., 2002; Kettinger & Lee, 1994; Pitt et al., 1995). The SERVQUAL instrument uses the dimensions of tangibles, reliability, responsiveness, assurance and empathy to measure service quality. Furthermore, several studies applied the SERVQUAL model to measure service quality in the context of web-based information systems. For example, Sullivan and Walstrom (2001) applied the five dimensions of the SERVQUAL model to measure service quality of web-based book dealers. Similarly, Barnes and Vidgen (2002) developed the WebQual scale including the five factors: usability, design, information, trust and empathy. The scale was built by carefully rewording the original dimensions of SERVQUAL to suit online book stores. Another study by Iwwarden et al. (2003) used the SERVQUAL model to identify five dimensions of web-based service quality: fast access, easy navigation on the website, presentation of complete overview of the order before final purchase decision, assurance and simple registration process. A study focused on online traveling websites conducted by van Riel et al (2004) resulted in having service quality, navigation, design accessibility, reliability and customization as the dimensions of web-based service quality.

Previous studies on web-based service quality focused only on the application of the SERVQUAL model by rewording or dropping its existing items (Lee & Lin, 2005). However, academic research has found that relevant aspects of service quality in traditional outlets cannot simply be employed in the context of web-based information systems (Parasuraman et al., 2005). Lee and Lin (2005) have suggested reformulating the SERVQUAL model to be used meaningfully in the context of web-based service quality measurement. Accordingly, the current study restructures the dimensions of the SERVQUAL model as proposed in the next section.

## Research model and hypotheses

Existing literature on web-based service quality remains insufficient to provide a conceptual model of web-based service quality (Wolfenbarger & Gilly, 2003). Therefore, the current study uses the SERVQUAL model as its starting point to be restructured proposing that web-based service quality as a multi-dimensional construct that is composed of interface design, website usability, information quality, reliability, responsiveness, assurance and personalization. The model suggests that dimensions of web-based service quality are causally linked to two output measures: the overall service quality and loyalty intentions (see figure 1).

### *Web-based service quality dimensions*

This study restructures the SERVQUAL model to develop a framework for measuring web-based service quality utilizing the following dimensions: interface design, website usability, information quality, reliability, responsiveness, assurance and personalization, as discussed below.

## **Tangibles**

The tangibles dimension of the SERVQUAL model refers to physical facilities, equipment and the appearance of personnel. Tangibles in the context of the web can be re-formulated into website design and website usability (Zeithaml et al., 2000). Hence, the following hypotheses are proposed:

*H1a: Interface design influences positively overall service quality*

*H1b: Interface design influences positively customer loyalty*

*H2a: Website usability influences positively overall service quality*

*H2b: Website usability influences positively customer loyalty*

## **Reliability**

Reliability is perhaps the most important dimension of service quality in traditional and virtual stores (Parasuraman et al., 1988). Reliability in the offline context is defined as “the ability to perform the promised service dependably and accurately” (Parasuraman et al., 1988, p. 23). Some authors addressed reliability from the service approach as providing the service as it is promised, while others consider it as a technical issue defined by the quality of information the web presents (van Riel et al., 2003). Therefore, we re-structure web-based reliability into information quality and service reliability. Accordingly, we propose:

*H3a: Information quality influences positively overall service quality*

*H3b: Information quality influences positively customer loyalty*

*H4a: Reliability influences positively overall service quality*

*H4b: Reliability influences positively customer loyalty*

## **Responsiveness**

Responsiveness in the context of e-commerce can be described as the website’s ability to give prompt service and to respond to customers’ complaints and questions quickly, efficiently and handle them in a prompt manner (Zeithaml et al., 2000). Some aspects of this dimension are automated email responses, human e-mails and offering a relevant Frequently Asked Questions (FAQs) webpage. Hence, we posit the following:

*H5a: Responsiveness influences positively overall service quality*

*H5b: Responsiveness influences positively customer loyalty*

## **Assurance**

Assurance in traditional stores refers to general trustworthiness. Zeithaml et al. (2000) refer to assurance in virtual space as “...the degree to which customers believe the site is safe from intrusion and personal information is protected ... involves the confidence the customer feels in dealing with the site and is due to the reputation of the site and the products or services it sells” (p. 16). Accordingly, we propose the following hypotheses:

*H6a: Assurance influences positively overall service quality*

*H6b: Assurance influences positively customer loyalty*

**Empathy**

According to Zeithaml et al. (2000), personalization and customization in virtual space are equivalent to empathy in traditional bricks-and-mortar stores. Personalization can be translated to offering the customer customized products, personalized recommendations and individualized attention (Lee & Lin, 2005). The following hypotheses are proposed:

*H7a: Personalization influences positively overall service quality*

*H7b: Personalization influences positively customer loyalty*

The proposed research model (see figure 1) is tested considering a number of methodological issues as discussed next.

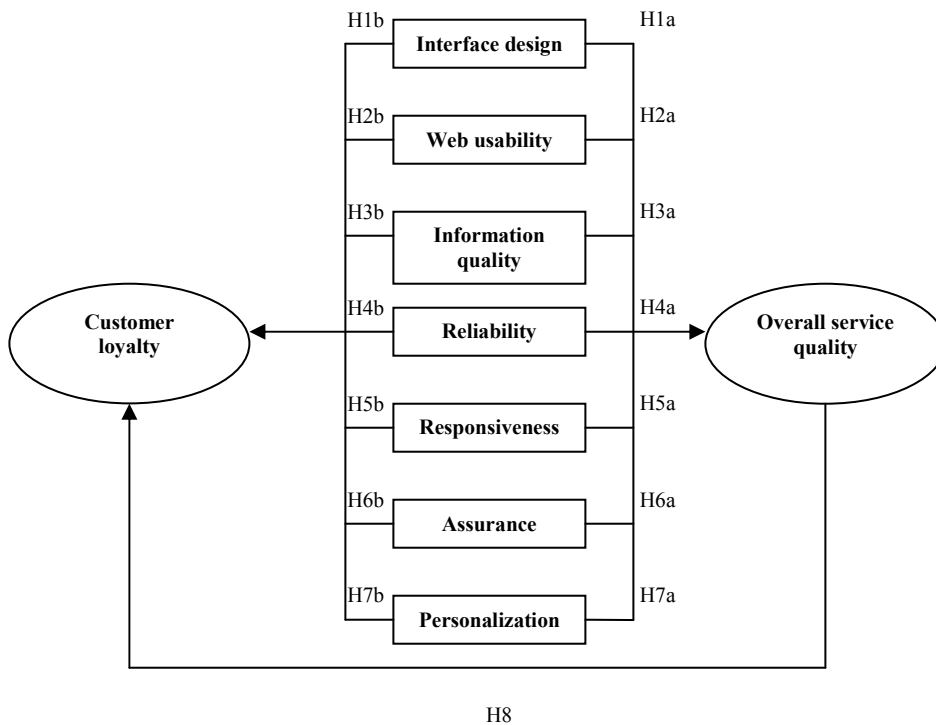


Figure 1. Research model

**Research methodology**

To test our conceptual framework, an online questionnaire was developed by reviewing prior research from service quality, IS service quality and web-based service quality. Some methodological issues were considered in conducting research work as discussed below.

### ***Subject selection***

According to Zeithaml et al. (1990), "the only criteria that count in evaluating service quality are defined by customers. Only customers judge quality; all other judgments are essentially irrelevant" (p. 16). Accordingly, the study develops the scales of web-based service quality from the perceptions of online shoppers. For the purpose of this study, college students of a mid-size university in the South were invited to participate. According to Jupiter (2004), the young adult population is the most active among web users. Moreover, about 86% of college students have unlimited free access to the Internet and were rather familiar with the medium (Walczuch & Lundgren, 2002). Additionally, 81 % of college students have made an online purchase for products (64 % compact disks, 58% books and 42% clothing) (Pastore, 2000) which are the type of products this study focuses on. More importantly, the use of students in this study decreases the effect of variance on web-based literacy when not exposed to all factors (structure, roles and responsibilities) of the real world environment (Lee & Lin, 2005). As a result, we believe that samples of college students resemble the Internet shoppers' population.

### ***Measures and data collection***

Measures of the dimensions of web-based service quality were adopted from the relevant literature. Items of overall service quality were revised from Lee and Lin (2005) and Wolfinbarger and Gilly (2003), while measures of loyalty intention were adopted from Parasuraman et al. (2005). All items were measured using seven-point Likert-type scales ranging from (1) strongly disagree to (7) strongly agree.

The obtained sample size (N = 315) is considered sufficient and exceeds the recommendation of five cases to one item in conducting multivariate data analysis (Hair et al., 1998). The age profile of participants represents most age groups, with the majority (45 %) being in the 21 to 30 age range and sixty-eight percent of the respondents were men. As a result, the sample is considered representative of the United States Internet users (Burns, 2005). Next to collecting data, analytical work has been conducted as discussed in the following section.

## **Results**

In order to capture the key factors of web-based service quality, an exploratory factor analysis was conducted. Then the research model was tested using Structural Equation Modeling (SEM) by following a two-step process recommended by Anderson and Gerbing (1988). First, a measurement model was developed by conducting confirmatory factor analysis. Second, a structural model was developed to test the research hypotheses.

### ***Conducting exploratory factor analysis***

An Exploratory Factor Analysis (EFA) was conducted to identify the number of factors that adequately represent the underlying dimensions of web-based service quality. According to Garson (2006), it is recommended to use Principal Axis Factoring (PAF) as extraction method and Varimax rotation when the factors are going to be used in a subsequent analysis. Since our goal is to maintain the items with the most significant loadings in obtaining an interpretative factor solution, the cut-off point of 0.50 for items loadings and eigenvalue of value of one were used (Hair et al., 1998). The factor analysis resulted in a six-factor solution that is composed of website usability (the extent to which the website is well-structured and easy to navigate), information quality (the extent to which the website offers high content quality), reliability (the extent to which the website performs services as promised), responsiveness (the extent to which it is possible to get a quick response and needed help using automated and human factors), assurance (the extent to which the website conveys trust and

confidence), and personalization (the extent to which the website provides individualized attention). Items that represent the dimension of interface design were eliminated in terms of loading significantly on more than one dimension and low correlation with items of the same trait (Hair et al., 1998). Li et al. (2002) suggest that customer preferences on such items may not be always linear. For example, some online shoppers may prefer high quality graphics, while others may prefer a simpler interface that does not include excessive flash animation.

### ***Conducting confirmatory factor analysis***

Confirmatory Factor Analysis (CFA) was conducted by developing a measurement model that describes the nature between the constructs and the indicator variables (Hatcher, 1994). The resulting model was evaluated for goodness-of-fit, reliability and validity. Variety of indices were used to assess the model's goodness of fit such as normed Normed  $\chi^2$  (Ratio of the chi-square to the degrees of freedom), Goodness of Fit Index (GFI), Bentler's Comparative Fit Index (CFI), the Bentler & Bonett Non-Normed Fit Index (NNFI) and the and Root Mean Square Error of Approximation (RMSEA) (Hatcher, 1994). The Normed  $\chi^2$  was 1.75 less than the cut-off value of 3.0 suggested by Bagozzi and Yi (1988). Goodness of Fit Index (GFI) value was 0.95 indicating a good fit (Bagozzi & Yi, 1988), while both of the CFI test and the NNFI test were 0.94 exceeding the cut-off value of 0.90 indicating a very good incremental fit (Hair et al., 1998; Hatcher, 1994). The value of the RMSEA was .047 indicating a good fit (Hatcher, 1994) (see table 1).

### ***Reliability and validity assessment***

The developed scales demonstrated strong psychometric properties based on findings from a variety of reliability and validity indices. Reliability of scales was assessed using Cronbach's alpha (Hatcher, 1994). Obtained reliability values exceeded the cut-off value of 0.80 indicating a strong reliability (Hatcher, 1994). The validity of scales was assessed considering convergent and discriminant validity. All items loaded on its factors with factor loadings exceeding 0.70 indicating convergent validity (Bagozzi & Yi, 1988). Discriminant validity was assessed using the confidence interval test. None of the calculated confidence intervals included a value providing evidence on the discriminant validity of scales (Hatcher, 1994). Predictive validity was assessed by examining the relationship between web-based service quality-identified dimensions and the two output measures overall service quality and loyalty intentions, as discussed in the structural analysis study.

### ***Structural analysis***

The hypothesized research model was tested by developing a structural model. First, a saturated model (SMsq-overall-loy) was developed by specifying that all web-based service quality dimensions affect both overall service quality and loyalty intentions. The saturated model (SMsq-overall-loy) that incorporates all possible relations did not fit the data well. Therefore, a revised model (RMsq-overall-loy) was developed using modification indices of Lagrange multiplier test and Wald test (Hatcher, 1994).



Table 1. Results of confirmatory factor analysis

Construct/Item	Loadings (a)	t-value (b)	Std Err	Cronbach's Alpha
<b>Information Quality</b>				0.882
<b>IQ1:</b> Information contained is current and timely	.876	19.42	0.07	
<b>IQ3:</b> Information contained is accurate and relevant	.869	19.73	0.08	
<b>IQ4:</b> Information contained is at the right level of detail	.834	19.56	0.07	
<b>IQ5:</b> Information contained is pretty much what I need to carry out my tasks	.911	20.12	0.06	
<b>IQ6:</b> Information contained is easy to understand	.858	19.44	0.08	
<b>Website usability</b>				0.897
<b>US1:</b> Finding your way on the website is easy.	.861	17.23	0.06	
<b>US2:</b> Navigation is consistent and standardized	.858	17.43	0.06	
<b>US4:</b> Scrolling through pages is kept to minimum.	.845	17.01	0.06	
<b>US5:</b> Graphics and animation do no detract me from use	.823	17.23	0.07	
<b>Reliability</b>				0.876
<b>REL1:</b> When the website promises to do something it does so	.891	17.45	0.06	
<b>REL2:</b> All relevant order confirmation details is sent to my emails within 24 hours	.861	17.73	0.06	
<b>REL3:</b> Order cancellation and returns are confirmed within three days	.871	18.31	0.07	
<b>REL4:</b> Order tracking details are available until delivery	.887	18.23	0.06	
<b>REL5:</b> The website service performs the service right the first time	.905	20.01	0.06	
<b>REL6:</b> The website is available all the time	.712	17.80	0.06	
<b>Responsiveness</b>				0.873
<b>RES1:</b> When you have a problem, the website service shows a sincere interest in solving it.	.921	18.76	0.05	
<b>RES2:</b> Automated or human e-mail responses on serving pages give customer prompt service.	.854	17.81	0.06	
<b>RES3:</b> Emails' responses are relevant and accurate.	.876	17.66	0.06	
<b>RES4:</b> Emails' content is appropriate to customer requirements.	.866	16.89	0.05	
<b>RES5:</b> Website addresses are included in all existing documentation, publicity and advertising channel	.734	18.92	0.06	
<b>Assurance</b>				0.889
<b>ASS1:</b> Security policy is accessible.	.923	21.12	0.08	
<b>ASS2:</b> Privacy policy is accessible	.941	21.18	0.08	
<b>ASS3:</b> The website contains company details.	.867	19.24	0.07	
<b>ASS4:</b> The website's retailer is widely known for having a good reputation	.888	19.32	0.07	
<b>Personalization</b>				0.924
<b>PER1:</b> The website gives me personal attention.	.923	17.11	0.05	
<b>PER2:</b> The website enables me to order the product in a way that meets my needs.	.885	18.10	0.05	
<b>PER3:</b> The website understands my specific needs.	.862	18.64	0.05	

a) Extraction Method: Principal Axis Factoring ; Rotation Method: Varimax with Kaiser Normalization.; loadings < 0.30 not shown

b) These are standardized loadings estimates from CFA using the CALIS procedure of SAS package.

(c) Based on t-tests for null hypothesis, *t-value* greater than 1.96 are significant at  $p >: 0.05$ ; *t-value* greater than 2.567 are significant at  $p >: 0.01$ ; *t-value* greater than 3.29 are significant at  $p >: 0.001$  (Hatcher, 1994).

The revised theoretical model yields a better fit to the data in terms of obtained fit indices. Normed  $\chi^2$  value was 1.89 less than the value of three (Bagozzi & Yi, 1988). The CFI value was 0.91 and the value of NNFI was 0.91. The parsimony of the model was assessed using the Adjusted Goodness of Fit index (AGFI), the Parsimony Ratio (PR) and the parsimonious normed-fit index (PNFI) (Hatcher, 1994). The AGFI was 0.89 slightly below the 0.90, while the PR ratio was 0.82 and PNFI was 0.83. Both values are greater than the 0.50 limit (Hatcher, 1994). In addition, value of RMSEA was 0.048 less than the value of 0.05 (Hatcher, 1994). The main objective of conducting structural analysis is to test the hypothesized research model. Table 2 presents the structural parameters estimates and the hypotheses testing results.

**Table 2. Results of structural model estimation**

Path to	Path from	Hypothesis	Structural coefficient	t-value
Overall service quality	Website usability	H2a	0.24	2.58*
	Information quality	H3a	0.32	4.12**
	Reliability	H4a	0.38	4.50**
	Responsiveness	H5a	0.28	2.61**
	Assurance	H6a	0.39	5.09**
	Personalization	H7a	0.21	2.56*
Loyalty intentions	Website usability	H2b	0.18	2.04*
	Information quality	H3b	0.29	2.76**
	Reliability	H4b	0.48	4.45**
	Responsiveness	H5b	0.32	3.35**
	Assurance	H6b	0.49	4.79**
	Personalization	H7b	0.13	1.44
	Overall service quality	H8	0.51	5.21**

\*  $p < 0.01$ ; and \*\*  $p < 0.001$

## Discussion and conclusion

In recognition of the expanding importance of service quality of information systems (IS) as one of the primary measures of IS success and effectiveness, increasing calls have been issued to include IS service quality as a measure of IS success (Kettinger & Lee, 1994; Jiang et al., 2002; Pitt et al., 1995). However, service quality is an abstract construct that is difficult to capture and measure (Lee & Lin, 2005). Recognizing the lack of IS service quality measurement models, several leading researchers have proposed the use of the SERVQUAL for IS service quality measurement (Kettinger & Lee, 1994; Pitt et al., 1995). The current study restructures the dimensions of SERVQUAL to suit the context of web-based service quality measurement. According to the analytical work of exploratory and confirmatory factor analysis, web-based service quality is a multidimensional construct that is composed of website usability, information quality, reliability, responsiveness, assurance and personalization. Furthermore, the study examines how identified dimensions of web-based service quality influence overall service quality and loyalty intentions. The structural analysis shows that assurance and reliability are the most important factor influencing the overall service quality and loyalty intentions. Surprisingly, personalization was found to affect overall service quality without influencing significantly loyalty intentions. Confirming findings of previous research, this study finds a significant link between overall service quality and loyalty. In light of research work and results, the following implications are provided.

## **Implications**

The study provides implications for practitioners as well as for researchers. Each is addressed below. Moreover, limitations of the study are discussed.

### ***Implications for researchers***

The theoretical contributions of this work are threefold. First, we developed a multi-dimensional instrument for measuring web-based service quality from the perceptions of online customers. The 27-item instrument is precise, easy to use and exhibits strong reliability and validity. Second, this research contributes to information system (IS) research in supporting restructuring and modifying the SERVQUAL model to be used for IS service quality measurement. Third, consistent with studies on service quality and its consequences in physical facilities (e.g., Ruyter et al., 1998; Zeithaml et al., 1996), this research supports that the relationship between overall service quality and loyalty intentions is significant.

### ***Implications for managers***

The study has a number of implications for practitioners currently conducting web-based business. First, as an increasing number of organizations invest in web technologies to establish an effective web channel, it is difficult for organizations to realize any returns on their investments without an appropriate instrument for measuring web-based service quality (Aladwani & Palvia, 2002; Pitt et al., 1995). Moreover, previous research developed a non-customer centric instruments that focused mostly on the perceptions of web developers and designers (Aladwani & Palvia, 2002; Wolifinbarger & Gilley, 2003). In this paper, we offer a reliable and valid diagnostic tool that enables managers to identify problematic issues in their web-based services and take corrective actions. Second, the study suggests that managers need to focus on developing marketing strategies that enhance the perception of trust and strengthen the perception of the reliability of their service. Firms can enhance the perception of assurance by using security emblems and familiar vendor names. Additionally, maintaining good customer service is one of the important ways to sustain good service quality. Online managers need to adopt advanced technologies that commit to a good customer service. For example, technologies that enable online customers to communicate via a text chat window with a live customer service representative improve the perception of customer service quality (Twenty, 1999). Moreover, online customers like being offered multiple of ways of how to get support (Freed, 2005). Therefore, employing technologies that provide support by email, phone calls and a web chat window at the same quality enhances the customers' perceived value and satisfaction (Foresee, 2005). Personalization technologies tailor web pages and product offerings to the customer's preferences and interests. However, these technologies should be used carefully (Serino et al., 2005). Personalization is potentially a double-sided concept that may decrease the trusting beliefs. As a result, firms need to understand their customer behavior in order to apply the right personalization technique to the right customer.

Limitations of this study must be acknowledged. This includes limitations generally associated with instrument building. However, the systematic instrument-building framework that was followed has substantially improved the instrument's validity and reliability.

In summary, while businesses have begun to realize the importance of establishing a web presence and implementing web-based service, much work is yet needed to better manage web-based service quality.

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