

MEASURING THE QUALITY OF E-SERVICE: SCALE DEVELOPMENT AND INITIAL VALIDATION

Samar I. Swaid

Department of Mathematics and Computer Science
Philander Smith College
One Trudie Kibbe Reed Drive, Little Rock, AR 72202
sswaid@philander.edu

Rolf T. Wigand

Departments of Information Science and Management
University of Arkansas at Little Rock
2801 S. University Avenue, Little Rock, AR 72204-1099
rtwigand@ualr.edu

ABSTRACT

The primary objective of this article is twofold: (i) constructing a scale for measuring e-service quality, and (ii) examining the effects of the dimensions of e-service quality on the various types of customer loyalty. By conducting exploratory factor analysis and structural equation modeling, we found that e-service quality is measured on six dimensions: information quality, website usability, reliability, responsiveness, assurance and personalization. Furthermore, the study identifies the influence of the individual dimension of e-service quality on the different types of service loyalty. Structural analysis reveals that assurance is the most important factor affecting 'price tolerance', while reliability is the factor with the greatest influence on 'preference loyalty'. The dimension of responsiveness is the only one having significant negative impact on 'complaining behavior'. Online retailers are provided with tactical strategies on how to immunize online shoppers' loyalty against switching behavior and price sensitivity. Limitations and directions for future research are offered.

Keywords: service quality, loyalty, online shopping, SERVQUAL, structural analysis

1. Introduction

With the rapid growth of business to consumer (B2C) electronic commerce (e-commerce), electronic retailers realized that regardless of their business type and product offerings, they are requested to deliver superior service quality over the web, here termed *e-service quality*. Delivering high quality service is considered an essential strategy for business success and survival [Reichheld & Schefer 2000; Zeithaml et al. 1996].

Initially, companies focused on establishing appealing websites to interact and communicate with online shoppers. Therefore, a number of attempts have been made to understand e-service quality in terms of web interactivity [e.g., Aladwani & Palvia 2002; Loiacono et al. 2007]. Such approaches on measuring e-service quality using cues that emerge from interacting with the website were found to be insufficient and inappropriate to measure the quality of the online service experience [Wolfenbarger & Gilly 2003]. According to industry analyst Datamonitor, US companies lost over \$6.1 billions in online sales in 1999 due to failing to implement effective e-service solutions [Bnet, 2000]. This means that e-retailers struggle in delivering quality service and lack an accurate measurement tool to diagnose the weakness factors in their e-service delivery systems.

What makes measuring the quality of e-service difficult and complicated in the context of e-retailing? Electronic retailing (in contrast to traditional retailing) is not a single relatively uniform marketing activity [Francis & White 2004]. Therefore, e-retailing based service systems differ based on channels of delivery, service content and product type [Voss 2003]. Consequently, 'one-size fits all' e-service quality instruments lead to misleading results. Instrument construction should consider the building components of the e-service delivery systems. Wolfenbarger and Gilly [2003] explain problems found in e-service quality instrumentation by "Little commonality exists among the scales developed for measuring website characteristics to consumers. Some scales focus exclusively on the website interface, while others attempt to measure the entire purchase transaction" (p. 185). This study aims to understand quality of service systems in the context of e-retailing where shoppers buy tangible products that need to be packaged and delivered. In this setting of e-service experience, e-service quality is a function of how the web facilitates effective shopping, purchasing and delivery of products and services [Zeithaml et

al. 2000]. Therefore, measuring the quality of the e-service experience includes cues that occur before, during and after the e-purchase transaction.

Service quality has been shown to promote customer loyalty and retention [Parasuraman et al. 2005; Zeithaml et al. 1996]. Some researchers focused on e-service quality and its relation to intentions to return and repurchase [e.g., van Riel et al. 2004], attitude toward the website [e.g., Wolfenbarger & Gilly 2003], intentions to buy from the website [e.g., Loiacono et al. 2007] and behavioral intentions [e.g., Collier & Bienstock 2006]. But what makes the concept of loyalty an important issue in the context of e-retailing? Electronic markets are competitive places [Reichheld & Schefer 2000], however, recent research suggests that e-retailers enjoy customer loyalty more than bricks-and-clicks retailers do [Reichheld & Schefer 2000]. About one-half of e-retailers' sales is accounted for by repeat loyal buyers [Balabanis & Reynolds 2006]. Online shoppers are no longer willing to be engaged in extensive searches and they are willing to pay premium prices when transacting with e-retailers they experienced [Reichheld & Schefer 2000; Srinivasan et al. 2002]. However, several reasons undermine building online customers' loyalty. As the web represents a fundamental trade and communication channel, it opens up the industry to ever-growing competition that increases the difficulty of retaining customers [Vatanasombut et al. 2004]. For instance, web technologies and intelligent search agents reduce search costs encouraging customers to switch to an alternate provider [Chen & Hitt 2002]. In addition, e-retailers selling commodity products face the problem of differentiating themselves in markets where new entrants can easily compete [Vatanasombut et al. 2004]. Therefore, winning customer loyalty is a priority for e-businesses survival. Even though a number of studies examined the quality-loyalty relation in the e-service setting, the quality-loyalty link was tested on the aggregate level [e.g., Loiacono et al. 2007; Parasuraman et al. 2005; Srinivasan et al. 2002]. Considerable business and academic evidence demonstrates that service loyalty is comprised of different types [Bloemer et al. 1999; de Ruyter et al. 1988; Zeithaml et al. 1996]. Service loyalty is a multidimensional concept that is composed of favorable and unfavorable behavioral outcomes. Variables that predict favorable loyalty (e.g., re-purchase intentions and recommending the website) may not be asymmetrically related to other types of loyalty (e.g., willingness to pay more and complaining behavior) [Zeithaml et al. 1996]. Therefore, examining the quality-loyalty link on the level of the individual dimension is of theoretical and practical interest.

In sum, this study aims to: (i) identify the key dimensions of e-retailing service quality; and (ii) investigate the impact of the dimensions of e-service quality on the different types of service loyalty. This contribution proceeds as follows. The next section presents the literature review. Then, we discuss the research model and hypotheses. Section four presents the research methodology and analytical work. In light of the research findings, we provide a discussion and conclusion in section five. The final section offers implications for researchers and practitioners and provides future directions for research.

2. Literature Review

Early research on service quality considered services as intangible and its quality as an elusive construct that is difficult to understand [Parasuraman et al. 1988]. Rooted in the Expectation-Confirmation Theory [Oliver 1980], the SERVQUAL model was proposed. A combination of theoretical and empirical research resulted in developing the SERVQUAL model that considers service quality as a multi-dimensional construct consisting of five dimensions: tangibles, reliability, responsiveness, assurance and empathy. The SERVQUAL development was based on the function of the difference scores or gaps between perceptions and expectations ($Q = P - E$). The SERVQUAL model is widely adopted to measure service quality in traditional stores, the public sector, higher education, real estate, hospitals, the legal profession, employees service providers and festivals (for details see [Li et al., 2002]). This model was also employed to measure information systems service quality [e.g., Jiang et al. 2000; Kang et al. 2002; Kettinger et al. 2005], e-retailing service quality [e.g., Barnes & Vidgen 2001], e-banking service quality [Zue et al. 2002], online travel service quality [e.g., van Riel et al. 2004] and web portals service quality [e.g., Yang et al. 2005]. In addition to the SERVQUAL-oriented instruments, other studies investigated the dimensions of e-service quality considering other cues [e.g., Loiacono et al. 2007; Ranganhan & Granapathy 2002; Wolfenbarger & Gilly 2003]. Most scholarly research on e-service quality included some aspects of behavioral intentions (e.g., re-purchase intentions, re-visit intentions and recommendation intentions). One of the theories that has been used widely to explain customer behavior in e-service settings is the Theory of Reasoned Action (TRA) [Fishbein & Ajzen 1975]. TRA can predict loyalty intentions and true loyalty based on identifying the causal relationships among attitudes, intentions and behavior [Fishbein & Ajzen 1975]. Research has found that the construct of loyalty should be operationalized as a form of behavioral loyalty (e.g., repeat purchasing and purchasing sequence), attitudinal loyalty (e.g., willingness to recommend service provider to others), and cognitive loyalty (e.g., price tolerance and when the service provider comes first to mind) [Day 1969, Zeithaml et al. 1996]. Integrating this view, Oliver [1999] defines loyalty as "... a deeply held commitment to rebuy or repatronize a preferred product/service consistently in the

future thereby causing repetitive same-brand or same-brand set purchasing, despite situational influences and marketing efforts having the potential to cause switching behavior” (p. 392). Empirically, service loyalty is found to be a multi-attribute construct that is composed of distinct but related factors of preference loyalty, price sensitivity and complaining behavior [de Ruyter et al. 1999; Zeithaml et al. 1996].

Table 1. Dimensions of E-service Quality and its Consequences Identified by Various Scholars

Research	Independent Variables	Dependent Variables			
		Loyalty Constructs			Other Variables
	E-service Quality Dimensions	Preference Loyalty	Price Tolerance	Complaining Behavior	
Barnes and Vidgen, [2002]	Usability, design, information, trust and empathy	-	-	-	-
Collier and Bienstock, [2006]	Process quality, outcome quality, recovery	Three-item scale for intentions to purchase, re-visit and to recommend	-	-	Switching and three-item scale for customer satisfaction
Gefen [2002]	Three-factor solution: tangibles, combined dimension (responsiveness, reliability and assurance) and empathy	Loyalty intentions	-	-	Customer satisfaction
Lee and Lin [2005]	Web design, reliability, responsiveness, trust, and personalization	One-item scale for intentions to purchase and one-item scale intentions to recommend	-	-	Overall service quality and customer satisfaction
Parasurman et al. [2005]	E-S-Qual: efficiency, fulfillment, system availability and privacy E-RecS-Qual: responsiveness, compensations and contact	Summated score of five-item favorable loyalty intentions	-	-	Overall service quality and perceived value
van Riel et al. [2001]	Core services, supplementary services and user interface	One-item scale for intentions to return	-	-	
Wolfenbarger and Gilly [2003]	Website design, fulfillment/reliability, security/privacy and customer service	Five-item scale of favorable loyalty intentions	-	-	Global quality, customer satisfaction and attitude towards Website

Few studies examined the relations among e-service quality and some types of loyalty. For example, Loiacono et al. [2007] developed the WebQual™ that is composed of informational fit-to-task, interactivity, trust, response time, ease of understanding, intuitive operations, visual appeal, innovativeness, flow/emotional appeal, consistent image, online completeness and better than alternative channels. These authors tested the correlations among the identified dimensions and a two-item scale of intent to reuse the website. Another study by Srinivasan et al. [2002] has investigated the links among the antecedents of loyalty (i.e., customization, contact interactivity, cultivation, community, choice, convenience and character) and variables of search, word-of-mouth and willingness to pay more. Although this latter study focused on antecedents and consequences of customer loyalty (not service quality) in virtual environments, it shed some light on the behavioral consequences of customer loyalty. Similarly,

Ranganhan and Granapathy [2002] identified the key dimensions of business-to-customer websites as information content, design, security and privacy. A four-question scale representing purchase intent was used as the dependent variable. Wolfinbarger and Gilly [2003] constructed an instrument to measure e-service quality based on the factors of: website design, reliability/fulfillment, privacy/security and customer service. Their research model includes a five-item scale for measuring loyalty intentions and a five-item scale representing attitude toward website. Also, the study by Gefen [2002] tested the applicability of the dimensions of the SERVQUAL model in e-commerce. This study has resulted in identifying three factors: tangibles, empathy and combined factor of reliability, responsiveness and assurance perceptions. The ultimate goal of Gefen’s [2002] study was to test the links among the dimensions of e-service quality, perceived risk, trust and cost-to-switch and the variable of customer loyalty. Although the study investigated the relative importance of e-service quality on customer loyalty, the loyalty variable was a unidimensional construct that focused only on favorable behavioral consequences (i.e., comes first to mind, doing more business, willingness to recommend and encouraging others to do business with the provider). Finally, Parasuraman et al. [2005] developed two scales E-S-QUAL for core services quality and E-RecS-QUAL for service recovery quality. E-S-QUAL consists of efficiency, system availability, fulfillment and privacy, while E-RecS-Qual consists of responsiveness, compensation and contact. They investigated the influence of the dimensions of the E-S-Qual on ‘preference loyalty’; loyalty types, however, such as ‘loyalty under increased pricing’ and ‘complaining behavior’ were not included in the research model (See Table 1 for literature review of selected studies).

In summary, only limited attention has been paid to the area of e-service quality and its relations to multi-dimensional loyalty. According to our knowledge, no study until now tested the quality-loyalty relation considering the different types of service loyalty. This study is designed to bridge this gap in research.

3. Development of Hypotheses

In order to view the full picture of the intricate pattern of e-service quality-customer loyalty, the following conceptual model is developed

3.1 E-service quality model

Table 2. Definitions and Conceptualizations of E-service Quality Dimensions

Constructs	Definitions	Sample items	Selected references
Website Design	Customer perception of the degree the website interface is visually appealing and well designed	Attractiveness, style consistency, proper use of colors, font, media, etc.	Wolfinbarger and Gilly [2003]
Website Usability	Customer perception of degree of user friendliness in using the website and ease of navigation.	Ease to navigate, limited scrolling., availability of instructions of navigation	Parasuraman et al. [2005]
Information Quality	Customer perception of usefulness and quality of website content	Usefulness of information, accuracy, fit to task, up-to-date	Li et al. [2002]
Service Reliability	Customer perception of reliability of the site (e.g., confirmation emails, order tracking functions) and accuracy of service promises(e.g., delivering what is ordered)	Confirmation emails, order tracking functions, delivering what is promised, performing the service right at first time	Wolfinbarger and Gilly [2003]
Responsiveness	Customer perception of getting the help when needed by automated or human factors	Automated and human emails answering questions, showing sincere interest in solving customers’ problems	Parasuraman et al. [2005] Wolfinbarger and Gilly [2003]
Assurance	Customer perception of the confidence and trust toward the website	Availability of privacy and security policies, good reputation, third party seals	Parasuraman et al. [2005] Wolfinbarger and Gilly [2003]
Personalization	Customer perception of the individualized attention and differentiated service that are tailored to meet individual’s needs and preferences	Personalized website pages, personalized contents and customized products	Wolfinbarger and Gilly [2003]

As the SERVQUAL model has demonstrated strong acceptance in measuring service quality, this study uses the SERVQUAL model as its starting point. Past research has adopted the SERVQUAL model by adding new items, dropping or rewording existing items to operationalize and crystallize its generic dimensions. However, Voss [2003] suggested that the SERVQUAL model needs to be reformulated to suit the unique setting of online stores. Following the guidelines of Voss [2003] in re-structuring the SERVQUAL dimensions, we propose the following elements as the key dimensions of e-service quality: website design, information quality, reliability, responsiveness, assurance and personalization (See Table 2 for the constructs' definitions and conceptualizations). Hence, we suggest that:

H1: *E-service quality dimensions (website design, website usability, information quality, reliability, responsiveness, assurance and personalization) are correlated to overall service quality.*

3.2 The links among dimensions of e-service quality and loyalty types

Insights from research on traditional service quality and loyalty [e.g., Oliver 1999; de Ruyter et al. 1998; Zeithaml et al. 1996] imply that different dimensions of e-service quality have different effects on the different types of loyalty. In accordance with findings from these studies, we suggest the following (see Figure 1):

H2: *There are positive relationships among dimensions of e-service quality and loyalty types of 'preference loyalty' and 'price tolerance'.*

H3: *There are negative relationships among dimensions of service quality and 'complaining behavior'.*

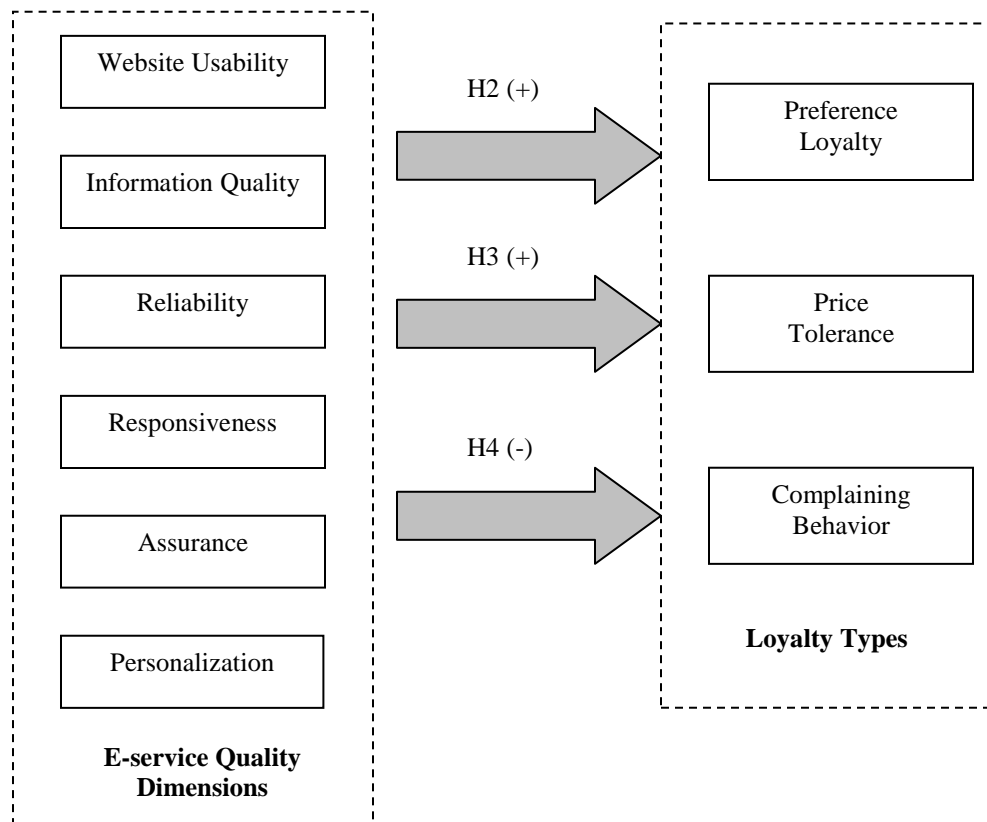


Figure 1. Research Model

In order to test these research hypotheses, this research was conducted as a two-step study. The first phase focused on developing a scale through an iterative process of purification and design of the instrument. The second study was conducted to assess the scale's reliability and validity as discussed in the following section.

4. Research Methodology

This study follows the guidelines suggested by Churchill [1979] and Anderson and Gerbing [1988] in developing comprehensive scales. First, constructs are conceptualized by defining the domain of the constructs. Then, dimensions are operationalized focusing on the content validity of the dimensions. Next, data are collected using the initially developed scale. Data purification is the step that follows data collection. Usually analytical techniques such as reliability analysis and factor analysis are used to drop and purify measures. After purifying data

and identifying the main constructs, another dataset is used to assess the reliability and validity of the developed scale. Reliability of the developed measures is assessed using Cronbach’s alpha and the composite reliability index, while validity is evaluated based on conducting Structural Equation Modeling.

4.1 Subject selection and data collection

According to Zeithaml et al. [1996] “... 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). Therefore, undergraduate and graduate college students of a mid-size university with sufficient web experience were invited to participate in our study. Some studies question the appropriateness of using student subjects considering issues of external validity and generalizability [Gordon et al., 1986]. However, Greenberg [1987] suggests that it is important for theoretical and applied research to focus on internal validity in terms of operationalizations and establishing strong theoretical foundation. Moreover, a number of reasons suggest that, for this type of research, student subjects used would not affect the validity of the findings. First, according to Jupiter [2006], college students as young adults are the most active web users, consume more entertainment and media and conduct more personal businesses online than the overall web audience. Second, the population of college students is younger and better educated than the population of the conventional customer and closely resembles the online customer population [McKnight et al. 2002]. Finally, using a homogenous population like college students can decrease the effect of variance when not exposed to all factors (structure, roles, and responsibilities) of the real world environment [Greenberg, 1987; Legris et al. 2003] Thus, students of a mid-size university in the South were invited to participate in the study. We followed Parasuraman et al. [2005] in using subjects who used the Internet at least 12 times during the past three months and made at least three online purchase transactions within that period. The subjects were contacted at three points of time during a period of two weeks via e-mail explaining the purpose of the study and directing them to the questionnaire’s website. Dimensions of e-service quality and service loyalty were operationalized by adopting scales from reliable and validated scales of past studies (See Table 2).

The dependent variables of the study (i.e., loyalty constructs of price tolerance, complaining behavior and preference loyalty) were adopted from Zeithaml et al. [1996] and Parasuraman et al. [2005]. The variable of ‘price tolerance loyalty’ is defined as willingness to pay premium prices and is measured by a three-items scale, while the ‘complaining behavior’ variable - loyalty in negative format – is conceptualized as the propensity to switch and complain to employees about the online firm, external agencies and friends. Both constructs, price tolerance and complaining behavior, are adopted from Zeithaml et al. [1996]. The construct of ‘preference loyalty’ supporting the favorable intentions of loyalty including saying positive things about the e-retailer, recommending the company to someone else, and considering the e-retailer their first choice to do more business with in the future is adopted from Parasuraman et al. [2005] (See Table 3).

Table 3. E-Loyalty Dimensions

Dimensions	Items	References
Preference Loyalty	Say positive things about XYZ to other people Recommend XYZ to someone who seeks your advice Encourage friends and relatives to do business with XYZ Consider XYZ your first choice to buy ... services Do more business with XYZ in the next few years Do less business with XYZ in the next few years	Parasuraman et al. [2005]
Price Sensitivity	Take some of your business to a competitor that offers more attractive prices Continue to do business with a competitor that offers more attractive prices Pay a higher price than a competitor charges for the benefits you currently receive from XYZ Switch to a competitor if you experience a problem with XYZ’s service	Zeithaml et al. [1996]
Complaining Behavior	Complain to other consumers if you experience a problem with XYZ’s service Complain to external agencies, such as the Better Business Bureau, if you experience a problem with XYZ’s service Complain to XYZ’s employees if you experience a problem with XYZ’s service	Zeithaml et al. [1996]

Items are measured using a seven-point Likert scale ranging from (1) strongly disagree to (7) strongly agree. We started by pre-testing the initial version of the instruments using 21 subjects from the same population of college students. Several items were modified and deleted to ensure content, clarity and meaningfulness. The obtained sample size (N = 557) satisfies the condition of having five cases to one item ratio needed in conducting factor analysis [Hair et al. 1998]. The age profile of participants represents most age groups, with the majority (46%) being

in the 20 to 46 age range and 61% of the respondents were male, which indicates that the obtained sample resembles the population of Internet users. Typical products and purchases were books (24%), computer hardware and accessories (21%) and clothing (18%).

4.2 Exploratory factor analysis

Collected data were screened for outlier cases and missing data. Two incomplete cases were eliminated from the analysis, while no outlier cases were detected. Collected data was randomly split into two datasets. The first dataset consists of 320 subjects to be used for the scales' design and refinement by conducting exploratory factor analysis and reliability analysis [Hair et al. 1998]. The second dataset consisting of 235 cases was used for testing the scale's reliability and validity.

Items that are related to e-service quality were arranged in a matrix to test the correlation among these variables. According to Hair et al. [1998], it is necessary before conducting Exploratory Factor Analysis (EFA) to make sure that sufficient variance exists within the variables correlation matrix [Hair et al. 1998]. The Bartlett test of sphericity and the Measure of Sampling Adequacy (MSA) were used for testing the correlation matrix. The significance of the Bartlett test was .000 and the Kaiser-Meyer-Olkin measure of sampling adequacy was 0.897, both indicating the adequacy of conducting the EFA. According to Hair et al. [1998], it is recommended to use Principal Axis Factoring (PAF) as the extraction method and Varimax rotation when factors are going to be used in a subsequent analysis. Therefore, exploratory factor analysis was conducted in an iterative process using the PAF extraction method and Varimax rotation resulting in a battery of 28-item explaining 80.23% of the variance in the correlation matrix. The obtained factor structure consists of six dimensions: website usability, information quality, reliability, responsiveness, assurance, and personalization. At this phase of the research, the reliability of measures was assessed using Cronbach's alpha that ranged from 0.828 to 0.889, exceeding the 0.70 recommended by Nunnally and Bernstein [1994] (See Table 4).

As conducting the EFA is found to be satisfactory in the early stages of research, it is recommended to use confirmatory factor analysis at later stages [Bagozzi & Yi 1988; Churchill 1979]. Further refinement was conducted using the second dataset by applying confirmatory factor analysis.

4.3 Confirmatory factor analysis

Further testing is needed to verify the dimensionality of e-service quality. We applied Confirmatory Factor Analysis (CFA) in accordance with Hatcher [1994] using the second portion of the data. A measurement model consisting of e-service quality constructs was developed by eliminating items with insignificant loadings and by using the modification indices of the Lagrange multiplier and the Wald test. Next, the model was evaluated for goodness-of-fit, reliability and validity. The model's goodness-of-fit is determined using a variety of indices. The chi-square (X^2) value was 542.4 at $p < .0001$ suggesting model rejection. However, due to the sensitivity of chi-square to the sample size, it is inappropriate to be used as a measure of goodness-of-fit [Hatcher 1994]. Instead, several researches indicate the appropriateness of using the normed chi-square test instead. Normed chi-square (X^2/df), which is the ratio of chi-square to the degree of freedom was 1.84 less than the value of three recommended by Bagozzi and Yi [1988]. As the Bentler Comparative Fit Index (CFI) and Bentler and Bonett Non-Normed Fit Index (NNFI) (sometimes labeled the Tucker Lewis Index) were shown to be independent of sample size [Anderson & Gerbing 1988], both were used to measure the model's goodness-of-fit. The CFI value was 0.96 and the NNFI was 0.95, both exceeding the cut-off of 0.90, indicating a very good incremental fit [Hatcher 1994]. Root mean-square-error-of-approximation (RMSEA) was used in the analysis of the residuals [Hatcher 1994]. The value of RMSEA was 0.047, less than the recommended 0.05, thus indicating a good fit [Hatcher, 1994].

The measurement model was further assessed for construct reliability and validity. Construct reliability was assessed using the composite reliability index [Hatcher 1994]. Values of the composite reliability index ranged from 0.82 to 0.94 exceeding the recommended 0.70 cut-off [Nunnally and Bernstein 1994]. T-test values were all significantly different from zero at $p < .001$, which supports convergent validity [Hatcher 1994].

Additionally, Bagozzi and Yi [1988] defined factor loading exceeding 0.70 as evidence of convergent validity. As depicted in Table 5, the factor loadings for all constructs exceed the recommended level of 0.70, indicating acceptable item convergence on the intended constructs. In addition to convergent validity, it is essential to evaluate the discriminant validity of the constructs. Discriminant validity is the "degree to which two conceptually similar constructs are distinct" [Hair et al., 1998, p. 118]. One way to assess the discriminant validity of constructs is by using the confidence interval test [Hatcher 1994]. This test involves calculating the confidence interval of plus or minus two (± 2) of the standard error around the correlation between the factors. The discriminant validity is determined if the confidence interval does not include the value of one [Hatcher 1994]. Confidence intervals of the developed scale did not include the value of one supporting the discriminant validity of the constructs (See Table 6). Correlations among dimensions of e-service quality and overall service quality were calculated. Dimensions of e-service quality were correlated significantly with overall service quality ranging from 0.56 to 0.21 (See Table 7).

Since one of the main advantages of Structural Equation Modeling is to test the interrelated questions in a single, systematic and comprehensive analysis [Gefen et al., 2000], we applied this analytical method to test the relations among the dimensions of e-service quality and the three types of customer loyalty (i.e., preference loyalty, price tolerance and complaining behavior).

Table 4. Factor Structure of E-Service Quality Scale

Construct/ Measure	Mean	S.D.	Factor loading ^a	Construct reliability
Information Quality				.867
IQ1:Information contained on the website is current and timely	4.65	1.776	.873	
IQ2:Information contained on the website is accurate and relevant	4.85	1.621	.865	
IQ3:Information contained on the website is at the right level of detail	4.87	1.683	.889	
IQ4: Information contained on the website is pretty much what I need to carry out my tasks	4.74	1.758	.842	
IQ5: Information contained on the website is in appropriate format	4.80	1.540	.839	
IQ6: Information contained on the website is easy to understand	4.77	1.736	.871	
Reliability				.852
REL1: The Website when it promises to do something in a certain time it does so	4.95	1.521	.876	
REL2: All relevant order confirmation details are sent to my email within 24 hours	4.86	1.460	.860	
REL3: Order cancellation and returns are confirmed within three days	4.96	1.462	.841	
REL4: The website service performs the service right the first time	4.83	1.497	.863	
REL5: Order tracking details are available until delivery	4.88	1.398	.845	
REL6: The website is available all the time	4.78	1.487	.800	
Responsiveness				.801
RES1: Automated or human e-mail responses give customers prompt service	5.06	1.487	.840	
RES2: Email systems are both inbound and outbound to deal with customer complaints	4.59	1.42	.823	
RES3: Website addresses are included in all existing documentation, publicity and advertising channels	4.48	1.317	.717	
RES4: Email responses are relevant and accurate and appropriate to customer requirements	4.53	1.420	.829	
RES5: The website shows sincere interest in resolving any problems	4.52	1.297	.805	
Assurance				.820
ASS1: The website has adequate security features	5.14	1.318	.821	
ASS2: The website has a good reputation	4.97	1.751	.871	
ASS3: I feel I can trust this website	5.00	1.607	.838	
ASS4: The company behind the site is reputable	4.78	1.543	.786	
Website Usability				.856
US1: Finding your way in the website is easy	4.91	1.632	.866	
US2: Navigation is consistent and standardized	5.01	1.447	.880	
US3: Scrolling through pages is kept to a minimum	4.93	1.495	.868	
US4: Graphics and animation do no detract me from use	4.91	1.382	.907	
Personalization				.828
Pers1: The website gives me personal attention	4.94	1.429	.876	
Pers2: The website enables me to order the product in a way that meets my needs	4.30	1.692	.882	
Pers3: The website understands my specific needs	4.55	1.726	.854	

^aExtraction method: Principal Axis Factoring. Rotation method: Varimax with Kaiser Normalization; Rotation converged in 6 iterations

Table 5. Results of confirmatory factor analysis of e-service quality

Construct/Item	Loadings ^a	t-value ^b	Standard Error	Composite Reliability	Variance Extracted Estimates
Information Quality				0.920	0.750
IQ1	0.888	19.47	0.07		
IQ3	0.839	17.75	0.08		
IQ4	0.888	19.48	0.07		
IQ5	0.925	20.87	0.06		
IQ6	0.800	16.51	0.08		
Website Usability				0.908	0.718
US1	0.855	17.99	0.06		
US2	0.854	17.95	0.07		
US4	0.819	16.84	0.06		
US5	0.806	16.43	0.07		
Reliability				0.905	0.722
REL1	0.832	17.46	0.06		
REL2	0.840	17.70	0.06		
REL4	0.757	15.16	0.07		
REL5	0.855	18.20	0.06		
REL6	0.905	20.01	0.06		
REL3	0.712	14.89	0.06		
Responsiveness				0.910	0.735
RES1	0.903	19.93	0.06		
RES2	0.845	17.84	0.06		
RES3	0.841	17.76	0.06		
RES4	0.814	16.87	0.06		
RES5	0.880	19.11	0.06		
Assurance				0.914	0.855
ASS1	0.936	21.26	0.07		
ASS2	0.948	21.76	0.08		
ASS3	0.888	19.49	0.08		
ASS4	0.881	19.23	0.08		
Personalization				0.841	0.712
PER1	0.8260	16.06	16.60		
PER2	0.8449	17.12	17.12		
PER3	0.8626	17.63	17.63		
Goodness-of-fit statistics:		X ² /df = 1.73	CFI = .96	RMSEA = .047	
		GFI = .89	NNFI = .96		

^a Standardized loadings estimates from the CFA using Proc Calis of SAS software; ^b t-values greater than 1.96 are significant at $p < 0.05$, those greater than 2.576 are significant at $p < 0.01$; and those greater than 3.291 are significant at $p < 0.001$

4.4 Structural analysis study

Structural Equation Modeling (SEM) was conducted following the two-step procedure recommended by Anderson and Gerbing [1988]. First, a measurement model (MMQ-L) including constructs of e-service quality and the three constructs of customer loyalty in one model was developed by conducting confirmatory factor analysis. Normed X² was 1.92 indicating a good fit [Hatcher, 1994]. The value of GFI was 0.90, while the CFI and the NNFI values were 0.93, exceeding the value of 0.90 and indicating a good fit. Value of RMSEA was 0.049 less than 0.05 cut-off value suggested by Hatcher [1994]. The next step in the development of a measurement model is building a theoretical model that indicates the relationships among independent variables and dependent variables. The theoretical model (TMQ-L) that incorporates all possible relations among the constructs of e-service quality and constructs of customer loyalty was developed. Reviewing the theoretical model using modification indices is necessary to develop a better model. Modification indices identify paths and relationships that might deserve consideration of removal or addition to the theoretical model [Hatcher 1994]. A revised theoretical model (RMQ-L) was built by eliminating insignificant paths and adding extra paths as suggested by modification indices (i.e., Wald test and the Lagrange multiplier test) and re-evaluating the model in an iterative process. This process continued

until the revised model (RMQ-L) showed a logical theoretical model with good indicators of model fit. The RMQ-L yields a better fit to the data in terms of obtained fit indices and theoretical foundation. Normed X^2 was 1.98 ($Pr > 0.001$) while values of CFI and NNFI were 0.91 and 0.90, respectively. Although the value of GFI was 0.89, slightly below the 0.90, it is still acceptable [Bagozzi & Yi 1988]. The parsimony of the model is evaluated using the Parsimonious Normed Fit Index (PNFI), the Adjusted Goodness of Fit (AGFI) and the Parsimony Ratio (PR). These indices signify the simplicity of the model [Hatcher 1994]. The AGFI was 0.88 slightly below the 0.90 level, while the PR ratio (the ratio of the degrees of freedom in the model to the degree of freedom in the null model) was 0.88 and the PNFI (calculated by multiplying the NFI value by the value of PR ratio) was 0.92. Both values are greater than the 0.50 limit recommended by Hatcher [1994]. In addition, the value of RMSEA was 0.048, thus less than the recommended value of 0.05 [Hatcher 1994] (See Figure 2).

Table 6. Construct Correlations and Confidence Interval Values Among Dimensions of E-Service Quality

Variable 1	Variable 2	Correlation	Standard Error	Lower Boundary	Upper Boundary
Information Quality	Website Usability	0.639	0.051	0.337	0.541
Information Quality	Reliability	0.388	0.052	0.284	0.492
Information Quality	Responsiveness	0.293	0.056	0.181	0.405
Information Quality	Assurance	0.224	0.055	0.114	0.334
Information Quality	Personalization	0.466	0.054	0.058	0.274
Website Usability	Reliability	0.419	0.052	0.305	0.523
Website Usability	Responsiveness	0.416	0.051	0.314	0.518
Website Usability	Assurance	0.205	0.055	0.095	0.315
Website Usability	Personalization	0.179	0.056	0.067	0.291
Reliability	Responsiveness	0.443	0.049	0.345	0.541
Reliability	Assurance	0.266	0.054	0.158	0.374
Reliability	Personalization	0.251	0.055	0.141	0.361
Assurance	Personalization	0.203	0.060	0.083	0.323

Table 7. Correlations among constructs of e-service quality and overall service quality rating

	Usability	Information Quality	Reliability	Responsiveness	Assurance	Personalization
Information Quality	0.25**					
Reliability	0.43**	0.75**				
Responsiveness	0.20**	0.26**	0.41**			
Assurance	0.34**	0.65**	0.74**	0.28**		
Personalization	0.22**	0.45**	0.41**	0.21**	0.24**	
Overall Service Quality	0.46**	0.57**	0.76**	0.58**	0.69**	0.44**

Notes: ** $p < 0.01$

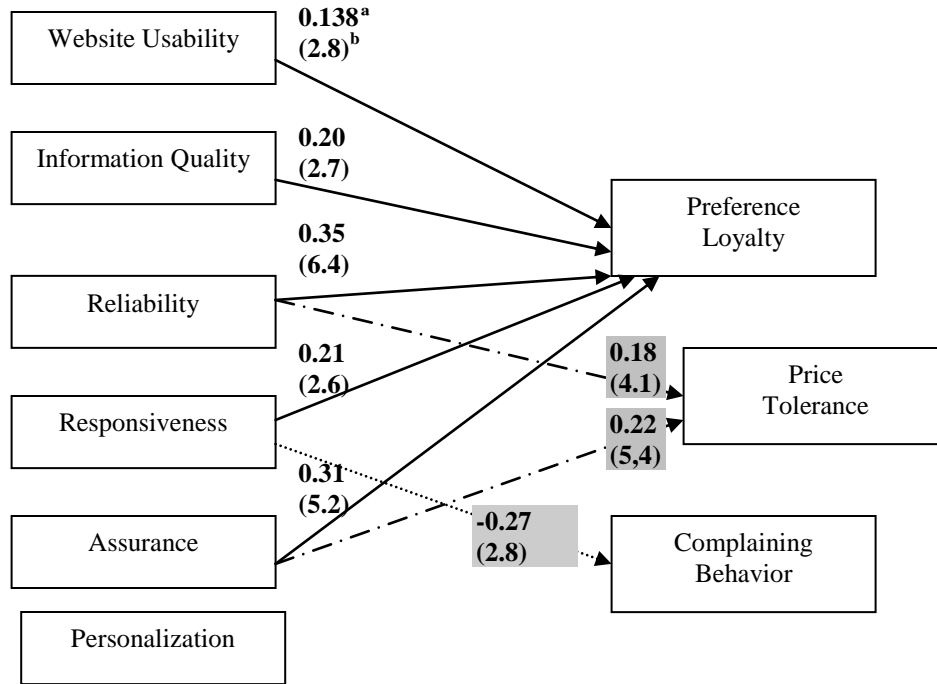


Figure 2. Paths coefficients and t-values of the relationship between e-service quality and loyalty
 Notes: ^a Standardized path coefficients; ^b Significant t-values

5. Discussion and Conclusion

The purpose of this contribution is to develop and validate an instrument for measuring service quality for e-retailing websites. Multiple rounds of empirical validation via field surveys of online shoppers helped in refining a six-factor scale that demonstrates adequate psychometric properties in terms of reliability and validity. In the setting of e-retailing websites, e-service quality is measured on six dimensions: website usability, information quality, reliability, responsiveness, assurance and personalization. The dimension of website design did not reveal itself as a distinct dimension. Some studies on web evaluations suggest that customer preferences on such items may be an inverted U-relationship and not linear [Li et al. 2002; Nadkarni & Gupta 2007]. In other words, some online shoppers may prefer high quality graphics, animation and rollover effects while others may prefer simpler website design that includes uncomplicated visual features of text, graphics and animation.

Unlike past research that investigated the quality-loyalty relationship on the aggregate level, this study aims to understand the relationships among the attributes of perceived service quality and the several types of service loyalty. Our analysis yields an intricate pattern of service quality-service loyalty relationships at the level of the individual dimensions. We have found that except for personalization, e-service quality dimensions are related to the different types of customer loyalty. The perception of reliability and assurance are the most important factors that affect favorable loyalty aspects such as re-purchase intentions, communicating positive word-of-mouth and loyalty under increased pricing. The quality of customer service and web responsiveness influence negatively the propensity to switch and communicating negative word-of-mouth. This goes partially in line with Parasuraman et al.'s [2005] findings showing that offering reliable service encourages customer loyalty. Additionally, trust or assurance (used interchangeably in other studies such as [Thatcher and George, 2004; Zeithaml et al. 2000]) has been found to exhibit a positive influence on price tolerance. For example, some evidence has been established that credibility of the vendor signals assurance and reduces customers' price sensitivity [Kim & Toh 2006]. Moreover, Ba and Pavolu [2002] found that in efficient markets with dynamic pricing, customers are willing to compensate reputable sellers with price premiums to assure safe transactions. This may be explained by the risk and uncertainty customers perceive in e-markets [Ba & Pavolu 2002; Gefen 2003]. Since trust reduces the perceived risk in such environments [Brynjolfsson & Smith 2000], customers are likely to be willing to pay more for transactions with trustworthy vendors. With regard to complaining behavior, responsiveness was the only dimension that significantly affects 'complaining behavior'. Customer service was found to form 33.8% of reasons behind complaining behavior in online stores [Cho et al. 2003].

The analytical work of the current study identified the dimensions of e-service quality and tested the service quality-loyalty relationships considering the multidimensionality of both concepts. Consequently, the developed scale represents psychometrically sound measures for both theoretical and applied research.

6. Implications and limitations

E-commerce is considered an innovative information system [Wigand, 2003; 1997] that lacks direct face-to-face interaction. Therefore, in such a technology-mediated environment, measuring service quality is more difficult and challenging [Parasuraman et al. 2005]. As was suggested by prior research that service quality is contextualized [Parasuraman et al. 1988], this scale is constructed to measure the quality of e-retailing service systems that facilitate shopping purchasing and delivering of tangible products. However, scale development is hardly a research objective in its own right, if the designed scale is not employed in subsequent studies. As such, the instrument construction of e-service quality scale in this paper is a part of a larger study examining the loyalty formation in e-markets (to be reported elsewhere). Further studies investigating online relationships may use the proposed scale of e-service quality to study the impact of e-service quality perception in such contexts. Some important areas of e-commerce are customer satisfaction and trust. Researchers are encouraged to apply the proposed scale to examine factors that play a role in satisfaction and trust formation.

As customers' retention becomes a challenge in e-markets [Reichheld & Scheffer 2000], this study investigated the influence of service quality attributes on customer loyalty. The present study takes the first step in investigating the influence of e-service quality on different concepts of customer loyalty. The results corroborate the findings made by previous studies on traditional customer loyalty [Bloemer et al. 1999; de Ruyter et al. 1998] that differentiate between loyalty types, showing the advantage of treating each type as a distinct construct. Investigating the roles played by e-service quality attributes on different loyalty types resulted in the following findings. Price tolerance and preference loyalty are affected mostly by the perception of assurance and reliability. The high quality of customer service and web responsiveness, on the other hand, weaken the propensity of communicating negative word-of-mouth.

From a practical perspective, we have developed diagnostic tools that enable online retailers measuring e-service quality at a detailed and specific level. Information obtained on the linkage of service quality-service loyalty provides online vendors actionable benchmarks that may be used in securing online shopper loyalty, especially that e-markets are characterized by low search cost and high competition [Brynjolfsson & Smith 2000]. Our findings suggest that different types of customer loyalty can be influenced by the perception of e-service quality. Preference loyalty was found dominantly influenced by the perception of reliability and assurance. Therefore, the managerial challenge here is to develop marketing strategies that are mainly focused on old-fashioned service basics such as on-time delivery, building the company profile and offering clear and trustworthy privacy and security policies. As e-service is delivered and consumed in a technology-based environment, offering order-tracking features, sending confirmation emails and providing inventory checking functions increase the perception of website reliability. Additionally, online managers need to address web interactivity criteria such as usability and informativeness of their websites. Web designers should provide a logical webpage layout and a consistent navigation scheme that enhance the perception of web usability. Research has shown that unmet customer expectations are considered a primary cause of both online and offline customer complaints [Chen & Hitt 2002]. Therefore, giving faster feedback response in an accurate manner can be approached as a defensive marketing strategy. Offering online chat services, self-help centers or a combination of different communication channels could enhance the speed and accuracy of responding to online shoppers' questions and thereby lessen their complaints [Chen & Hitt 2002]. Additionally, online shoppers value context-based help. Offering a Frequently Asked Questions (FAQ) section that is accessible and easy to locate increases customers' perception of customer service and decreases their propensity to switch to other e-retailers.

E-markets tend to be efficient markets where the shopper has relatively full transparency over product offerings and prices at different retailers. This results in fierce price competition. Our findings suggest that e-retailers can mitigate the tendency to compete on price by relying on the perception of assurance and trust. In order to lessen the weight attached to perceived price, it is important to signal trust and inspire confidence. Besides web-based attributes that deal with providing clear privacy and security policies, it is important to build trust through developing a company profile in terms of reputation and size. For example, online vendors can utilize online communities to spread positive word-of-mouth. Online feedback mechanisms allow online shoppers to publicize their purchase experiences with online vendors by rating their service quality [Ba & Pavolu 2002]. Advertising directly or indirectly by being favorably mentioned in popular media develops a good reputation and signals trust [Bhattacharjee 2002] and thereby generates price premiums [Ba & Pavolu 2002]. Although our research did not find a direct relationship between personalization and any of the customer loyalty types, other studies have indicated

indirect relationships mediated by satisfaction [e.g., Lee & Lin 2005]. Applying personalization technologies enhance customer satisfaction that will lead to customer loyalty [Lee & Lin 2005]. However, managers should apply personalization with caution. The online customer is unwilling to trade security with personalized offers and services. Applying the right personalization technique to increase positive feelings associated with online transactions without affecting the assurance perception of the website will indirectly secure customer loyalty [Lee & Lin 2005]. For example, adopting strategies of cross-selling, up-selling and product bundling recommendations that are based on real-time analytical data may improve the overall service quality perception.

As discussed above, theory suggests that service quality is crucial for the retailer's financial success because without it online shoppers will not return and conduct more business with the retailer [Parasuraman et al. 1988; Reichheld & Scheffer 2000; Zeithaml et al. 1996]. Expanding on this view, this study explores how the different dimensions of e-service quality affect the different types of loyalty. This study was, however, limited in certain respects. Acknowledgement of these limitations below suggests new potential directions for future research.

Considering different cues from industry reports and academic research that indicate the resemblance of the population of college students to the online shoppers population [Pew Internet 2002; Pastore 2000], this study considers the student sample as a solid and valid sampling basis to test the research model. Participants of the current study used the Internet at least 12 times during the past three months and made at least three online purchase transactions within that period. Their age profile varied from 21 to 56 years and they shopped for different tangible products. The study is conducted via an online questionnaire, which is most appropriate for topics on customer behavior in online environments [Dillman 2002]. However, it is possible that "the novelty of online surveys may have biased a subject's response to the survey" [Bhattacharjee 2002, p. 237], although they hardly constitute a novelty any longer at the time the survey was administered. Moreover, a single-item measure assessing the subjects' comfort with filling out online questionnaires is used. On a seven-item scale, the mean score of this item was 6.3 suggesting that the novelty of online questionnaires did not bias the subjects' responses. Regardless, the establishment of external validity requires using other distinct samples, especially that external validity – the potential for generalizability – "... is not something that can be achieved in any single study, but is an empirical question that requires comparisons over different studies" [Greenberg 1987, p. 157].

Related to this issue, the study was conducted using several analytical methods to analyze the large sample gathered in the United States. As quality factors differ based on cultural dimensions [e.g., Muthitachoen & Palvia, 2002; Shareef et al 2008; Singh et al., 2008] and across-cultural validation, using another sample gathered elsewhere is encouraged. Replicating the study across different cultures and nations may provide cross-cultural comparisons of the concepts of e-service quality, customer loyalty and their relationships. Another area that researchers are encouraged to pursue is re-testing the quality-loyalty relation controlling some socio-demographic characteristics such as gender, age, race, social status, education level, income level, and employment status. For instance, males were found to interact differently than females with the web [Venkatsh & Agarwal 2006]. Also, younger users hold more positive attitudes toward computers compared to older users [Venkatsh & Agarwal 2006], maybe suggesting that older working adults might find additional factors important in the setting of e-service. Moreover, Igbaria and Parasuraman [1988] found that users with higher education are more tolerant toward web usage and easier to satisfy compared to users with lower education levels. This demonstrates that considering such socio-demographic variables in service quality models may reveal additional insights. There is also evidence that psychological characteristics of the customer such as time-stressed behavior, computer self-efficacy and technology readiness play important roles in determining online customer behavior [Yi & Hwang 2003; Zeithaml et al. 2000]. These issues were beyond the scope of the current study, but exploring them could contribute to our understanding of service quality and customer loyalty in e-commerce.

Additional research could also examine the quality-loyalty relation considering other variables such as perceived risk, perceived control and switching costs as they apply to the industry as a whole to shed more light on e-service quality and its behavioral consequences. Another potentially fruitful avenue to consider is product offerings. Researchers suggest that e-service quality factors differ according to product categories [Santos 2003]. The current study focused on tangible complex products in general. Thus, examining the dimensionality of e-service quality considering websites of specific product characteristics may sharpen our results. For example, examining the proposed model in online industries that sell heavily branded products (e.g., apparel and furniture) may suggest additional factors that are highly important for this type of product. Incorporating such variables in testing the e-service quality-loyalty link can help in understanding the influence of e-service quality in retaining customers and its significant role in e-commerce activity. Finally, research has classified online task goals into two distinct types: goal-oriented and experiential [Novak et al., 2000; Wolfenbarger & Gilly 2003]. Goal-oriented users have a clearly defined goal putting more effort into reaching the ultimate objective of their activity; whereas an experiential goal refers to browsing the web timelessly in a relatively unstructured manner for an eye-catching website [Wolfenbarger

& Gilly 2003]. As research suggests that goal-oriented and experiential task goals encourage distinct mechanisms to be used by users when they interact with the web [Nadkarni & Gupta 2007], examining what cues are used by the experiential users in evaluating e-service quality is a fruitful area for future research.

According to Kuttner, "The Internet is a nearly perfect market because information is instantaneous and buyers can compare the offerings of sellers worldwide. The result is fierce price competition and vanishing brand loyalty" [1998, p. 20]. The goal of this contribution is to examine the emerging yet critical role of e-service quality as a strategy to secure customer loyalty. An improved understanding of the concept of e-service quality and its links with its behavioral consequences is essential to building loyalty models in the setting of e-retailing. This study contributes to this improved understanding and took the first step in this direction.

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This paper reports the development of a team reward attitude construct and initial validation of a measure in a longitudinal study of team members (initial $n = 566$). Confirmatory factor analysis results provide support for a revised 9-item scale in two different time periods separated by four months. The quality of one's prior team experiences is also a factor that, interestingly, has not received a great deal of attention as a predictor of reactions to team-based reward systems, but the theory of allocation preferences suggests that prior experiences are central in moulding allocation attitudes. Initial scale development and item selection. The development of the TRA measure proceeded using attitude scale construction techniques for Likert-type scales. The Work-Family Conflict Scale (WAFCS): Development and Initial Validation of a Self-report Measure of Work-Family Conflict for Use with Parents. Divna Haslam. 1 Abstract. This paper outlines the development and validation of the Work-Family Conflict Scale (WAFCS) designed to measure work-to-family conflict (WFC) and family-to-work conflict (FWC) for use with parents of young children. An expert informant and consumer feedback approach was utilised to develop and refine 20 items, which were subjected to a rigorous validation process using two separate samples of parents of 12 year old children ($n = 305$ and $n = 264$). In: Spilker B (ed) Quality of life assessment in clinical trials. Raven Press, New York, pp 47-57. Google Scholar. The best way to measure the quality of recommendation engines is, without doubt, A/B testing. So, in that sense I am mostly aligned with Sean Owen's answer (although there are some things I have a slightly different view point on and I will address later). How do I provide consumers with intelligent services that meet the diverse needs of modern life as an app developer? HONOR, HONOR Official Account. Answered May 21, 2020. One way is to use HUAWEI HMS Core. So for many online sites, it's unclear how to measure the quality of personalization and recommendations using metrics like CTR, or revenue, or dwell time, or whatever. What's an engineer to do? Well, consider the fact that many of these are relevance algorithms.