e-SELFQUAL: A scale for measuring online self-service quality

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ABSTRACT

The measurement of online self-service quality has become increasingly crucial as firms deliver an expanding array of services through their Web sites. Substantial research examines online services using salient scales primarily developed for personnel-orchestrated, face-to-face services; several recently developed scales that target online services focus on important information and/or system characteristics but do not consider e-retailers' fundamental roles holistically. The reported research synthesizes relevant previous research and proposes a conceptual framework to examine the quality of online self-services in e-retailing. The proposed framework then guides a scale development effort that includes a series of pilot and validation studies. The resulting scale, e-SELFQUAL, provides a means for examining the relationships between online service quality and customer satisfaction, as well as loyalty in e-retailing. This study has several important implications for research and business practice.

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1. Introduction

The measurement and evaluation of online service quality become increasingly important as firms deliver an expanding array of services through the Internet. Such online services are particularly crucial for retailing, in which Web sites clearly emerge as a critical channel for retailers globally. The growth of electronic retailing (e-retailing hereafter) is phenomenal. Take the United States as an example: E-retailing amounted to $127 billion in sales in 2007, with an annual growth of 18.4%, whereas total retail sales recorded only a modest 3.4% increase in the same period (U.S. Census Bureau, 2007). Such impressive growth warrants examinations of the key issues and challenges surrounding online services in e-retailing.

To deliver quality service performance and establish favorable firm–customer relationships, retailers must identify customers' needs, wants, and preferences (Howard and Worboys, 2003). Effective measurements are indispensable; several measurement scales and their extensions prevail, though most originally stemmed from conventional, face-to-face service contexts. For example, considerable previous research employs SERVQUAL to assess the quality of an information system or the associated services (e.g., Kassim and Bojeib, 2002; Kettinger et al., 1995; Pitt et al., 1995). However, the service environment may differ significantly between physical store outlets and online storefronts (Suter and Burton, 1996); thus, scales targeting face-to-face services, such as SERVQUAL, may not embrace the essential aspects of online services, which makes them less appropriate or effective for measuring online service quality.

Motivated by the importance of online services and the intrinsic limitations of many existing measurement scales (e.g., SERVQUAL), some researchers undertake rigorous scale development efforts that target Web-based services (e.g., WEBQUAL by Loiacono et al., 2002; e-TailQ by Wolfinbarger and Gilly, 2003; E-S-Qual by Parasuraman et al., 2005; eTransQual by Bauer et al., 2006). By and large, these scales emphasize specific characteristics of online services rather than focusing on the essential roles of an e-retailer (Akinci et al., 2009). From a research perspective, additional scale development efforts should measure the quality of online services in e-retailing (Bauer et al., 2006) and consider the fundamental roles of online vendors holistically. DeLone and McLean (2003) note that an online information provider often serves a dual role: an information provider that offers system-generated information relevant to users' needs or inquiries and a service provider that delivers information services, together with necessary service support. Similarly, an e-retailer must simultaneously provide accurate and up-to-date information through a Web site, operate reliable and secure information systems, and ensure satisfactory service delivery and fulfillment (Ennew and Binks, 1999; Novak et al., 2000).

Through a synthesis of relevant previous research, this study proposes a conceptual framework for examining online self-service quality in e-retailing. The proposed framework anchors in the e-retailer's multiple roles, through the lenses of information, system, and service, and has premises derived from theories and extant literature in service operations research, online services, and information systems. The service aspect of online self-service is a critical dimension that previous research does not address sufficiently

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(Meuter et al., 2000). The proposed framework then guides the development of a scale for online service quality through a series of pilot and validation studies. With the resulting e-SELFQUAL scale, this study examines the relationships between online service quality and customer satisfaction, as well as loyalty in e-retailing. Finally, this article concludes with some important implications for research and business practice derived from the findings.

2. Literature review

This section provides an overview of service quality, reviews previous research on online service quality, and highlights the gap that motivates this study.

2.1. An overview of service quality

Service quality remains of focal interest to researchers and practitioners. Many researchers consider service quality a measure of how well the delivered service level meets the customer's expectation. Building on this conceptualization, Parasuraman, Zeithaml, and Berry (1985, 1988) develop and refine SERVQUAL, a multi-item scale for measuring the quality of face-to-face services with five dimensions: tangibles, reliability, responsiveness, assurance, and empathy. A review of extant marketing literature suggests that service quality, as measured by SERVQUAL, can influence important service outcomes, such as customer satisfaction, intention, or loyalty (Parasuraman et al., 1988).

2.2. Previous online service quality research

Compared with the abundant research examining the quality of face-to-face services, investigations of online service quality remain in their infancy (Serkan et al., 2010). A common approach adapts or extends SERVQUAL to assess online services (DeLone and McLean, 2003). However, face-to-face services differ from online services in their fundamental quality dimensions. Take e-retailing for example: Customers often demand more control, expect to incur less effort, and anticipate higher transaction efficiency (Ding et al., 2007). As firms strive for effective online self-services (e.g., shopping, banking), they shift their service delivery from face-to-face contacts to technology-enabled mediation that minimizes the interaction between customers and service personnel. As a result, several dimensions fundamental to face-to-face service quality become substantially less relevant, such as tangibility and reliability. As Parasuraman et al. (2005) comment, attempts to adapt or extend a face-to-face service scale to measure or evaluate online service quality may lead to decreased reliability, questionable convergent validity, constrained predictive validity, or diminished adequacy and efficacy. A burgeoning need exists to develop measurement scales specific to online self-services.

A handful of scales measure Web site quality (Loiacono et al., 2002; Yoo and Donthu, 2001), online service quality (Bauer et al., 2006; Parasuraman et al., 2005; Zeithaml et al., 2000), or e-retailing quality (Wolfinbarger and Gilly, 2003). In general, these scales derive from rigorous development efforts and focus on important characteristics pertaining to information or the system; few consider the service dimension of online services comprehensively (Nelson et al., 2005; Wixom and Todd, 2005). As Table 1 summarizes, SITEQUAL primarily targets system quality, whereas e-TailQ and E-S-Qual emphasize system quality and service quality.

As information technology continues to advance, service providers can easily replicate or even leapfrog their competitors in Web site design, system functionality, and product offerings. Therefore, unique service experiences should become increasingly crucial because they can create sustainable competitive advantages (Scott, 2007; Ding et al., 2010). Therefore, research should scrutinize the service aspect of online self-services in e-retailing and develop appropriate measurement scales that embrace all essential aspects of an e-retailer's service performance.

With respect to online services, information quality typically entails accuracy, completeness, timeliness, and/or presentation effectiveness (Nelson et al., 2005). System quality embraces important characteristics of an information system, invariant of system usage or applications, such as accessibility, flexibility, integration, reliability, and timeliness (Wixom and Todd, 2005). Service represents another crucial quality dimension of online services (Pitt et al., 1995; Wolfinbarger and Gilly, 2003). In e-retailing, service quality encompasses an e-retailer's overall support that can affect customers' satisfaction, experience, intentions, or purchase decisions (Cronin and Taylor, 1992).

An intuitive and logical way to analyze the quality of an online self-service is to examine the fundamental roles of an e-retailer, which collectively define service quality. An e-retailer often simultaneously assumes the roles of an *information provider* (e.g., producing information relevant to customers' needs or interests), a *system provider* (e.g., operating a Web site and back-end computer-based systems), and a *service provider* (e.g., rendering customer services and support) (Ennew and Binks, 1999; Novak et al., 2000). By synthesizing previous research in service operations and information systems, this article proposes a holistic framework of the fundamental roles of an online vendor and

Table 1
Online service quality scales in prior studies.

| Article	Scale	Information related	System related	Service related
Zeithaml et al. (2000)	E-SQ		Access, ease of navigation, flexibility, reliability, price knowledge, aesthetics, efficiency, personalization, privacy,	Responsiveness, assurance
Yoo and Donthu (2001)	SITEQUAL		Ease of use, design, speed, security	
Francis and White (2002)	PIRQUAL	Product attribute	Functionality, ownership conditions, security	Delivery, customer service
Loiacono et al. (2002)	WEBQUAL (1)	Informational fit to task, ease of understanding, completeness	Appeal, response time, flow, image, operations, better than alternatives, innovativeness, interactivity, trust	
Barnes and Vidgen (2002)	WEBQUAL (2)	Information	Usability, design	Empathy, trust
Wolfinbarger and Gilly (2003)	e-TailQ		Web site design, privacy	Fulfillment/reliability, customer service
Parasuraman et al. (2005)	E-S-Qual		Efficiency, availability, privacy	Fulfillment
Parasuraman et al. (2005)	E-Res-QUAL		Responsiveness	Compensation, contact
Bauer et al. (2006)	eTransQual		Reliability, process, functionality/design	Responsiveness, enjoyment
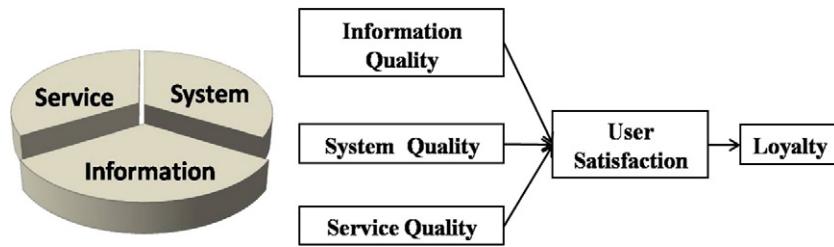
Fig. 1. e-Service composition and corresponding quality constructs.

then uses the framework to guide a scale development that targets the quality of online self-services in e-retailing. The framework is congruent with a refined IS success model (DeLone and McLean, 2003) and provides a conceptual foundation for further developments of measurement scales appropriate for online self-services (see Fig. 1).

3. Analysis of online self-service quality

In e-retailing, vendors provide online self-services to customers for improved service effectiveness and cost efficiency. When doing so, vendors must attend to key issues in service design and delivery, because customers' desires and intentions to use a self-service depend on their perceived performance of the online customer–firm interface. Several previous studies show that dissatisfying self-service experiences often result from the vendor's failure to design services that meet customers' needs, wants, or preferences (Ennew and Binks, 1999). Customer-centric designs may help promote alternative service channels enabled by self-service technology (Bitner et al., 2002). When using an online self-service, customers usually value perceived control (Bateson, 1985; Ward and Barnes, 2001) and convenience (Bateson, 1985; Berry et al., 2002; Meuter et al., 2000); they often engage in the service process extensively and become a critical element or even an integrator of the service process (Moon and Frei, 2000). From a service coproduction perspective (Moon and Frei, 2000), customers likely compare an online self-service and corresponding face-to-face services according to their service fulfillment effectiveness (Parasuraman et al., 2005). Furthermore, customers may expect personal assistance for practical purposes, such as when they confront a dysfunctional system, encounter unforeseen difficulties, or need to make a special request (Meuter et al., 2000). Thus, in e-retailing, customers demand better control, convenience, and appropriate personal assistance for service fulfillment.

A review of extant literature also suggests that appropriate scales for measuring online self-service quality are generally lacking in e-retailing, particularly those that consider the service dimension (Meuter et al., 2000). The proposed conceptual framework builds on self-service theories and relevant prior research and embraces multiple fundamental structural dimensions of service quality in e-retailing at a higher order. This framework can provide a foundation for measurement scale developments.

3.1. Perceived (cognitive) control

Perceived control depicts a cognitive state of flow experience and generally refers to the belief that the person has, at his or her disposal, a response that can influence an event (Ajzen, 1991). Among the different, subtle dimensions of perceived control (Ajzen, 1991), cognitive control is essential and requires a person to predict probable sequences of an event and understand the implications of those consequences, which closely resembles the script theory model (Bateson, 1985). Cognitive control mitigates uncertainty (Imada and Nageishi, 1982); increases the service value that customers perceive (Bateson, 1985); and clarifies a situation, particularly with regard to the need for service involvement (Botvinick et al., 2001).

In a retail setting, a customer's perceived cognitive control should evoke affect, because perceived control closely associates with the customer's judgment of whether the environment will facilitate or frustrate his or her goal achievement (Ward and Barnes, 2001). Prior research identifies perceived cognitive control as a crucial, desirable feature of self-service (Dabholkar and Bagozzi, 2002; Meuter et al., 2000). According to Bateson (1985), perceived cognitive control can account for the customer's decision to use a self-service, which reinforces the influence of perceived cognitive control in predicting probable event sequences. In e-retailing, such controls can result from a customer's perception of his or her ability to navigate the vendor's Web site effectively and anticipate how the site will respond to his or her input or request (Novak et al., 2000). In online shopping for example, perceived cognitive control emerges when customers visiting a vendor's site know what to expect when they click on a link, have a good understanding about whether they can complete a transaction within a normal timeframe, or anticipate the information they will receive upon completing a transaction (Dabholkar and Bagozzi, 2002; Ding et al., 2007).

3.2. Service convenience

Service convenience represents another essential dimension of the online self-service quality (Zeithaml et al., 2000) that promises self-served customers significant savings in time and effort through reduced waiting time and increased service efficiency (Ding et al., 2007; Meuter et al., 2000). Berry et al. (2002) examine service convenience by analyzing the time and effort incurred by a customer, which are central to service performance (i.e., decision convenience), transaction benefits (i.e., transaction convenience), core service benefits (i.e., benefit convenience), and interactions with the vendor after the service (i.e., postbenefit convenience). Bauer et al. (2006) provide an alternative conceptualization of interactions between an e-retailer and customers in a framework with a four-stage transaction process: information, agreement, fulfillment, and after-sale. In general, customers value convenience across different stages of the service process; the time and effort requirements they perceive in each stage can influence their evaluation of overall service convenience. According to Berry et al. (2002), service convenience is an essential dimension of online self-service quality and can reflect different stages, including registration, shopping cart, transaction, and updates.

3.3. Customer service

Despite impressive growth in e-retailing and vendors' efforts to lure consumers away from conventional stores to Web-based channels, online sales accounted for 2.8% of total retail value in 2006 (U.S. Census Bureau, 2007). This relatively small sales volume may clarify the myth that the Web offers a pure self-service channel (Moon and Frei, 2000). A common assumption suggests that e-retailers should let customers help themselves access product information or service details; the expectation then becomes that customers perform nearly all tasks required to access and use a service

online. However, this assumption could frustrate or even annoy customers. Through the lens of service coproduction, an e-retailer should shoulder some tasks associated with an online service and relieve the customer's burden by providing adequate customer services (Ding et al., 2007). By offering customer service through multiple channels, an e-retailer can influence customer satisfaction favorably (Ennew and Binks, 1999) and harness increased customer loyalty that leads to greater profits (Howard and Worboys, 2003). All else being equal, customers generally value responsive, helpful, and willing services in response to their inquiries, questions, or problems (Wolfinbarger and Gilly, 2003). Thus, this study considers customer service an essential dimension of online self-service quality, measured by ease of reach, sincerity, responsiveness, and order return (Para-suraman et al., 2005; Wolfinbarger and Gilly, 2003).

3.4. Service fulfillment

Service fulfillment, also central to online self-service quality (Parasuraman et al., 2005), generally refers to accurate product information presentations and detailed service descriptions that enable a customer to receive what he or she orders through the delivery of the right service within the promised timeframe (Wolfinbarger and Gilly, 2003). In e-retailing, service fulfillment denotes the extent to which a vendor's Web site (and computer-based systems) fulfills promises about service availability and order delivery (Parasuraman et al., 2005). Congruent with the analysis by Wolfin-barger and Gilly (2003) and Parasuraman et al. (2005), this study considers service fulfillment a crucial dimension of online self-service quality, which depends on order delivery, price, and item presentation evaluation.

In summary, online self-service quality in e-retailing embraces several fundamental aspects: perceived cognitive control, service convenience, customer service, and service fulfillment. This frame-work guides the subsequent scale development, which began with an extensive review of extant literature and candidate items from prior research. A series of pilot tests, validation checks, and evaluations helped ensure the validity of the measurement scale with respect to common fit indices, convergent and discriminant validity, and reliability thresholds. To demonstrate the applicability and practical value of the developed scale, this article also uses e-SELFQUAL to examine the relationship between self-service quality and customer satisfaction, as well as loyalty in e-retailing.

4. e-SELFQUAL scale development

Scale development is critical to business research but receives relatively less attention than the phenomena that necessitate the development of a measurement scale. In general, the scale develop-ment process consists of item generation, scale development, and scale evaluation (Churchill, 1979). The first phase requires the generation of a pool of candidate items through literature reviews, focus group discussions, and domain experts' input (Boudreau et al., 2001), in conjunction with content validity assessments of the candidate items. In the scale development stage, researchers must select and group appropriate candidate items to create a subset of items that exhibit desirable reliability and validity. Finally, in the scale evaluation phase, the developer must examine all (remaining) items thoroughly to ensure them posses desirable psychometric properties.

4.1. Initial measurement item generation

To develop e-SELFQUAL, the authors first reviewed relevant literature in service operations and information systems and gathered 28 candidate items, which multiple experienced researchers in service operations and IS scrutinized. To ensure the content validity, the examination of the initial items involved a card shuffling assessment

with five business faculty members and a pretest with 75 students (Churchill, 1979). The suggestions collected from the card-shuffling panel and pretest improved the (candidate) items' readability and clarity; the feedback also indicated the removal of redundant items that tapped the same facet of a focal construct. The final candidate pool of 21 items was congruent with the online self-service quality framework. Each item employed a five-point Likert scale, anchored at 1 "strongly disagree" and 5 "strongly agree."

4.2. Questionnaire construction

The pilot test served to examine the validity of the initial 21-item scale; the test involved 176 participants, randomly selected from a general-purpose mailing list at a research university located in the southwestern United States, as well as business researchers who appeared on a mailing list for a business research consortium. Most items loaded on their respective dimensions, and overall loadings exceeded .7 on average. The eigenvalue rule and scree test assess the extracted factors (Cronbach, 1951); according to the scree test results, perceived control, service convenience, customer service, and service fulfillment exhibited satisfactory consistency. A principal component analysis (PCA), with Oblimin and Kaiser normalization, helped the authors examine the loadings on the initial unrotated and rotated factors. Because PCA requires no orthogonal assumptions among the factors under examination, this method is advantageous in combina-tion with direct Oblimin, offering greater simplicity and a wider range of probable oblique solutions (Harman, 1976). To ensure the necessary reliability, items that did not load on their respective dimensions properly did not appear in the subsequent analysis. Several of the excluded items targeted the transaction in service convenience and the order return in customer service but did not load properly. As a result, 13 question items remained.

Several important demographic characteristics of the subjects represented control variables (i.e., age, gender, and online purchase experience); the authors also examined the potential influence of item sequencing in the survey. According to the analysis results, neither the demographic characteristics nor item sequencing showed a significant effect on subjects' responses to items that target different dimensions of online self-service quality.

4.3. Measurement scale applications

To assess the predictive validity of the service quality dimensions, the authors administered a survey study that contained the 13 question items and additional items to measure customer satisfaction and loyalty. Amazon, a major e-retailer with enormous purchase volumes and customers, was the target e-retailer. Several instructors helped recruit respondents among graduate and undergraduate business students; the respondents received cash rewards for their voluntary participations. Each respondent needed to complete the survey in two weeks. Those who had not completed the survey within this two-week window received a reminder message, another copy of the survey, and another two weeks to respond.

Among the 500 students contacted, 311 completed and returned the survey; however, 9 completed the survey partially and therefore did not appear in the subsequent data analyses. The sample consists of 302 respondents, for a 60.4% effective response rate. The respondents range between 19 and 57 years of age, with a mean of 28 years. The gender composition seems balanced: 47% women and 53% men. Approximately 93% of the respondents had used the Internet for more than one year; all respondents had purchased from Amazon in the past 12 months. As a group, the respondents thus represent experienced Internet users familiar with e-retailing and online purchases.

4.4. Analysis of unidimensionality

The initial exploratory factor analysis (EFA) includes the full set of items as input and uses a .60 cut-off value for the factor loadings (Hedhli and Chebat, 2008). A four-factor construct results, which matches the proposed number of service quality dimensions. The test of the reliability and validity of the extracted dimensions uses confirmatory factor analysis (CFA) with LISREL 8.71. This method examines each dimension in terms of the local fit indices, factor loadings, average variance extracted (AVE), and Cronbach's α (Churchill, 1979). The fit indices suggest a good fit between the extracted dimensions (i.e., perceived control, service convenience, customer service, and service fulfillment) and the e-SELFQUAL scale. The fit criteria also exceed the threshold values that Bagozzi and Baumgartner (1994) suggest, in support of the unidimensionality of each construct. A second-order CFA, with all extracted quality dimensions, tests whether these identified dimensions constitute a higher-order construct. The results ($\chi^2 = 93$, $df = 61$, root mean squared error of approximation [RMSEA] = .04, confirmatory fit index [CFI] = .99, root mean residual [RMR] = .05, goodness-of-fit index [GFI] = .99, adjusted goodness-of-fit index [AGFI] = .99) reveal that each dimension exhibits a large and positive loading on the second-order factor ($p < .001$). Furthermore, the correlations among the four constructs are statistically significant at the .01 level, suggesting that they converge into a common underlying construct (Bauer et al., 2006). Taken together, the data fit a higher-order model well.

To address the potential threat of random capitalization (MacCallum et al., 1992), a secondary analysis split the data into two equal halves: a calibration and a validation sample. Both the EFA and CFA of the calibration sample result in the same factor structure. The subsequent analysis of the validation sample therefore considers the factor structure a priori. The fit statistics are satisfactory (i.e., $\chi^2 = 88.4$; $df = 61$; RMSEA = .05; CFI = .98; RMR = .06; GFI = .97; AGFI = .97), and all path loadings are statistically significant.

4.5. Validity and reliability assessment

The validity assessment involves examining the convergent validity, discriminant validity, and reliability of the measurement scale using a CFA with LISREL 8.71. The scale exhibits satisfactory psychometric characteristics, as noted previously: CFI = .99, GFI = .99, and AGFI = .99. Fig. 2 summarizes the construct loadings derived from the CFA; all first-order dimensions reveal positive loadings on the

Table 2
Squared correlations between e-SELFQUAL dimensions, standard errors, and *t*-values.

	Perceived control	Service convenience	Service fulfillment	Customer service
Perceived control	.82			
Service convenience	.37 (.04) 13.58	.58		
Service fulfillment	.56 (.04) 17.70	.36 (.05) 11.63	.77	
Customer service	.32 (.05) 11.63	.36 (.05) 13.03	.42 (.04) 12.92	.79

Notes: average variance extracted appears on the diagonal. All correlations are significant at *p*<.01.

second-order factor of e-SELFQUAL, ranging from .72 to .86, with $p < .001$.

These analyses yield evidence that e-SELFQUAL possesses satisfactory convergent validity for measuring online self-service quality in e-retailing. To examine the discriminant validity of the scale, the authors compared the correlation between the constructs and the AVE of each investigated construct to determine if each AVE exceeds the squared intercorrelations between constructs (Fornell and Larcker, 1981). In Table 2, the diagonal elements represent the AVE, and the off-diagonal elements denote the squared intercorrelations. The AVE ranges between .58 and .82, exceeding all the squared coefficients, for which the maximum value is .56. This comparative analysis again shows that e-SELFQUAL exhibits satisfactory discriminant validity (Boudreau et al., 2001).

Finally, the assessment of scale reliability requires an examination of internal consistency. Consistent with the scale development procedure by Cronbach (1951), this study evaluated the reliability of e-SELFQUAL items in terms of Cronbach's α values. Furthermore, comparing the internal consistency of each item with that of the other items that measure the same construct can indicate internal homogeneity (Churchill, 1979). As Table 3 shows, each construct achieves a Cronbach's α value greater than .8, a commonly recommended threshold for adequate reliability (Boudreau et al., 2001). Taken together, the internal consistency results suggest the e-SELFQUAL scale possesses satisfactory reliability.
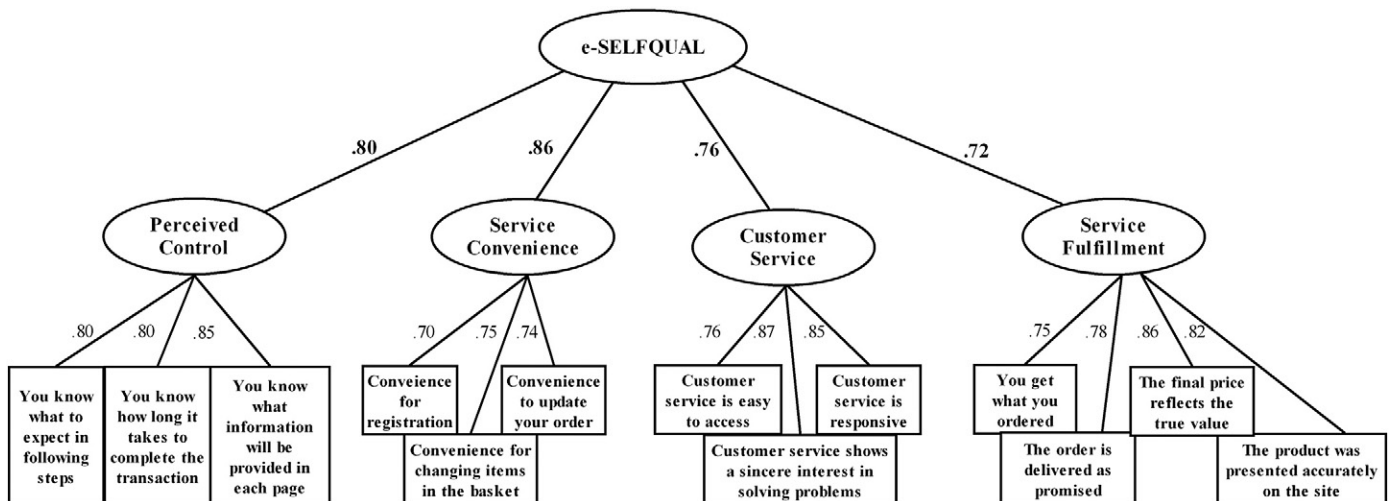

Fig. 2. Second-order model of e-SELFQUAL. Notes: fit measures: $\chi^2 = 93$, $df = 61$, RMSEA = .04, CFI = .99, RMR = .05, GFI = .99, AGFI = .99.

Table 3
Psychometric properties and CFA results for e-SELFQUAL, customer satisfaction, and loyalty.

Factor	Mean	S.D.	Standardized CFA factor loadings	AVE
Perceived control; $\alpha = .80$				.64
I know what to expect in following steps.	3.82	.89	.80	
I know how long it takes to complete the transaction.	3.68	.95	.80	
I know what information will be provided in each page.	3.70	.92	.85	
Service convenience; $\alpha = .86$				.58
Convenience for registration	3.85	.80	.70	
… for changing items in the shopping cart	4.04	.80	.75	
… to update my order	3.94	.81	.74	
Customer Service; $\alpha = .72$				.67
Customer service is easy to access.	3.51	.95	.76	
… shows a sincere interest in solving problems.	3.68	.93	.87	
… is responsive.	3.63	.93	.85	
Service fulfillment; $\alpha = .76$				.67
I get what I ordered.	4.20	.97	.75	
The order is delivered as promised.	4.07	.93	.78	
The final price reflects the true value.	4.03	.88	.86	
The product is presented accurately on this site.	4.20	.86	.82	
Customer Satisfaction; $\alpha = .92$				.81
It was the right thing to purchase on this site.	4.09	.95	.89	
I have truly enjoyed purchasing from this site.	4.02	.91	.90	
My choice to purchase from this site is a wise one.	4.04	.91	.92	
I am satisfied with my purchase from this site.	4.15	.93	.93	
Loyalty; $\alpha = .88$				.74
I encourage friends to do business with this site.	3.86	.99	.78	
I say positive things about this site to other people.	3.89	.99	.85	
I will do business with this site in the next few years.	4.06	.97	.92	
I would recommend this site to someone else.	3.97	.93	.88	

Notes: AVE = average variance extracted.

4.6. Predictive value of e-SELFQUAL

To demonstrate the applicability and practical value of the developed scale, the authors employ e-SELFQUAL (and each of its dimensions) to examine the relationship between online self-service quality and customer satisfaction, as well as customer loyalty in e-retailing. Use of multiple (linear) regression analyses is advantageous compared with other statistical analysis methods because this method avoids the influence of multicollinearity, heteroscedasticity, and polynomial relationships (Neter et al., 1990). Table 4 summarizes important psychometric properties of customer satisfaction and loyalty. In each regression model, the average measurement score of corresponding items substitutes for a quality dimension of e-

Table 4
Relationship of e-SELFQUAL dimensions to customer satisfaction and loyalty.

Construct	Customer satisfaction	Customer loyalty
Perceived control	.11 [**]	.18 [***]
Service convenience	.10 [**]	.10 [**]
Customer service	.17 [***]	.16 [**]
Service fulfillment	.43 [***]	.30 [***]
R^2	.46	.42

[**] Significant at $p < .01$.
[***] Significant at $p < .001$.

SELFQUAL. The results indicate that all extracted service quality dimensions have significant effects on customer satisfaction and loyalty. Service quality, as measured by e-SELFQUAL, accounts for 46% of the variance in customer satisfaction and 42% of the variance in customer loyalty, suggesting desirable external validity. With respect to customer satisfaction, service fulfillment appears to be the most important determinant ($\beta = .43$), consistent with Wolfinbarger and Gilly's (2003) results; that is, service fulfillment provides a strong predictor of overall service quality and customer satisfaction. The other quality dimensions seem to contribute to customer satisfaction comparably, as suggested by beta weights of .17 for customer service, .11 for perceived cognitive control, and .10 for service convenience. For loyalty, service fulfillment again emerges as the most important determinant ($\beta = .30$), followed by perceived cognitive control ($\beta = .18$), customer service ($\beta = .16$), and service convenience ($\beta = .10$). These findings reinforce the criticality of service fulfillment for affecting customer satisfaction and loyalty, two essential service outcomes in e-retailing.

5. Discussion

From a marketing perspective, the proposed framework and developed scale help clarify the debate about e-service quality by moving away from the long-fought battle over quality measurements toward a theoretical and managerial quest for how such measurements may help firms create satisfied customers by fulfilling their needs and preferences. This research therefore contributes uniquely to service research as an initial attempt to link the quality–satisfaction–loyalty chain from marketing literature to IS success models in IS research, with a prominent focus on the quality of self-services in e-retailing.

5.1. Research contributions

This research contributes to extant research on e-service quality in several ways. The disparity in existing online service quality measurements partially reflects the difference between marketing's view of quality (Parasuraman et al., 2005) and the view from the IS perspective (Kassim and Bojeib, 2002). Whereas the former tends to emphasize the service aspect, the latter values information and system aspects. This study integrates the critical quality dimensions reflecting an e-retailer's fundamental roles (i.e., information, system, and service provider) but with clear boundaries between the dimensions. To examine the structural dimension of online service quality, this study uses a holistic conceptual analysis and empirically tests the dimensions through a series of pilot tests, validation checks, and evaluations. The resulting e-SELFQUAL scale consists of elements pertaining to the information and the system, as well as items capturing the service performance of an e-service. Hence, this study can advance understanding of critical antecedents of service quality in e-retailing.

In addition, the proposed framework supports extensions to the quality–satisfaction–loyalty chain in online service contexts (McKinney et al., 2002). Whereas some researchers consider service quality the sole antecedent of customer satisfaction or behavioral intentions in service settings (e.g., Ennew and Binks, 1999), the proposed framework allows researchers to examine the quality–satisfaction–loyalty chain by incorporating information and system quality, which improves the validity and efficacy of research models predicting customer behavior in online service settings. For example, an interesting extension to this research would integrate the quality–satisfaction–loyalty chain and the two-phase quality–satisfaction model (McKinney et al., 2002) to investigate how quality, measured according to information, system, and service aspects, may influence customer satisfaction along these dimensions (see Fig. 3).
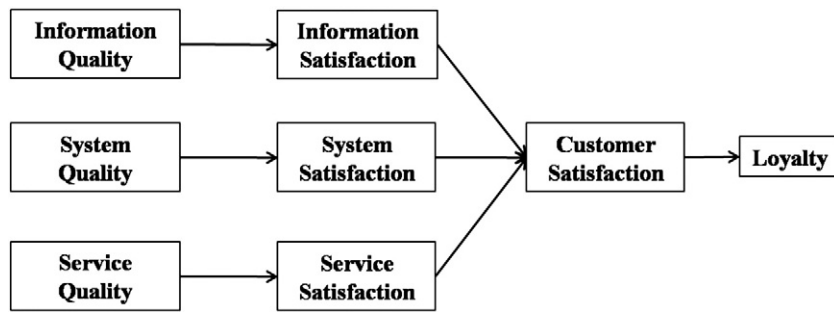
Fig. 3. e-Service quality framework.

5.2. Managerial implications

This study observes a significant, positive relationship between e-SELFQUAL and service performance, measured by customer satisfaction and loyalty. The results suggest service fulfillment is the most important factor driving customer satisfaction and loyalty, followed by customer service, perceived cognitive control, and service convenience. The proposed framework also analyzes online vendors' service performance in light of their triple role as information, system, and service provider. This framework can help bridge academic research and management practice by providing guidance to e-retailers regarding how to monitor, evaluate, and enhance their service performance.

The findings also can augment current practices in e-commerce that constantly face the challenge to increase their transaction volume and customer satisfaction. For example, this study offers insights about how an online vendor could strengthen relationships with customers from a service quality perspective. E-retailing sites must fill customer orders and provide appropriate, around-the-clock customer support services through multiple channels. Online service providers might contemplate reducing their operating costs by adopting various Web-based services, but the empirical results suggest instead that vendors should relieve customers' burden by offering appropriate personal service channels and assistance, in conjunction with self-service options (Ding et al., 2007).

In addition to fulfilling customers' service requests (Parasuraman et al., 2005; Wolfinbarger and Gilly, 2003), online service providers should proactively solicit feedback about the service process to improve customers' perceptions of control and service convenience. To make customers fully aware of and able to predict event sequences, service providers should examine the service process and provide specific instructions about the procedure for completing a transaction or a summary of important information in each service stage. For improved service convenience, online providers could optimize the service process by eliminating repetitious or confusing steps. For example, Amazon.com employs a fast-track registration and one-click checkout to make services conveniently accessible to all customers. Ample opportunities exist for increasing service convenience further, such as embedding a virtual shopping cart in the checkout procedure that allows customers to make swift changes in the purchased items while the site processes the customer's order.

6. Conclusion and further research

This research represents an early effort to analyze and measure online service quality from a self-service aspect. In addition to extending prior research in service marketing and information systems, the proposed framework highlights the desirability of developing online self-service quality measurement scales that correspond to an e-retailer's triple roles. By bridging previous research in online service quality and IS success, this study demonstrates the viability of the proposed framework and the

practical value of the developed scale to examine online self-services and their relationships with customer satisfaction and loyalty (DeLone and McLean, 2003). Overall, the results suggest online service providers should ensure service fulfillment, enable customers to control the service process, offer considerable time and effort savings, and provide timely customer service and assistance.

As does any empirical research that employs a generic framework to examine a relatively complex phenomenon, this study has several limitations. First, the samples used for the pretest, validation checks, and evaluations reflect general Amazon shoppers but may not be equally representative of other e-retailing scenarios. Second, the proposed scale adopts a utilitarian view of service quality and therefore does not consider hedonic aspects that could be important in some e-retailing contexts. Third, the demographic characteristics of the respondents mirror those of many Internet users, but potential regional biases may exist, and regional variations mark service styles (McKinney et al., 2002). Fourth, the items in the final scale do not capture all facets of service convenience and customer service; specifically, the scale development processes recommended dropping the transaction aspect of service convenience and the order return aspect of customer service. This limitation requires further efforts to reexamine or expand e-SELFQUAL.

Continued investigations also should use samples of diverse consumers and target diverse e-retailers across industries or sectors to reexamine the developed measurement scale. Future research should refine the conceptualization, definitions, and dimensions of e-SELQUAL to capture all crucial facets of online self-service quality. Additional studies also could examine e-SELQUAL in terms of adequacy and predictive efficacy to reveal promising areas for improvement. Culture represents another important future research direction; the adequacy or viability of validated measurement scale may be subject to cultural effects (Kettinger et al., 1995). Therefore, reexaminations of e-SELFQUAL should include consumers in different geographic locations or with different cultural backgrounds. Finally, service quality does not constitute the sole determinant of customer satisfaction or loyalty (DeLone and McLean, 2003). Future studies should integrate information, system, and price levels to evaluate their effects, independent or combined, on focal service outcomes (e.g., customer satisfaction, loyalty).

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