E-S-QUAL

A Multiple-Item Scale for Assessing Electronic Service Quality

A. Parasuraman
University of Miami

Valarie A. Zeithaml
University of North Carolina at Chapel Hill

Using the means-end framework as a theoretical foundation, this article conceptualizes, constructs, refines, and tests a multiple-item scale (E-S-QUAL) for measuring the service quality delivered by Web sites on which customers shop online. Two stages of empirical data collection revealed that two different scales were necessary for capturing electronic service quality. The basic E-S-QUAL scale developed in the research is a 22-item scale of four dimensions: efficiency, fulfillment, system availability, and privacy. The second scale, E-RecS-QUAL, is salient only to customers who had nonroutine encounters with the sites and contains 11 items in three dimensions: responsiveness, compensation, and contact. Both scales demonstrate good psychometric properties based on findings from a variety of reliability and validity tests and build on the research already conducted on the topic. Directions for further research on electronic service quality are offered. Managerial implications stemming from the empirical findings about E-S-QUAL are also discussed.

Keywords: *e-service quality; online stores; customer service; scale development*

Although no longer believed to be the revolution previously conceived, the Internet remains a critical channel for selling most goods and services. Companies such as Amazon distribute products and services solely through Web channels, and virtually all companies are creating Web channels as sources for prepurchase information (cars), alternative ways to buy products (retailers such as GAP, Talbot's, and Eddie Bauer), approaches to expand services (industrial products), and ways to capture time-conscious and upscale consumers (online banking). If these channels are to be viable, they must be perceived by consumers as effective and efficient.

Even though low price and Web presence were initially thought to be the drivers of success, service quality issues soon became pivotal. When consumers could not complete transactions, products were not delivered on time or at all, e-mails were not answered, and desired information could not be accessed, the viability of Web channels was jeopardized. Mounting business and academic evidence demonstrated a widespread lack of adequate service quality delivered through the Internet (Ahmad 2002; Lennon and Harris 2002; LoCascio 2000; Pastore 2001). This problem still persists (Cox 2002; Gaudin 2003; InternetNewsBureau 2003). If Web channels are to be

accepted by consumers, companies must shift the focus of e-business from e-commerce—the transactions—to e-service—all cues and encounters that occur before, during, and after the transactions.

To deliver superior service quality, managers of companies with Web presences must first understand how consumers perceive and evaluate online customer service. Although there are many different types of Internet sites, the research described in this article focuses only on online shopping sites. The article does not deal with other Internet sites—such as online newspapers, portals, free download sites, customer-to-customer sites such as eBay or Topica, sites that are collections of links, or job sites such as Monster.com—that exist for purposes other than online shopping and that are advertiser supported. The purpose of this article is to describe the development, refinement, psychometric evaluation, properties, and potential applications of a multiple-item scale for measuring e-service quality (e-SQ) of sites on which customers shop online. The process that produced the scale involved a sequence of steps consistent with conventional guidelines for scale development (Churchill 1979; Gerbing and Anderson 1988). Figure 1 provides an overview of the steps.

The remainder of this article consists of five sections. The first section provides a synopsis of the extant literature on traditional SQ and e-SQ. Drawing on insights from the extant literature and a comprehensive qualitative study, the second section offers a formal definition of e-SQ and delineates its domain (Step 1 in Figure 1). The next section describes a preliminary scale, the process used in refining it through both qualitative and empirical research, and the scale's psychometric properties (Steps 2 through 5). The fourth section discusses additional empirical research that was conducted to further assess the refined scale's reliability and validity, and to explore the nature and extent of e-SQ's impact on customers' overall quality and value perceptions, as well as their loyalty intentions (Step 6). The final section offers directions for future research and discusses managerial implications.

TRADITIONAL SERVICE QUALITY VERSUS ELECTRONIC SERVICE QUALITY

Extensive research on traditional SQ has been conducted during the past 20 years (see Parasuraman and Zeithaml 2002 for a review). In contrast, only a limited number of scholarly articles deal directly with how customers assess e-SQ and its antecedents and consequences. In this section, we briefly overview the relevant aspects of traditional SQ and describe the reasons why that research needs to be repeated in the electronic context.

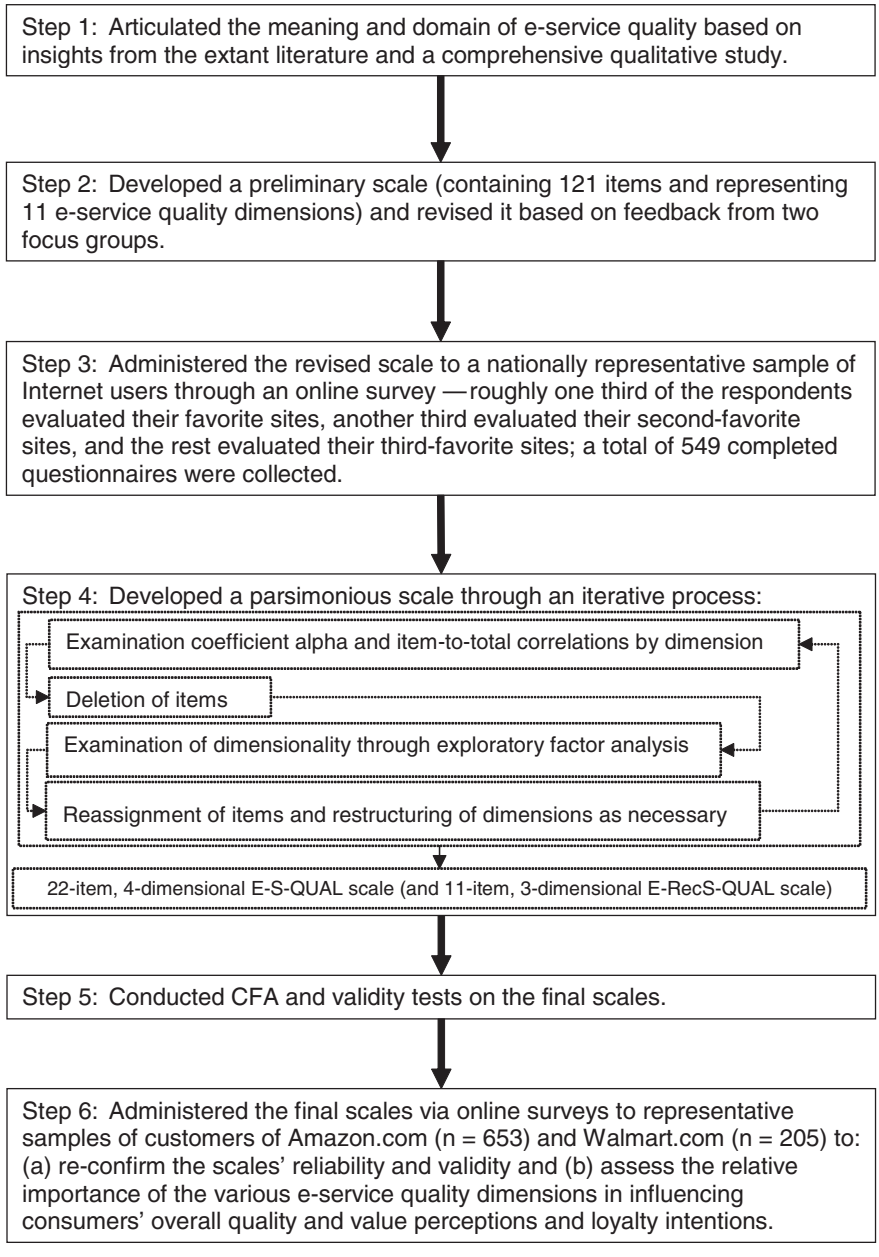
Traditional Service Quality

By traditional SQ we are referring to the quality of all *non-Internet-based* customer interactions and experiences with companies. Early scholarly writings on SQ (Grönroos 1982; Lehtinen and Lehtinen 1982; Lewis and Booms 1983; Parasuraman, Zeithaml, and Berry 1985; Sasser, Olsen, and Wyckoff 1978) suggested that SQ stems from a comparison of what customers feel a company should offer (i.e., their expectations) with the company's actual service performance. Using insights from these studies as a starting point, Parasuraman, Zeithaml, and Berry (1988, 1991) conducted empirical studies in several industry sectors to develop and refine SERVQUAL, a multiple-item instrument to quantify customers' global (as opposed to transaction-specific) assessment of a company's SQ. This scale measures SQ along five dimensions: reliability, responsiveness, assurance, empathy, and tangibles. The SERVQUAL instrument and its adaptations have been used for measuring SQ in many proprietary and published studies. It has also generated debate in the literature about the most appropriate ways to assess SQ (Brown, Churchill, and Peter 1993; Carman 1990; Cronin and Taylor 1992; Parasuraman, Berry, and Zeithaml 1991, 1993; Parasuraman, Zeithaml, and Berry 1994a, 1994b; Teas 1993.

Three broad conclusions that are potentially relevant to defining, conceptualizing, and measuring perceived e-SQ emerge from the traditional SQ literature: (a) The notion that quality of service stems from a comparison of actual service performance with what it should or would be has broad *conceptual* support, although some still question the *empirical* value of measuring expectations and operationalizing SQ as a set of gap scores; (b) the five SERVQUAL dimensions of reliability, responsiveness, assurance, empathy, and tangibles capture the general domain of SQ fairly well, although (again from an empirical standpoint) questions remain about whether they are five distinct dimensions; and (c) customer assessments of SQ are strongly linked to perceived value and behavioral intentions.

A noteworthy feature of the extant SQ literature is that it is dominated by people-delivered services. As such, whether the preceding conclusions extend to e-SQ contexts and what the similarities and differences are between the evaluative processes for SQ and e-SQ are open questions. One author who has extended the SERVQUAL conceptualization to the electronic context is Gefen (2002), who found that the five service quality dimensions collapse to three with online service quality: (a) tangibles; (b) a combined dimension of responsiveness, reliability, and assurance; and (c) empathy. In that research, tangibles were found to be the most important dimension in increasing customer loyalty and the combination dimension most

FIGURE 1
Process Employed in Developing the Scale to Measure e-SQ



NOTE: e-SQ = e-service quality.

critical in increasing customer trust. However, the items in the scale were changed to adapt to the electronic context (e.g., tangibles were represented in part by an item about appearance of the Web site), and therefore the scales were not comparable across the research contexts. For this and other reasons discussed below, studying e-SQ requires scale development that extends beyond merely adapting offline scales.

Why e-SQ?

Insights from studies dealing with people-technology interactions imply that customer evaluation of new technologies is a distinct process. For instance, findings from an extensive qualitative study of how customers interact with, and evaluate, technology-based products (Mick and Fournier 1995) suggest that (a) customer satisfaction with

such products involves a highly complex, meaning-laden, long-term process; (b) the process might vary across different customer segments; and (c) satisfaction in such contexts is not always a function of preconsumption comparison standards. Another major qualitative study by the same authors (Mick and Fournier 1998), focusing on people's reactions to technology, suggests that technology may trigger positive and negative feelings simultaneously. Moreover, other research involving both qualitative and empirical components demonstrates that customers' propensity to embrace new technologies (i.e., their *technology readiness*) depends on the relative dominance of positive and negative feelings in their overall technology beliefs (Parasuraman 2000). Earlier studies focusing on specific technologies have also shown that consumers' beliefs about, and reactions to, the technology in question are distinct and positively correlated with acceptance (Cowles 1989; Cowles and Crosby 1990; Dabholkar 1996; Eastlick 1996). Other research shows that perceived usefulness and ease of use are correlated significantly with self-reported (Davis 1989) and actual (Szajna 1996) usage of technology.

Collectively, the findings of these studies reveal important differences in acceptance and usage of technologies across customers depending on their technology beliefs and suggest that similar differences might exist in the evaluative processes used in judging e-SQ. In other words, customer-specific attributes (e.g., technology readiness) might influence, for instance, the attributes that customers desire in an ideal Web site and the performance levels that would signal superior e-SQ.

Research on e-SQ

Some academic researchers have developed scales to evaluate Web sites. Loiacono, Watson, and Goodhue (2000) created WebQual, a scale for rating Web sites on 12 dimensions: informational fit to task, interaction, trust, response time, design, intuitiveness, visual appeal, innovativeness, flow-emotional appeal, integrated communication, business processes, and substitutability. However, this scale's primary purpose is to generate information for Web site designers rather than to measure service quality as experienced by customers. The research that produced the scale involved students visiting Web sites to evaluate them rather than actual purchasers evaluating their experiences. Therefore, although some WebQual dimensions might influence perceived service quality, other dimensions (e.g., innovativeness, business processes, and substitutability) are at best tangential to it. Moreover, the scale developers excluded a dimension called *customer service* because it could not be measured under the research methodology that was used. For the same reason, WebQual does not include fulfillment as a dimension.

Barnes and Vidgen (2002) developed a completely different scale to measure an organization's e-commerce offering, which they also call WebQual. This scale provides an index of a site's quality (customer perceptions weighted by importance) and has five factors: usability, design, information, trust, and empathy. Data used in developing and testing the questionnaire were obtained from convenience samples of university students and staff who were directed to visit one of three bookstore sites, to collect some information about a book of their choice, and then to rate their experience on the scale items. The scale is designed to be answered without a respondent needing to complete the purchasing process and is therefore a transaction-specific assessment of a site rather than a comprehensive evaluation of the service quality of a site.

Yoo and Donthu (2001) developed a nine-item SITEQUAL scale for measuring site quality on four dimensions: ease of use, aesthetic design, processing speed, and security. As in the case of Barnes and Vidgen's (2002) WebQual scale, data for developing and testing SITEQUAL were gathered from convenience samples. Specifically, students enrolled in marketing classes were asked to visit and interact with three Internet shopping sites of their own choice and then evaluate each site. Like WebQual, SITEQUAL does not capture all aspects of the purchasing process and therefore does not constitute a comprehensive assessment of a site's service quality.

Using an online survey, Szymanski and Hise (2000) studied the role that customer perceptions of online convenience, merchandising (product offerings and product information), site design, and financial security play in e-satisfaction assessments. This study did not include aspects of customer service or fulfillment; rather, it dealt only with aspects of the Web site. Furthermore, it measured satisfaction rather than service quality.

Wolfinbarger and Gilly (2003) used online and offline focus groups, a sorting task, and an online-customer-panel survey to develop a 14-item scale called eTailQ. The scale contains four factors: *Web site design* (involving some attributes associated with design as well as an item dealing with personalization and another dealing with product selection), *reliability/fulfillment* (involving accurate representation of the product, on-time delivery, and accurate orders), *privacy/security* (feeling safe and trusting of the site), and *customer service* (combining interest in solving problems, willingness of personnel to help, and prompt answers to inquiries). Wolfinbarger and Gilly's goal of creating a scale to measure customer perceptions of e-tailing quality is excellent, and their three-study aproach is comprehensive. The resulting scale

raises several questions, however. Although two of their dimensions—security/privacy and reliability/fulfillment—show strong face validity and are highly descriptive of the items they represent, the other two dimensions appear less internally consistent and distinct. Web site design, for example, embraces aspects of in-depth information, level of personalization, selection, and speed of completing transactions. The factor called customer service contains items relating to the company's willingness to respond to customer needs, the company's interest in solving problems, and the promptness with which inquiries are answered. These dimensions, as well as other items that might be relevant to customer assessment of service quality on Web sites, need to be tested further.

Thus, although past studies provide insights about criteria that are relevant for evaluating e-SQ, the scales developed in those studies also raise some important questions that call for additional research on the topic. On the basis of a comprehensive review and synthesis of the extant literature on e-SQ, Zeithaml, Parasuraman, and Malhotra (2002) detailed five broad sets of criteria as relevant to e-SQ perceptions: (a) information availability and content, (b) ease of use or usability, (c) privacy/security, (d) graphic style, and (e) reliability/fulfillment. A number of studies have examined various aspects of these criteria. Some have been hypothesized to be critical, whereas the importance of others has been demonstrated empirically. Availability and depth of information appear to be important because when users can control the content, order, and duration of product-relevant information, their ability to integrate, remember, and thereby use information improves (Ariely 2000). Ease of use appears relevant because Internet-based transactions are complex and intimidating to many customers. Privacy (the protection of personal information) and security (the protection of users from the risk of fraud and financial loss) have been shown empirically to have a strong impact on attitude toward use of online financial services (e.g., Montoya-Weiss et al. 2003). Graphic style—which embodies such issues as color, layout, print size and type, number of photographs and graphics, and animation—has also been shown to affect customer perceptions of online shopping (Hoffman and Novak 1996; Hoque and Lohse 1999; Schlosser and Kanfer 1999). Finally, reliability/fulfillment has been cited as an important facet of e-SQ (Palmer, Bailey, and Faraj 1999; Wolfinbarger and Gilly 2003). In fact, Wolfinbarger and Gilly (2003) found that reliability/fulfillment ratings were the strongest predictor of customer satisfaction and quality, and the second strongest predictor of intentions to repurchase at a site.

Insights from the research on e-SQ reviewed above and a comprehensive conceptual study of the nature and structure of e-SQ (Zeithaml, Parasuraman, and Malhotra 2000) formed the starting point for developing the e-SQ scale that is the focus of this article. The following sections describe in detail the various scale-development steps outlined in Figure 1.

DEVELOPMENT AND REFINEMENT OF A SCALE TO MEASURE e-SQ

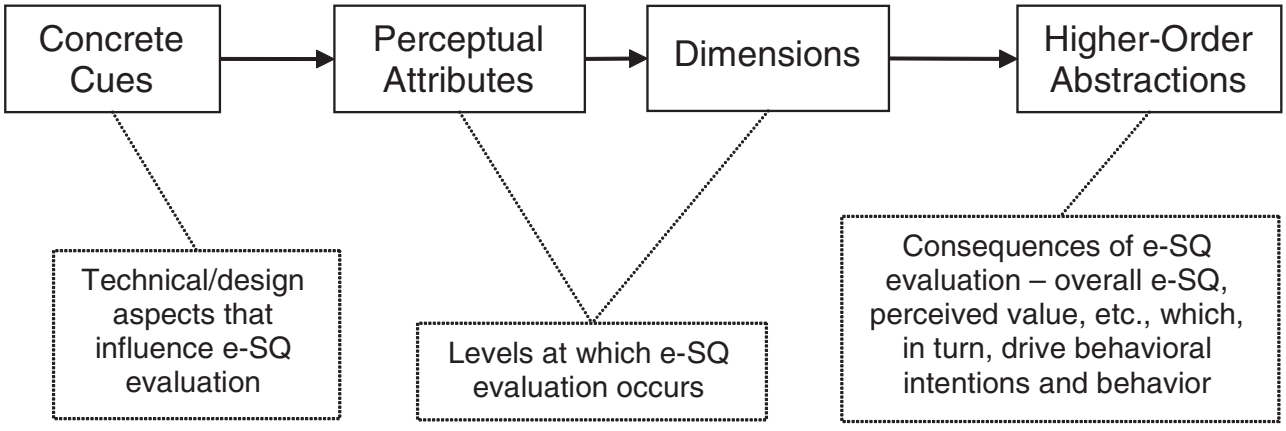
Definition and Domain of e-SQ

The extant literature and extensive focus group research in Zeithaml, Parasuraman, and Malhotra's (2000) study suggested that customers' assessment of a Web site's quality includes not only experiences during their interactions with the site but also postinteraction service aspects (i.e., fulfillment, returns). As such, e-SQ is defined broadly to encompass all phases of a customer's interactions with a Web site: *the extent to which a Web site facilitates efficient and effective shopping, purchasing, and delivery.*

In discussing what they considered to be desirable characteristics of Web sites, the focus group participants in Zeithaml, Parasuraman, and Malhotra's (2000) study mentioned a variety of features—ranging from specific, concrete cues (e.g., tab structuring, search engines, one-click ordering), to more general perceptual attributes (e.g., perceived ease of finding what one is looking for, perceived transaction speed) to broad dimensions (e.g., ease of navigation in general, responsiveness to customer needs), to higher-order abstractions (e.g., overall perceived quality and value). To represent the full range of evaluative criteria emerging from their focus groups, the researchers proposed a theoretical framework that is anchored in the means-end-chain approach to understanding consumers' cognitive structures. This approach holds that consumers retain product information in memory at multiple levels of abstraction (Olson and Reynolds 1983; Young and Feigen 1975). The proposed framework is summarized in Figure 2.

The antecedents of e-SQ are specific concrete cues—such as one-click ordering, Trust-e symbols, and search engines—that trigger perceptual attributes. Evaluations of e-service quality along the perceptual attributes coalesce into evaluations along more abstract dimensions. The attribute- and dimension-level evaluations lead to more global assessments at higher levels of abstraction (e.g., overall assessment of e-SQ and perceived value), which in turn influence behavioral intentions and actual behavior (Zeithaml, Parasuraman, and Malhotra 2000).

FIGURE 2
A Means-End Framework for Understanding the Domain and Consequences of e-SQ



NOTE: e-SQ = e-service quality.

A critical initial step in the scale development is the correct specification of the domain from which items are to be drawn in constructing the scale (Churchill 1979). As the theoretical framework in Figure 2 implies, the core evaluative process for assessing e-SQ encompasses the perceptual and dimensional levels. Concrete cues, in effect, are antecedents that influence this process, whereas the higher-order abstractions are consequences of the process. Therefore, Web site features associated with the core evaluative process—in particular, the perceptual attributes—constituted the domain of items for the e-SQ scale.

The specification of perceptual-level attributes as the domain of scale items is appropriate for several additional reasons. First, perceptual attributes are more enduring evaluative aspects than are concrete cues. The reason is that although the concrete cues associated with Web sites will change as technology changes, the more abstract perceptual attributes triggered by those cues do not themselves change. For example, one perceptual attribute of a Web site may be "easy to maneuver through the site"; the concrete cues that currently signal this attribute could include tab structuring, site map, search engine, layering of information, and number of clicks to get to the correct location, among others. Although these specific concrete cues will change (or be replaced by new cues) with advances in technology, the perceptual attribute "easy to maneuver through the site" will still be relevant as an evaluative criterion. Second, because concrete cues associated with Web sites are generally of a technical nature, not all customers might be aware of them or be able to assess how good they are. Perceptual attributes, by virtue of their being more experiential than technical, are more readily assessable by all customers. Moreover, perceptual attributes are more "scaleable" than are concrete cues—that is, they can be rated along a continuum; in contrast, many concrete cues such as one-click ordering and Trust-e symbols are either present or absent. Third, compared to dimension-level assessments, perceptual-attribute ratings are more specific and can offer finer-grained insights about e-SQ shortfalls; at the same time, when dimension-level e-SQ assessments are needed, they can be obtained easily by aggregating the appropriate perceptual-attribute ratings. Fourth, the linkages implied in the theoretical framework (Figure 2) between the e-SQ evaluative process (i.e., perceptual/dimension-level assessments) and its consequences (i.e., higher-order abstractions) constitute a natural "nomological net" for verifying the construct validity of an e-SQ scale consisting of perceptual-attribute level items. The verification is done by empirically examining the effects of perceptual-attribute level (and hence dimension-level) ratings on endogenous constructs such as perceived value and loyalty intentions (more on this later).

Zeithaml, Parasuraman, and Malhotra's (2000) study identified dozens of Web site features at the perceptual-attribute level and categorized them into 11 e-SQ dimensions:

1. *Reliability:* Correct technical functioning of the site and the accuracy of service promises

(having items in stock, delivering what is ordered, delivering when promised), billing, and product information.
2. *Responsiveness:* Quick response and the ability to get help if there is a problem or question.
3. *Access:* Ability to get on the site quickly and to reach the company when needed.
4. *Flexibility:* Choice of ways to pay, ship, buy, search for, and return items.
5. *Ease of navigation:* Site contains functions that help customers find what they need without difficulty, has good search functionality, and allows the customer to maneuver easily and quickly back and forth through the pages.
6. *Efficiency:* Site is simple to use, structured properly, and requires a minimum of information to be input by the customer.
7. *Assurance/trust:* Confidence the customer feels in dealing with the site and is due to the reputation of the site and the products or services it sells, as well as clear and truthful information presented.
8. *Security/privacy:* Degree to which the customer believes the site is safe from intrusion and personal information is protected.
9. *Price knowledge:* Extent to which the customer can determine shipping price, total price, and comparative prices during the shopping process.
10. *Site aesthetics:* Appearance of the site.
11. *Customization/personalization:* How much and how easily the site can be tailored to individual customers' preferences, histories, and ways of shopping

The collection of Web site attributes pertaining to these 11 dimensions served as the e-SQ domain from which we drew items for the e-SQ scale (Table 2 in Zeithaml, Parasuraman, and Malhotra (2000, pp. 17-21) lists these attributes).

Preliminary Scale

A set of 121 items representing all facets of the e-SQ domain formed our initial scale. We incorporated this scale into two questionnaire versions with different scale anchors and formats. We then evaluated the alternative versions in two focus group interviews with graduate students at a major university in the eastern United States.

The specific goals of the focus groups were to (a) understand respondents' reactions to alternative ways of phrasing scale items and anchors (Likert-type scale versus low-high performance anchors); (b) reword items to improve clarity; (c) eliminate redundant items; and (d) obtain feedback on the length, format, and clarity of the instructions and initial questionnaire draft. On the basis of insights from the focus groups, we simplified the directions, eliminated some confusing items, reworded some others, and chose a Likert-type scale format for collecting responses. The revised questionnaire had 113 items with 5-point scales ranging from 1 (*strongly disagree*) to 5 (*strongly agree*).

Sample Design and Data Collection

In the next stage of the scale-development process we hired a marketing research firm to administer the revised questionnaire to a random sample of Internet users through an online survey. The research firm contacted potential respondents and screened them to determine if they had sufficient online shopping experience (specified as having used the Internet at least 12 times during the past 3 months and made at least three purchases within that period). Qualified respondents were asked to list three sites with which they were most familiar. To get adequate variance in the data, we established a quota-sampling plan. One third of the respondents were asked to evaluate their favorite sites, one third were asked to evaluate their second favorite sites, and one third were asked to evaluate their third favorite sites.

To collect the data, respondents were directed to a Web site containing the revised questionnaire, which they then self-administered. To encourage participation, respondents who filled out the surveys were entered into a random drawing to receive one of several cash prizes. This process yielded a total of 549 completed questionnaires. By virtue of the aforementioned quota-sampling plan, these questionnaires covered a range of sites that varied in terms of both perceived quality and product variety (apparel, books, CDs, computer software and hardware, drugs, electronics, flowers, groceries, toys).

Data Analysis and Scale Reduction

The survey data, pooled across all sites, were subjected to various scale-reduction/refinement analyses consistent with standard procedures for developing and refining scales. The pooling of data was appropriate at this scale refinement/reduction stage because the purpose was to produce a general scale that would be appropriate for assessing service quality of a variety of sites. We first conducted reliability analysis by grouping the items according to the 11 a priori conceptual dimensions from which they were derived. We then pruned the list of items within each dimension by examining corrected item-to-total correlations and deleting items whose elimination improved reliability coefficient alpha. Another criterion we used to

eliminate items emerged from an observed pattern of a high proportion of missing data on certain items. Upon analysis, it was evident that all of these items related to service recovery (product returns, problems, compensation for problems, ways to reach the company for information or to deal with problems). Approximately one third to one half of the respondents did not respond to these items, presumably because they had not experienced the issues covered by the items (the e-retailing study by Wolfinbarger and Gilly [2003] also reported an average missing-value rate of 32% for similar items). Because recovery was an important aspect of service, we set aside these items for separate analysis to develop an e-recovery service scale. We conducted further analyses with the remaining items to develop an e-core service quality scale (E-S-QUAL).

We next conducted exploratory factor analysis on the items, using principal component analysis as the extraction method and oblimin (with Kaiser normalization) as the rotation method. We used the breaks-in-eigenvalues criterion to determine the initial number of factors to retain. We then went through a series of iterations, each involving elimination of items with low loadings on all factors or high cross-loadings on two or more factors, followed by factor analysis of the remaining items. This iterative process resulted in the final E-S-QUAL Scale, consisting of 22 items on four dimensions, which we labeled and defined as follows:

1. *Efficiency:* The ease and speed of accessing and using the site.
2. *Fulfillment:* The extent to which the site's promises about order delivery and item availability are fulfilled.
3. *System availability:* The correct technical functioning of the site.
4. *Privacy:* The degree to which the site is safe and protects customer information.

We conducted confirmatory factor analysis (CFA) to further assess the factor structure of the E-S-QUAL Scale.

We next analyzed the items we had set aside earlier for constructing a scale for measuring the quality of recovery service provided by Web sites. For this analysis, we used only the subset of respondents (approximately 50% of the full sample) who had completed these items. Following the same iterative process used in developing E-S-QUAL, we created an e-recovery service quality scale (E-RecS-QUAL) consisting of 11 items on three dimensions:

1. *Responsiveness:* Effective handling of problems and returns through the site.
2. *Compensation:* The degree to which the site compensates customers for problems.
3. *Contact:* The availability of assistance through telephone or online representatives.

As in the case of E-S-QUAL, we conducted CFA analysis to verify the factor structure of the E-RecS-QUAL Scale.

Reliability and Validity Assessment

The first two sections of the appendix contain the scale items for E-S-QUAL and E-RecS-QUAL. Table 1 presents the CFA results for E-S-QUAL, as well as coefficient alpha values for the four dimensions and item loadings from the exploratory factor analysis (EFA). Table 2 presents the corresponding results for the E-RecS-QUAL Scale.[1] The coefficient alpha values range from .83 to .94 for E-S-QUAL and .77 to .88 for E-RecS-QUAL, exceeding the conventional minimum of 0.7 (Nunnally and Bernstein 1994) and demonstrating high internal consistency and hence reliability of each dimension. These values together with the strong loadings of the scale items on their corresponding factors (in both EFA and CFA) support the convergent validity of each scale's component dimensions. The various fit indices for the CFA are also very good, with the possible exception of the root mean square error of approximation (RMSEA), which is slightly above the cutoff value of .06 suggested by Hu and Bentler (1999), although it is well within the criteria suggested by Browne and Cudeck (1993) for inferring acceptable fit. Collectively, these findings provide good support for the soundness of both scales' factor structures.[2]

1. The confirmatory factor analysis (CFA) results reported in Tables 1 and 2 are for first-order factor models specifying the scale items as reflective indicators of their corresponding latent constructs and allowing the latent constructs to intercorrelate. Whether to specify scale items as reflective or formative indicators of latent constructs is an important and challenging issue (Diamantopoulos and Winklhofer 2001; Jarvis, Mackenzie, and Podsakoff 2003). Our decision to use the reflective-indicator specification for the dimension-level latent constructs is consistent with several key criteria recommended by Jarvis, Mackenzie, and Podsakoff (2003) for choosing that specification over the formative-indicator specification: the relative homogeneity and hence interchangeability of scale items within each dimension, the high degree of covariation among items within each dimension, and the expectation that indicators within each dimension (e.g., efficiency) are likely to be affected by the same antecedents (e.g., Web site design characteristics) and have similar consequences (e.g., increase or decrease in transaction speed). We also ran second-order CFAs in which we modeled the latent first-order dimensions as reflective indicators of a second-order overall e-service quality (e-SQ) construct. The CFA loadings and model fit statistics were similar to those reported in Tables 1 and 2. However, based on the model specification criteria discussed by Jarvis, Mackenzie, and Podsakoff (2003), it might be more appropriate to treat the first-order dimensions as formative indicators of the second-order latent construct. However, estimating such a second-order measurement model requires at least two other *reflective* indicators for the second-order construct, in addition to the formative indicators already in the model (Diamantopoulos and Winklhofer 2001; Jarvis, Mackenzie, and Podsakoff 2003). Such additional reflective indicators were not available in the present study. Future research should address this limitation by collecting data on additional global questions that satisfy the criteria for being treated as reflective indicators of the second-order e-SQ constructs.

2. Because the E-S-QUAL Scale was developed on the basis of data from the full sample of respondents, whereas the E-RecS-QUAL Scale

TABLE 1
CFA and EFA Results for the E-S-QUAL Scale

	CFA Loadings		*EFA Loadings (after oblique rotation)*[a]			
Factor	*Loadings*[b]	t-*Value*[c]	*Efficiency*	*System Availability*	*Fulfillment*	*Privacy*
Efficiency (coefficient alpha = .94)						
EFF1	.84	24.00	.70			
EFF2	.88	26.78	.80			
EFF3	.81	22.68	.72			
EFF4	.86	26.07	.70			
EFF5	.79	22.72	.71			
EFF6	.74	20.53	.71			
EFF7	.82	23.63	.91			
EFF8	.85	25.34	.89			
System Availability (coefficient alpha = .83)						
SYS1	.64	12.54		.75		
SYS2	.78	14.67		.84		
SYS3	.71	13.48	.32	.61		
SYS4	.81	15.00	.31	.57		
Fulfillment (coefficient alpha = .89)						
FUL1	.84	23.33			.52	
FUL2	.88	25.49			.79	
FUL3	.82	22.61			.85	
FUL4	.85	24.02			.95	
FUL5	.77	20.38			.74	
FUL6	.77	20.83			.52	
FUL7	.85	24.03			.89	
Privacy (coefficient alpha = .83)						
PRI1	.79	16.03			.33	.74
PRI2	.78	16.86				.93
PRI3	.78	16.93				.95
Goodness-of-fit statistics						
χ^2 = 813.06						
df = 203						
CFI = .99						
NFI = .98						
RFI = .98						
TLI = .98						
RMSEA = .07						

NOTE: CFA = confirmatory factor analysis; EFA = exploratory factor analysis; CFI = Comparative Fit Index; NFI = Normed Fit Index; RFI = Relative Fit Index; TLI = Tucker-Lewis Index; RMSEA = root mean square error of approximation.
a. Total variance extracted by the four factors = 74%; rotation method: oblimin with Kaiser normalization; average interfactor correlation = .51; loadings < .30 not shown.
b. These are standardized loading estimates from CFA using the Amos software package.
c. Based on one-tailed tests, *t*-values greater than 1.65 are significant at $p < .05$; *t*-values greater than 2.33 are significant at $p < .01$.

The interfactor correlations between pairs of dimensions in the CFA ranged from .67 to .83 for the E-S-QUAL dimensions and .68 to .73 for the E-RecS-QUAL dimensions. To assess the discriminant validity of the scales, we constrained each of these correlations (one at a time) to unity in the measurement model (leaving all other parameters to be free) and repeated the CFA. In every case, the constrained CFA produced an increase in the chi-square statistic ($\Delta\chi^2$ with 1 *df*) that was significant at $p < .01$. These results support the distinctiveness of each scale's component dimensions.

In addition to the item pool from which E-S-QUAL and E-RecS-QUAL were constructed, the survey included two global measures: (a) overall quality of the site, rated by respondents on a 10-point scale (1 = *poor*, 10 = *excellent*), and (b) overall value of the site, rated by respondents on a 10-point scale (1 = *poor*, 10 = *excellent*). To assess the predictive validity of the two scales, we correlated each of these global measures with summed dimensional scores for each of the four dimensions of E-S-QUAL and the

was developed on the basis of data from a subsample (approximately 50% of the full sample), we redid the CFA for the E-S-QUAL Scale items using data from only the latter subsample. The CFA loadings and fit statistics from this reanalysis were very similar to those reported in Table 1 for the full sample, thereby supporting the robustness of the scale's factor structure.

TABLE 2
CFA and EFA Results for the E-RecS-QUAL Scale

	CFA Loadings		*EFA Loadings (after oblique rotation)*[a]		
Factor	*Loadings*[b]	t-*Value*[c]	*Responsiveness*	*Compensation*	*Contact*
Responsiveness (coefficient alpha = .88)					
RES1	.84	17.93	.79		
RES2	.83	17.86	.78		
RES3	.75	17.48	.70		
RES4	.72	15.70	.88		
RES5	.63	13.16	.87		
Compensation (coefficient alpha = .77)					
COM1	.89	16.79		.80	
COM2	.69	10.97	.36	.86	
COM3	.54	8.55		.72	
Contact (coefficient alpha = .81)					
CON1	.62	12.07			.70
CON2	.78	12.13		.35	.78
CON3	.87	12.74	.32		.81
Goodness-of-fit statistics					
$\chi^2 = 150.32$					
$df = 41$					
CFI = .99					
NFI = .99					
RFI = .98					
TLI = .99					
RMSEA = .07					

NOTE: CFA = confirmatory factor analysis; EFA = exploratory factor analysis; CFI = Comparative Fit Index; NFI = Normed Fit Index; RFI = Relative Fit Index; TLI = Tucker-Lewis Index; RMSEA = root mean square error of approximation.
a. Total variance extracted by the three factors = 72%; rotation method: oblimin with Kaiser Normalization; average interfactor correlation = .46; loadings < .30 not shown.
b. These are standardized loading estimates from CFA using the Amos software package.
c. Based on one-tailed tests, *t*-values greater than 1.65 are significant at $p < .05$; *t*-values greater than 2.33 are significant at $p < .01$.

three dimensions of E-RecS-QUAL. This analysis revealed positive and statistically significant ($p < .01$) correlations in all instances. The correlations of the E-S-QUAL dimensions with the overall measures ranged from .47 to .60 for quality and .44 to .54 for value. Likewise, the correlations of the E-RecS-QUAL dimensions with the overall measures ranged from .40 to .57 for quality and .33 to .49 for value. These results are indicative of the predictive validity of each scale's component dimensions.

ADDITIONAL ASSESSMENT OF THE REFINED SCALES

We conducted additional empirical research to further examine the scales' structure and properties. Specifically, the goals of this research were (a) to reconfirm the refined scales' reliability and validity in the context of two specific online companies (in contrast to the respondent-specified company contexts that produced the data used in developing and refining the scales) and (b) to examine the relative importance of the various e-SQ dimensions in influencing customers' overall quality and value perceptions and loyalty intentions.

Sample Design and Data Collection

We selected two online stores—amazon.com and walmart.com—to verify the psychometric properties of the E-S-QUAL and E-RecS-QUAL Scales. Several considerations led to the choice of these two online stores. While walmart.com has a well-known physical counterpart, amazon.com does not, thereby allowing coverage of the two major types of online retailing. The two sites also differ in terms of the types and variety of products they sell. The dissimilarities across the sites provided a more robust context for testing the refined scales than a single site or two similar sites would have. Yet another consideration in choosing these two sites was their popularity—at the time of the study, they were among the most visited sites according to "100 Hot Sites." This consideration was important because lists of users of specific sites were

unavailable and, as such, the sampling frame for the study consisted of individuals in the general population who had Internet access. Therefore, sites with high incidence rates within the population of Internet users were necessary for generating sufficiently large samples.

We hired a marketing research firm with expertise in conducting nationwide surveys to assist with the data collection. This firm (a) generated a list of a representative cross section of U.S. residents with Internet access, (b) contacted individuals on the list and screened them to determine if they had sufficient experience with walmart.com or amazon.com to qualify for the study (potential respondents had to have visited the site at least three times during the past 3 months and made at least three purchases from the site during that period), (c) directed them to a Web site containing the online questionnaire (two separate Web sites were set up—one each for the walmart.com and amazon.com surveys—and qualified respondents were requested to visit the appropriate site and complete the survey). To have a sufficient number of observations for verifying the factor structures and dimensionality of the refined scales through confirmatory factor analysis, we set a minimum sample size of 200 respondents for each site. This sample size exceeded the conventional requirement that around five observations per scale item are needed for conducting factor analyses (Hair et al. 1998; Stevens 1996).

In the general population with Internet access, the incidence of visits to walmart.com was considerably lower than that for amazon.com. Therefore, to meet the minimum sample size requirement for each site, the research firm used the following protocol in choosing and qualifying respondents from the sampling frame: Each potential respondent was selected randomly from the sampling frame and asked the screening questions pertaining to walmart.com. If the respondent qualified, he or she was directed to the Web site containing the survey for walmart.com. If the respondent did not qualify for walmart.com, he or she was asked the screening questions pertaining to amazon.com and, if qualified, was directed to the Web site containing the survey for amazon.com. As an incentive for participation, respondents completing the surveys were entered into a random drawing to receive one of several cash prizes. Respondents not qualifying for either online store were dropped from the study. This procedure was continued until both stores had at least 200 completed questionnaires.

The final sample sizes for walmart.com and amazon.com were 205 and 653, respectively. Table 3 contains descriptive profiles of the two samples. The samples are similar, except in terms of length of patronage—whereas 69% of the amazon.com sample had been using that site for 12 months or more, only 32% of the walmart.com sample had been doing so (this finding is not surprising in view of the fact that amazon.com had been in existence substantially longer than had walmart.com at the time of the study).

TABLE 3
Profiles of the Two Samples[a]

	Percentage	
Variable	*Amazon*	*Walmart*
Age in years		
< 25	10	10
25-40	40	43
41-55	34	34
> 55	15	13
Sex		
Male	25	22
Female	74	78
Level of education		
High school or less	14	21
Some college	40	41
College graduate	34	27
Graduate school	12	10
Annual household income		
< $25,000	15	15
$25,000-$49,999	34	35
$50,000-$74,999	26	32
$75,000 or more	24	17
Length of Web site use		
< 3 months	7	19
3 to less than 6 months	7	20
6 to less than 12 months	17	29
12 months or more	69	32
Frequency of Web site visits		
4 or less times a month	79	83
5 to 8 times a month	14	12
9 to 12 times a month	4	3
13 or more times a month	3	2

a. Numbers in the Amazon and Walmart columns are percentages based on the sample sizes for the corresponding sites; the numbers do not add to 100 in some cases because of rounding.

Measures Included in the Study

The survey instrument had four parts. The first part consisted of the 22 E-S-QUAL items shown in the appendix. The second part began with a dichotomous screening question asking respondents if they had experienced any problem or needed help with the site. Those answering yes were asked to respond to the 11-item E-RecS-QUAL battery shown in the appendix.

The third part contained multiple-item measures of two constructs—perceived value and loyalty intentions—that were used subsequently in assessing the scales' validity. The perceived value construct was measured with four items similar to those used in previous research (e.g., Dodds, Monroe, and Grewal 1991; Sirdeshmukh, Singh,

TABLE 4
Reliabilities and Intercorrelations[a,b]

	E-S-QUAL Dimensions					
	EFF	*SYS*	*FUL*	*PRI*	*VALUE*	*LOYALTY*
E-S-QUAL dimensions						
Efficiency (EFF)	*.94/.94*	.78	.73	.62	.72	.65
System Availability (SYS)	.77	*.86/.84*	.68	.55	.58	.56
Fulfillment (FUL)	.76	.68	*.93/.94*	.59	.62	.64
Privacy (PRI)	.62	.64	.65	*.85/.83*	.52	.48
Perceived Value (VALUE)	.73	.59	.63	.48	*.89/.92*	.70
Loyalty Intentions (LOYALTY)	.69	.56	.62	.48	.74	*.93/.96*

	E-RecS-QUAL Dimensions				
	RES	*COM*	*CON*	*VALUE*	*LOYALTY*
E-RecS-QUAL dimensions					
Responsiveness (RES)	*.72/.84*	*ns*	*ns*	.49	.56
Compensation (COM)	.85	*.74/.73*	*ns*	*ns*	*ns*
Contact (CON)	.80	.77	*.72/.79*	.37	*ns*
Perceived Value (VALUE)	.92	.83	.67	*.89/.92*	.70
Loyalty Intentions (LOYALTY)	.76	.77	.53	.74	*.93/.96*

a. The alpha reliabilties are shown in italics (on the diagonals), and estimates for Amazon are presented first.
b. The intercorrelations for Amazon are above the diagonal and Walmart below the diagonal. All values are significant at $p < .05$; *ns* = nonsignificant.

and Sabol 2002). The items, included in the third section of the appendix, are consistent with the conceptualzation of perceived value as a customer trade-off between benefits and costs (Zeithaml 1988) and focus on customers' higher order evaluations that have been posited to contribute to the perceived value of Web sites: perceptions of overall price, convenience, and control (Zeithaml, Parasuraman, and Malhotra 2000). The loyalty intentions construct was measured through a five-item Behavioral Loyalty Scale developed by Zeithaml, Berry, and Parasuraman (1996). The loyalty scale items are shown in the last section of the appendix.

The fourth part consisted of demographic and usage questions that produced the descriptive sample profiles shown in Table 3. In addition to the information in Table 3, one other sample characteristic is worth noting: In both samples the incidence of respondents experiencing difficulties with the sites was quite low. Only about 8% of the amazon.com sample of 653 and 16% of the walmart.com sample of 205 had experienced problems with, or sought assistance from, the sites. Therefore, the sample sizes for the E-RecS-QUAL portion of the survey were quite small—51 for amazon.com and 34 for walmart.com. The efective sample size was even smaller for some of the E-RecS-QUAL scale items (e.g., those relating to product returns) for which several respondents checked the "not applicable" response category depending on the nature of the problem or difficulty experienced. The restricted sample sizes limited the extent to which we could meaningfully assess E-RecS-QUAL's psychometric properties, especially in terms of conducting CFAs and structural equation modeling (SEM) analyses (the recommended minimum observations-to-variables ratio for meaningfully conducting such analyses is five [Hair et al. 1998; Stevens 1996]).

Reassessment of Reliability and Validity

Table 4 presents coefficient alpha values for, and intercorrelations among, the four E-S-QUAL dimensions, the three E-RecS-QUAL dimensions, and the measures of perceived value and loyalty intentions. The coefficient alpha values for all measures in both samples exceed the minimum standard of .7 (Nunnally and Bernstein 1994), suggesting that the measures are reliable. The four dimensions of E-S-QUAL have consistently strong and positive correlations with perceived value (.52 to .72 for amazon.com and .48 to .73 for walmart.com) and loyalty intentions (.48 to .65 for amazon.com and .48 to .69 for walmart.com). These results attest to E-S-QUAL's predictive validity.

The correlations for the three E-RecS-QUAL dimensions with perceived value and loyalty intentions are all large and significant for walmart.com, but only three of the six corresponding correlations are significant for amazon.com, perhaps because the number of respondents for several of these items was quite small for that site. Moreover, as mentioned before, insufficient sample size for E-RecS-QUAL hindered reconfirming the scale's factor structure and construct validity through CFA and SEM analyses. Thus, although the results from the scale-development phase of our research (Step 5 in Figure 1) provided equally strong

TABLE 5
CFA Results for the E-S-QUAL Scale

	Amazon		*Walmart*	
Factor	*Loadings*[a]	t-*Value*[b]	*Loadings*[a]	t-*Value*[b]
Efficiency				
EFF1	.86	28.97	.87	17.93
EFF2	.86	29.41	.86	16.91
EFF3	.79	25.69	.81	15.04
EFF4	.87	30.06	.88	18.11
EFF5	.76	24.05	.77	13.85
EFF6	.81	26.39	.81	15.16
EFF7	.81	26.64	.78	14.22
EFF8	.81	26.77	.82	15.47
System Availability				
SYS1	.76	19.88	.78	11.23
SYS2	.74	19.06	.74	10.91
SYS3	.79	20.54	.75	9.79
SYS4	.83	21.67	.79	11.79
Fulfillment				
FUL1	.88	29.33	.94	24.76
FUL2	.87	31.69	.91	23.78
FUL3	.81	27.08	.85	19.41
FUL4	.79	25.95	.88	21.43
FUL5	.77	25.38	.74	14.42
FUL6	.71	22.05	.68	12.18
FUL7	.87	31.88	.84	18.58
Privacy				
PRI1	.76	19.55	.77	10.43
PRI2	.87	21.58	.83	11.43
PRI3	.82	20.72	.78	10.79
Goodness-of-fit statistics				
χ^2	1278.21		739.86	
df	203		203	
CFI	.98		.97	
NFI	.98		.96	
RFI	.97		.95	
TLI	.98		.96	
RMSEA	.09		.11	

NOTE: CFA = confirmatory factor analysis; CFI = Comparative Fit Index; NFI = Normed Fit Index; RFI = Relative Fit Index; TLI = Tucker-Lewis Index; RMSEA = root mean square error of approximation.
a. These are standardized loading estimates from CFA using the Amos software package.
b. Based on one-tailed tests, t-values greater than 1.65 are significant at $p < .05$; t-values greater than 2.33 are significant at $p < .01$.

support for the reliability and validity of both E-S-QUAL and E-RecS-QUAL, there is a need for further psychometric assessment of E-RecS-QUAL in contexts involving Web sites that have a higher incidence of service problems than did the two sites included in our study. Analyses discussed in the remainder of the article focus on just E-S-QUAL.

Table 5 presents CFA results for the E-S-QUAL items.[3] The loadings generated are all high and significant ($p < .01$) in both samples. These results, along with the high coefficient alpha values for the four dimensions in both samples (Table 4), offer support for E-S-QUAL's convergent validity. The pairwise interfactor correlations produced by the CFA ranged from .38 to .63. Fixing each of these correlations to 1 and redoing the CFA produced a significant increase in the chi-square statistic in every instance ($\Delta\chi^2$ values with 1 *df* were all significant at $p < .01$) demonstrating high discriminant validity across the

3. The CFA results in Table 5 are for a first-order factor model specifying the scale items as reflective indicators of their corresponding E-S-QUAL dimension and allowing the four dimensions to intercorrelate. As we did in the scale development phase of our study (see footnote 1), we also conducted a second-order CFA with the four first-order dimensions modeled as reflective indicators of a second-order e-SQ construct. The results were similar to those in Table 5. However, as before, we were not able to conduct a second-order CFA with the first-order dimensions modeled as formative indicators because we did not have additional reflective indicators of the second-order construct that are needed for model estimation (Diamantopoulos and Winklhofer 2001; Jarvis, Mackenzie, and Podsakoff 2003).

four E-S-QUAL dimensions. Finally, values for the various fit indices, with the possible exception of RMSEA, exceed Hu and Bentler's (1999) criteria for good fit. Together, these results reinforce the support obtained in the scale-development phase for the psychometric soundness of E-S-QUAL.

To test the nomological validity of E-S-QUAL, we formulated a structural model consistent with the relationships implied in the latter stages of the means-end framework (Figure 2). Specifically, we modeled e-SQ as an exogenous construct that influences the higher order constructs of perceived value and loyalty intentions. In addition, consistent with extant theories, we modeled perceived value as an antecedent of loyalty intentions. The three constructs were treated as latent constructs in the structural model. For perceived value and loyalty intentions, their corresponding scale items served as indicator variables. For e-SQ, we first computed scores for efficiency, system availability, fulfillment, and privacy by adding the ratings on their corresponding scale items. We then used the summed scores for the four dimensions as indicators of the latent e-SQ variable.[4] The results of the SEM analyses for the two samples are summarized in Table 6.

The overall goodness-of-fit statistics and results from the structural-model portion of Table 6 (i.e., the structural coefficients and R^2 values) imply that the data from each of the two samples fit the proposed model reasonably well—all fit indices are well above conventional cutoff values (Hu and Bentler 1999), although the RMSEA values are somewhat high.[5] Furthermore, the uniformly high and significant item-construct loadings in the measurement-model portion of Table 6 suggest that the three latent constructs are reflected well by their corresponding indicator variables. The results collectively support E-S-QUAL's nomological validity. In other words, the fact that the empirical findings provide strong support for the proposed nomological net—consisting of theoretically derived links among e-SQ (measured with the newly developed E-S-QUAL), perceived value, and loyalty intentions (both measured with adaptations of previously well-established scales)—offers further evidence of the psychometric soundness of E-S-QUAL.

RELATIVE IMPORTANCE OF THE E-S-QUAL DIMENSIONS

The means-end theoretical framework posits, and the results in Table 6 verify, that E-S-QUAL assessments made at the dimensional level have an impact on higher-order evaluations. To determine the extent to which each E-S-QUAL dimension contributes to this impact, we conducted three multiple regression analyses in which the summed scores on the four dimensions were the independent variables and each of the following, in turn, served as the dependent variable: (a) a single-item overall quality measure (QUALITY) with a 10-point scale (1 = *poor*, 10 = *excellent*), (b) the summed score on the four-item perceived value measure (VALUE), and (c) the summed score on the five-item loyalty-intentions measure (LOYALTY). The top half of Table 7 summarizes the regression results.

The effects of efficiency and fulfillment on all three dependent variables are positive and significant, whereas the effects of system availability and privacy are nonsignificant, in both samples. The consistent lack of significance of the latter effects was surprising. As Table 4 shows, the pairwise correlations of system availability and privacy with perceived value and loyalty intentions, although somewhat lower than that of efficiency and fulfillment, are of the same order of magnitude. Therefore, multicollinearity due to the strong correlations among the summed-score measures of the four E-S-QUAL dimensions seemed to be a plausible explanation for the non-

4. It might have been preferable to treat e-SQ as a second-order latent construct in the structural model, with the four E-S-QUAL dimensions serving as the first-order constructs, which in turn are represented by the 22 scale items. But estimating such a complex model given the limited sample sizes, especially for Walmart, was problematic (Hu and Bentler 1999). We therefore opted to use summed scores for the four E-S-QUAL dimensions as indicators of e-SQ. It should be noted, however, that the use of improper item parcels as indicator variables could lead to misspecified models and biased parameter estimates (Kim and Hagtvet 2003). On the other hand, to the extent that item parcels are based on an appropriate initial conceptualization of the item domain (which was the case in the present study) and are not derived through a purely post hoc, data-driven basis, the risk of misspecifications and biased estimates is mitigated (Kim and Hagtvet 2003).

5. Regarding the somewhat high RMSEA values, it is worth noting that the interpretation of any fit index in isolation could be problematic because trade-offs between Type I and Type II errors call for the interpretation of *combinations* of indexes in various model contexts (Hu and Bentler [1999] and McQuitty [2004] offer insightful discussions of this issue and recommend interpretation guidelines). A related issue is statistical power, which depends on sample size as well as the degrees of freedom in the structural model and can be either too low (leading to nonrejection of incorrect models) or too high (leading to rejection of correct models) (McQuitty 2004). As such,

> situations in which power is overly great (i.e., > 0.9) may require a more relaxed interpretation of fit than is typical. Conversely, a more stringent interpretation of fit statistics is required when power is low, especially when goodness-of-fit statistics are not exemplary. (McQuitty 2004, p. 182)

McQuitty (2004) offers a table (Table 5 in his article) that summarizes the minimum sample sizes necessary for achieving specified levels of statistical power in testing structural models with varying degrees of freedom. Interpolating from this table, the statistical power turns out to be well above 0.9 for the Amazon sample ($n = 653$, $df = 62$) and is above 0.8 for the Walmart sample ($n = 205$, $df = 62$). The high statistical power (and exemplary values for the Comparative Fit Index [CFI], Normed Fit Index [NFI], Relative Fit Index [RFI], and Tucker-Lewis Index [TLI]) in both cases seem to mitigate the somewhat high root mean square error of approximation (RMSEA) values.

TABLE 6
SEM Analysis to Examine E-S-QUAL's Nomological Validity

Structural Coefficients and R^2 *Values*

Dependent Construct	*Amazon* *Coefficient (t-value)*[a]	*Walmart* *Coefficient (t-value)*[a]
Perceived value		
e-Service quality	.82 (18.25)	.75 (11.01)
R^2	.67	.56
Loyalty intentions		
e-Service quality	.34 (5.97)	.33 (4.25)
Perceived value	.48 (7.93)	.54 (6.61)
R^2	.62	.66
Measurement Model Item	*Construct Loading (t-values)*[a]	*Construct Loading (t-values)*[a]
e-SQ (E-S-QUAL)		
Efficiency	.92 (36.81)	.91 (18.21)
System availability	.83 (29.19)	.83 (15.97)
Fulfillment	.81 (27.82)	.84 (16.41)
Privacy	.67 (20.38)	.72 (12.49)
Perceived value		
Price	.71 (10.76)	.83 (14.21)
Overall value	.85 (20.62)	.94 (17.79)
Perceived control	.84 (20.46)	.84 (14.88)
Perceived convenience	.88 (21.18)	.86 (15.29)
Loyalty intentions		
Positive word of mouth	.94 (42.41)	.95 (26.21)
Recommend to others	.95 (47.51)	.93 (24.17)
Encourage others to use	.87 (37.75)	.92 (23.41)
First choice for future	.78 (28.17)	.84 (18.28)
Do more business in future	.73 (25.89)	.86 (15.21)
Goodness-of-fit statistics		
χ^2	487.77	174.91
df	62	62
CFI	.99	.99
NFI	.99	.98
RFI	.98	.98
TLI	.98	.98
RMSEA	.10	.09

NOTE: SEM = structural equation modeling; CFI = Comparative Fit Index; NFI = Normed Fit Index; RFI = Relative Fit Index; TLI = Tucker-Lewis Index; RMSEA = root mean square error of approximation.
a. Based on one-tailed tests, *t*-values greater than 1.65 are significant at $p < .05$; *t*-values greater than 2.33 are significant at $p < .01$.

significant effects of system availability and privacy. To determine the degree of multicollinearity, we computed the variance inflation factor (VIF) for each independent variable in regression equations. The mean VIF value across the four independent variables was 2.59 for the Amazon sample and 2.74 for the Walmart sample. These values imply the presence of at least a moderate degree of multicollinearity.[6]

6. There is no formal, theory-based cutoff value for the variance inflation factor (VIF), although values exceeding 10 are often regarded as indicating severe multicollinearity; however, VIF values greater than 2.5 are cause for concern (Allison 1999). Moreover, Netter et al. (1996) suggested that VIF values considerably larger than 1 are indicative of serious multicollinearity.

To circumvent the problem of multicollinearity, we conducted a factor analysis (with varimax rotation) of the ratings on the 22 items and extracted four orthogonal factors. In both samples, (a) the rotated loadings evidenced a relatively clean factor structure—with few exceptions, the items loaded very strongly on factors corresponding to their a priori dimensions and weakly on the other dimensions, (b) the four factors together accounted for about 75% of the variance in the items, and (c) the correlation between the factor-score measure of each dimension and its corresponding summed-score measure ranged from .77 to .89 (in contrast, correlations between factor-score measures and noncorresponding summed-score measures

TABLE 7
Regression Analyses of QUALITY, VALUE, and LOYALTY on Summed and Factor Scores for E-S-QUAL Dimensions

	Standardized Coefficients and R^2 Values					
	Amazon			*Walmart*		
	QUALITY	*VALUE*	*LOYALTY*	*QUALITY*	*VALUE*	*LOYALTY*
Independent variables—summed scores						
Efficiency	.46 (.00)	.56 (.00)	.36 (.00)	.37 (.00)	.53 (.00)	.39 (.00)
System availability	–.03 (.46)	–.04 (.44)	.03 (.53)	–.01 (.91)	.05 (.58)	.04 (.63)
Fulfillment	.35 (.00)	.20 (.00)	.34 (.00)	.46 (.00)	.27 (.00)	.34 (.00)
Privacy	.04 (.24)	.08 (.03)	.04 (.26)	–.03 (.65)	–.03 (.62)	.02 (.83)
Adjusted R^2	.57 (.00)	.55 (.00)	.49 (.00)	.56 (.00)	.58 (.00)	.52 (.00)
Independent variables—factor scores						
Efficiency	.47 (.00)	.51 (.00)	.40 (.00)	.44 (.00)	.53 (.00)	.45 (.00)
System availability	.30 (.00)	.32 (.00)	.33 (.00)	.28 (.00)	.32 (.00)	.32 (.00)
Fulfillment	.45 (.00)	.36 (.00)	.43 (.00)	.51 (.00)	.42 (.00)	.44 (.00)
Privacy	.22 (.00)	.24 (.00)	.21 (.00)	.21 (.00)	.20 (.00)	.23 (.00)
Adjusted R^2	.57 (.00)	.54 (.00)	.49 (.00)	.56 (.00)	.58 (.00)	.52 (.00)

NOTE: Numbers in parentheses are significance levels.

ranged from .21 to .47).[7] Because each factor-score measure is, in effect, a weighted combination of all 22 items, its interpretation is not synonymous with that of the corresponding summed-score measure. On the other hand, given the aforementioned results, it is reasonable to interpret each factor-score measure as *predominantly* representing the corresponding E-S-QUAL dimension. Therefore, regression analyses with the orthogonal factor-score measures (rather than the summed-score measures) as independent variables will provide a clearer picture of the relative contributions of the four E-S-QUAL dimensions in explaining the variance in the dependent measures (i.e., quality, value, and loyalty).

The bottom half of Table 7 summarizes the results from the three regression analyses in which the factor-score measures were the independent variables. These results show that all four factor-score measures have significant positive effects on the three dependent measures in both samples. The pattern of effects is consistent across dependent variables and samples and suggests that the factors representing efficiency and fulfillment have the strongest effects, followed by the factors representing system availability and then privacy.

Wolfinbarger and Gilly's (2003) etailing study—wherein their 14 eTailQ scale items were grouped into four dimensions labeled *Web site design*, *fulfillment/reliability*, *security/privacy*, and *customer service*—found that (a) Web site design and fulfillment/reliability had significant effects on overall quality, satisfaction, and loyalty intentions (with the effect of Web site design being much stronger on loyalty intentions than on quality and satisfaction); (b) security/privacy had no significant effect on any of the dependent variables; and (c) customer service had significant but relatively weak effects on quality and loyalty intentions, and no effect on satisfaction. To the extent that eTailQ's Web site design and reliability/fulfillment dimensions have some conceptual and content overlap with E-S-QUAL's efficiency and fulfillment dimensions, the results about the relative importance of dimensions of the two scales are similar. On the other hand, there are several important differences between the two scales as described below.

First, the two studies show different results as they relate to the significance of privacy. In the present study, regression analyses using factor-score measures as independent variables clearly and consistently show that the factor representing privacy plays a significant role in customers' higher-order evaluations pertaining to Web sites. Second, eTailQ's three-item customer service dimension is represented in the present study by a distinct scale—E-RecS-QUAL, consisting of 11 items grouped into three dimensions—that is intended for assessing the quality of a Web site's service in response to problems or questions experienced by customers. The relatively low importance of the customer service dimension observed in Wolfinbarger and Gilly's (2003) study might be an artifact of a high incidence of missing values for the customer-service questions due to those questions being asked of all respondents rather than only those who had problems or questions.[8] The separate E-RecS-QUAL Scale, in addition

7. Factor scores for the four orthogonal factors were generated by the SPSS 11.0 program that was used to conduct the factor analysis.

8. Wolfinbarger and Gilly (2003) used a mean-replacement procedure to impute values for customer service items with missing observations in order to include those data points in their analyses.

to being relevant only for recovery service (thereby minimizing if not eliminating the incidence of missing values), can offer a finer-grained assessment of recovery service quality. Third, E-S-QUAL's four-item system-availability dimension, the factor representing which has an even stronger effect on the dependent measures than does the factor representing privacy, is not explicitly and fully reflected in eTailQ; at best, it is subsumed under the more general Web site design dimension.

DISCUSSION

Informed by insights from the extant literature and using the means-end framework as a theoretical foundation, we set out to conceptualize, construct, refine, and test a multiple-item scale (E-S-QUAL) for measuring the service quality delivered by Web sites. In the preliminary stage of scale development, a large number of respondents did not provide ratings on a subset of the initial pool of items. An examination of these items revealed that they all pertained to nonroutine or recovery service encounters that many respondents apparently had not experienced. Therefore, in subsequent stages of scale development and refinement, we created a subscale of E-S-QUAL—called E-RecS-QUAL—containing items focusing on handling service problems and inquiries, and being salient only to customers who had had nonroutine encounters with the sites. The basic E-S-QUAL Scale (relevant for a Web site's entire customer base) is a four-dimensional, 22-item scale, whereas E-RecS-QUAL (relevant for the portion of the customer base with recovery service experience) is a three-dimensional, 11-item scale. We hope that the two scales will stimulate and facilitate additional scholarly research on e-SQ and also assist practitioners in systematically assessing and improving e-SQ. We next offer directions for further research on e-SQ and discuss the practical implications of our findings.

Directions for Further Research

Both scales demonstrate good psychometric properties based on findings from a variety of reliability and validity tests. However, the E-RecS-QUAL Scale should be viewed as a preliminary scale because the small samples of customers with recovery-service experience at the sites used in later stages of scale testing did not permit a comprehensive psychometric assessment of that scale. We selected amazon.com and walmart.com for the confirmatory phase of our research because they were among the most frequently visited Web sites at that time, and incidence of visits to sites among the general population was critical for sampling efficiency because we did not have access to site-specific customer lists. However, although the two chosen sites enjoyed high frequency of visits, it turned out that they both also had a low incidence of problem encounters, probably because the sites were among the most reputed sites at the time of the study. There is thus a need to further examine the reliability and validity of E-RecS-QUAL in the context of more diverse Web sites that have a higher incidence of problem encounters and to refine the scale if necessary.

To capture the full range of customer-service issues (e.g., product returns), all phases of our research focused on Web sites that sold physical products (in contrast to pure-service sites such as those offering financial or information services). As such, an important research priority is to examine the scales in the context of pure-service sites, make any necessary modifications, and assess the psychometric properties of the modified scales. As a starting point for such research, an examination of the scale items in the appendix suggests that (a) all items under the efficiency, system availability, and privacy dimensions of E-S-QUAL and the contact dimension of E-RecS-QUAL are germane to pure-service sites as well; (b) several of the items under the other three dimensions (fulfillment, responsiveness, and compensation) should also be applicable to pure-service sites; and (c) the remaining items could be modified or eliminated (and perhaps supplemented with additional items if necessary). Adapted scale versions based on the above suggestions need to be created and formally evaluated in the context of pure-service sites, including online newspapers, customer-to-customer sites, portals, and other such sites.

The purpose of E-S-QUAL (and E-RecS-QUAL) is solely to measure the *service quality* of Web sites. Other experiential aspects such as fun or pleasure do not fall within the conceptual domain of service quality because such hedonic aspects are distinct benefits that may not be relevant in all contexts or to all customers. On the other hand, understanding the interplay between benefits sought from a site and the site's service quality is a potentially fruitful avenue for research. For instance, are some e-SQ dimensions more critical than others when customers seek hedonic benefits from a Web site (e.g., an entertainment site), as opposed to when they engage in strictly goal-directed shopping interactions? Does the nature of the benefits sought (hedonic vs. goal-directed) moderate the impact of a Web site's service quality on customers' evaluation of the benefits? These and related questions are worth exploring.

Managerial Implications

As the discussion in the preceding section illustrates, there is a need for further research to deepen our under-

standing of the assessment, antecedents, and consequences of e-SQ. However, the findings from the present study have several important, even if broad, implications for practitioners.

First, efficiency and fulfillment are the most critical, and equally important, facets of Web site service quality. Of the four E-S-QUAL dimensions, customers' assessments of a Web site on these two dimensions have the strongest influence not only on overall quality perceptions but also on perceived value and loyalty intentions. The consistency of these results underscores the need for companies to place extra emphasis on Web site attributes pertaining to these two dimensions. In this regard, it is noteworthy that whereas the efficiency attributes deal with designing the Web site–customer interface, virtually all the fulfillment attributes relate to the Web site's behind-the-scenes infrastructure (see appendix). Thus, earning a high-quality image for a company's Web site involves much more than creating an excellent façade for the site.

Second, the system availability facet of Web sites is also a critical contributor to customers' perceptions of overall quality, value, and loyalty intentions. The four perceptual attributes that constitute system availability suggest that companies may not have full control over performance on this dimension; the equipment at the customer's end (e.g., type of computer and Internet connection) is also likely to affect performance on this dimension. Companies should be (a) sensitive to potential deleterious effects of sophisticated Web site design features on system availability and (b) proactive in identifying aspects of system availability that are beyond their control and devising appropriate communication scripts to appease complaining customers.

Third, although privacy is the least critical of the four E-S-QUAL dimensions, our regression results show that the factor representing this dimension still has a significant influence on customers' global evaluations of Web sites. Previous research has argued that privacy of Web sites may not be critical for more frequent users (Wolfinbarger and Gilly 2003). Experience may indeed mitigate concerns about Web site security. However, the fact that the respondents in our amazon.com and walmart.com surveys were prescreened for sufficient experience with the sites, coupled with the consistent findings from both surveys that privacy perceptions do influence customers' overall quality/value perceptions and loyalty intentions, emphasizes the need for companies to continue to reassure customers through Web site design cues and external communications signaling the privacy/security of their sites.

Fourth, the three recovery-service dimensions (responsiveness, compensation, and contact) and the perceptual attributes they contain imply service aspects that mirror aspects of traditional service quality (e.g., ready access to company personnel, concern for solving customers' problems). Therefore, although online companies might be able to deliver superior e-service during routine transactions with little or no human contact—in fact, none of the four basic E-S-QUAL dimensions and their corresponding attributes call for personal service—excelling in recovery service might require the human touch.

Fifth, E-S-QUAL and E-RecS-QUAL are generic and parsimonious scales, intended for obtaining a global (as opposed to transaction-specific) assessment of a Web site's service quality. Online companies can best use the scales in tandem (with the latter being administered only to customers who have had problems or questions) to track over time—and across competing Web sites—customers' overall e-SQ perceptions. Trends in the dimensional- and attribute-level ratings from such tracking studies will help identify Web sites' strengths and weaknesses and suggest ideas for improvement. Such tracking studies may have to be supplemented with more specific studies when necessary (e.g., to pinpoint the reasons for deficiencies on a particular dimension or perceptual attribute, to evaluate customer reactions to a new Web site feature, etc.). Companies can also enhance the diagnostic value of the perceptual ratings from the two scales by comparing those ratings with customers' minimum- and desired-service levels (Parasuraman, Zeithaml, and Berry 1994a). The minimum- and desired-service levels can be obtained by periodically incorporating into the tracking studies two additional ratings for each perceptual attribute (Parasuraman, Zeithaml, and Berry 1994a).

APPENDIX
Measures of Study Constructs

E-S-QUAL

Respondents rated the Web site's performance on each scale item using a 5-point scale (1 = *strongly disagree*, 5 = *strongly agree*). The items below are grouped by dimension for expositional convenience; they appeared in random order on the survey. The symbols preceding the items correspond to the variable names in Tables 1 and 5 in the body of the article.

Efficiency

EFF1	This site makes it easy to find what I need.
EFF2	It makes it easy to get anywhere on the site.
EFF3	It enables me to complete a transaction quickly.
EFF4	Information at this site is well organized.
EFF5	It loads its pages fast.
EFF6	This site is simple to use.
EFF7	This site enables me to get on to it quickly.
EFF8	This site is well organized.

System Availability

SYS1 This site is always available for business.
SYS2 This site launches and runs right away.
SYS3 This site does not crash.
SYS4 Pages at this site do not freeze after I enter my order information.

Fulfillment

FUL1 It delivers orders when promised.
FUL2 This site makes items available for delivery within a suitable time frame.
FUL3 It quickly delivers what I order.
FUL4 It sends out the items ordered.
FUL5 It has in stock the items the company claims to have.
FUL6 It is truthful about its offerings.
FUL7 It makes accurate promises about delivery of products.

Privacy

PRI1 It protects information about my Web-shopping behavior.
PRI2 It does not share my personal information with other sites.
PRI3 This site protects information about my credit card.

E-RecS-QUAL

Respondents rated the Web site's performance on each scale item using a 5-point scale (1 = *strongly disagree*, 5 = *strongly agree*). The items below are grouped by dimension for expositional convenience; they appeared in random order on the survey. The symbols preceding the items correspond to the variable names in Table 2 in the body of the article.

Responsiveness

RES1 It provides me with convenient options for returning items.
RES2 This site handles product returns well.
RES3 This site offers a meaningful guarantee.
RES4 It tells me what to do if my transaction is not processed.
RES5 It takes care of problems promptly.

Compensation

COM1 This site compensates me for problems it creates.
COM2 It compensates me when what I ordered doesn't arrive on time.
COM3 It picks up items I want to return from my home or business.

Contact

CON1 This site provides a telephone number to reach the company.
CON2 This site has customer service representatives available online.
CON3 It offers the ability to speak to a live person if there is a problem.

Perceived Value

The value measure consisted of four items; respondents rated the Web site on each item using a scale of 1 (*poor*) to 10 (*excellent*).

1. The prices of the products and services available at this site (how economical the site is).
2. The overall convenience of using this site.
3. The extent to which the site gives you a feeling of being in control.
4. The overall value you get from this site for your money and effort.

Loyalty Intentions

The loyalty measure consisted of five behavioral items; respondents indicated their likelihood of engaging in each behavior on a 5-point scale (1 = *very unlikely*, 5 = *very likely*).

How likely are you to . . .

1. Say positive things about this site to other people?
2. Recommend this site to someone who seeks your advice?
3. Encourage friends and others to do business with this site?
4. Consider this site to be your first choice for future transactions?
5. Do more business with this site in the coming months?

REFERENCES

Ahmad, S. (2002), "Service Failures and Customer Defection: A Closer Look at Online Shopping Experiences," *Managing Service Quality*, 12 (1), 19-29.

Allison, P. D. (1999), *Logistic Regression Using the SAS System*. Cary, NC: SAS Institute.

Ariely, Dan (2000), "Controlling the Information Flow: Effects on Consumers' Decision Making and Preferences," *Journal of Consumer Research*, 27 (2), 233-48.

Barnes, Stuart J. and Richard T. Vidgen (2002), "An Integrative Approach to the Assessment of E-Commerce Quality," *Journal of Electronic Commerce Research*, 3 (3), 114-27.

Brown, Tom J., Gilbert A. Churchill Jr., and J. Paul Peter (1993), "Improving the Measurement of Service Quality," *Journal of Retailing*, 69 (Spring), 127-39.

Browne, Michael W. and Robert Cudeck (1993), "Alternative Ways of Assessing Model Fit," in *Testing Structural Equation Models*, Kenneth A. Bollen and J. Scott Long, eds. Newbury Park, CA: Sage, 136-62.

Carman, James M. (1990), "Consumer Perceptions of Service Quality: An Assessment of the SERVQUAL Dimensions," *Journal of Retailing*, 66 (Spring), 33-55.

Churchill, Gilbert A. (1979), "A Paradigm for Developing Better Measures of Marketing Constructs," *Journal of Marketing Research*, 16 (February), 64-73.

Cowles, Deborah (1989), "Consumer Perceptions of Interactive Media," *Journal of Broadcasting and Electronic Media*, 33 (Winter), 83-89.

——— and Lawrence A. Crosby (1990), "Consumer Acceptance of Interactive Media in Service Marketing Encounters," *The Service Industries Journal*, 10 (July), 521-40.

Cox, B. (2002), *Customer Service Still a Struggle*. Retrieved from http://dc.internet.com/news/article.php/947951

Cronin, J. Joseph, Jr. and Stephen A. Taylor (1992), "Measuring Service Quality: A Reexamination and Extension," *Journal of Marketing*, 56 (July), 55-68.

Dabholkar, Pratibha A. (1996), "Consumer Evaluations of New Technology-Based Self-Service Options: An Investigation of Alternative Models of SQ," *International Journal of Research in Marketing*, 13 (1), 29-51.

Davis, Fred D. (1989), "Perceived Usefulness, Perceived Ease of Use and User Acceptance of Information Technology," *MIS Quarterly*, 13 (3), 318-39.

Diamantopoulos, Adamantios and Heidi M. Winklhofer (2001), "Index Construction with Formative Indicators: An Alternative to Scale Development," *Journal of Marketing Research*, 38 (May 2001), 269-77.

Dodds, William B., Kent B. Monroe, and Dhruv Grewal (1991), "Effects of Price, Brand, and Store Information on Buyers' Product Evaluations," *Journal of Marketing Research*, 28 (August) 307-19.

Eastlick, Mary Ann (1996), "Consumer Intention to Adopt Interactive Teleshopping," working paper, report No. 96-113 (August), Marketing Science Institute, Cambridge, MA.

Gaudin, S. (2003), *Companies Failing at Online Customer Service*. Retrieved from http://itmanagement.earthweb.com/erp/article.php/1588171

Gefen, David (2002), "Customer Loyalty in E-Commerce," *Journal of the Association for Information Systems*, 3, 27-51.

Gerbing, David W. and James C. Anderson (1988), "An Updated Paradigm for Scale Development Incorporating Unidimensionality and Its Assessment," *Journal of Marketing Research*, 25 (May), 186-92.

Grönroos, Christian (1982), *Strategic Management and Marketing in the Service Sector*. Helsingfors, Sweden: Swedish School of Economics and Business Administration.

Hair, Joseph F., Ralph E. Anderson, Ronald L. Tatham, and William C. Black (1998), *Multivariate Data Analysis*, 5th ed. Upper Saddle River, NJ: Prentice Hall.

Hoffman, Donna L. and Thomas P. Novak (1996), "Marketing in Hypermedia Computer-Mediated Environments: Conceptual Foundations," *Journal of Marketing*, 60 (July), 50-68.

Hoque, Abeer Y. and Gerald L. Lohse (1999), "An Information Search Cost Perspective for Designing Interfaces for Electronic Commerce," *Journal of Marketing Research*, 36 (August), 387-94.

Hu, Li-tze and Peter M. Bentler (1999), "Cutoff Criteria for Fit Indexes in Covariance Structure Analysis: Conventional Criteria versus New Alternatives," *Structural Equation Modeling*, 6 (1), 1-55.

InternetNewsBureau (2003), *Jupiter Research Reports That Companies Are Failing at Online Customer Service Despite Growth in Online CRM Spending*. Retrieved from http://www.internetnewsbureau.com/archives/2003/feb03/crm.html

Jarvis, Cheryl Burke, Scott B. Mackenzie, and Philip M. Podsakoff (2003), "A Critical Review of Construct Indicators and Measurement Model Misspecification in Marketing and Consumer Research," *Journal of Consumer Research*, 30 (September), 199-218.

Kim, Sooyeon and Knut A. Hagtvet (2003), "The Impact of Misspecified Item Parceling on Representing Latent Variables in Covariance Structure Modeling: A Simulation Study," *Structural Equation Modeling*, 10 (1), 101-27.

Lehtinen, Uolevi and Jarmo R. Lehtinen (1982), "Service Quality: A Study of Quality Dimensions," unpublished working paper, Service Management Institute, Helsinki, Finland.

Lennon, R. and J. Harris (2002), "Customer Service on the Web: A Cross-Industry Investigation," *Journal of Targeting, Measurement and Analysis for Marketing*, 10 (4), 325-38.

Lewis, Robert C. and Bernard H. Booms (1983), "The Marketing Aspects of Service Quality," in *Emerging Perspectives on Services Marketing*, Leonard L. Berry, G. Lynn Shostack, and Gregory Upah, eds. Chicago: American Marketing Association, 99-107.

LoCascio, R. (2000), *A Web Site Is Not a Vending Machine*. Retrieved from http://www.clickz.com/crm/onl_cust_serv/article.php/825521

Loiacono, Eleanor, Richard T. Watson, and Dale Goodhue (2000), "WebQual™: A Web Site Quality Instrument," working paper, Worcester Polytechnic Institute.

McQuitty, Shaun (2004), "Statistical Power and Structural Equation Models in Business Research," *Journal of Business Research*, 57 (February), 175-83.

Mick, David Glenn and Susan Fournier (1995), "Technological Consumer Products in Everyday Life: Ownership, Meaning, and Satisfaction," working paper, report No. 95-104, 1-59, Marketing Science Institute, Cambridge, MA

——— and ——— (1998), "Paradoxes of Technology: Consumer Cognizance, Emotions, and Coping Strategies," *Journal of Consumer Research*, 25 (September), 123-47.

Montoya-Weiss, Mitzi M., Glenn B. Voss, and Dhruz Grewal (2003), "Determinants of Online Channel Use and Overall Satisfaction with a Relational, Multichannel Service Provider," *Journal of the Academy of Marketing Science*, 31 (4), 448-58.

Netter, J., M. H. Kutner, C. J. Nachtsheim, and W. Wasserman (1996), *Applied Linear Regression Models*, 3rd ed. Chicago: Irwin.

Nunnally, Jum C. and Ira H. Bernstein (1994), *Psychometric Theory*. New York: McGraw-Hill.

Olson, Jerry C. and Thomas J. Reynolds (1983), "Understanding Consumers' Cognitive Structures: Implications for Advertising Strategy," in *Advertising and Consumer Psychology*, L. Percy and A. Woodside, eds. Lexington, MA: Lexington Books.

Palmer, Jonathon W., Joseph P. Bailey, and Samer Faraj (1999), "The Role of Intermediaries in the Development of Trust on the www: The Use and Prominence of Trusted Third Parties and Privacy Statements," *Journal of Computer Mediated Communication*. Retrieved from http://www.ascusc.org/jcmc/voI5/issue3/palmer.html.

Parasuraman, A. (2000), "Technology Readiness Index (TRI): A Multiple Item Scale to Measure Readiness to Embrace New Technologies," *Journal of Services Research*, 2 (4), 307-20.

———, Leonard L. Berry, and Valarie A. Zeithaml (1991), "Refinement and Reassessment of the SERVQUAL Scale," *Journal of Retailing*, 67 (4), 420-50.

———, ———, and ——— (1993), "More on Improving Service Quality Measurement," *Journal of Retailing*, 69 (Spring), 141-47.

——— and Valarie A. Zeithaml (2002), "Measuring and Improving Service Quality: A Literature Review and Research Agenda," In *Handbook of Marketing*, Bart Weitz, ed. Thousand Oaks, CA: Sage.

———, ———, and Leonard L. Berry (1985), "A Conceptual Model of Service Quality and Its Implications for Future Research," *Journal of Marketing*, 49 (Fall), 41-50.

———, ———, and ——— (1988), "SERVQUAL: A Multiple-Item Scale for Measuring Service Quality," *Journal of Retailing*, 64 (1), 12-40.

———, ———, and ——— (1994a), "Alternative Scales for Measuring Service Quality: A Comparative Assessment Based on Psychometric and Diagnostic Criteria," *Journal of Retailing*, 70 (3), 201-30.

———, ———, and ——— (1994b), "Reassessment of Expectations as a Comparison Standard in Measuring Service Quality: Implications for Further Research," *Journal of Marketing*, 58 (January), 111-24.

Pastore, M. (2001), *Online Customer Service Still Has Work to Do*. Retrieved from http://cyberatlas.internet.com/markets/retailing/article/0,,6061_577051,00.html

Sasser, W. Earl, Jr., R. Paul Olsen, and D. Daryl Wyckoff (1978), *Management of Service Operations: Text and Cases*. Boston: Allyn & Bacon.

Schlosser, Ann E. and Alaina Kanfer (1999), "Interactivity in Commercial Web Sites: Implications for Web Site Effectiveness," working paper, Vanderbilt University, Nashville, TN.

Sirdeshmukh, Deepak, Jagdip Singh, and Barry Sabol (2002), "Consumer Trust, Value, and Loyalty in Relational Exchanges," *Journal of Marketing*, 66 (January), 15-37.

Stevens, J. (1996), *Applied Multivariate Statistics for the Social Sciences*. Mahwah, NJ: Lawrence Erlbaum.

Szajna, Bernadette (1996), "Empirical Evaluation of the Revised Technology Acceptance Model," *Management Science*, 42 (1), 85-92.

Szymanski, David M. and Richard T. Hise (2000), "e-Satisfaction: An Initial Examination," *Journal of Retailing*, 76 (3), 309-22.

Teas, R. Kenneth (1993), "Expectations, Performance Evaluation, and Consumers' Perceptions of Quality," *Journal of Marketing*, 57 (October), 18-34.

Wolfinbarger, Mary and Mary C. Gilly (2003), "eTailQ: Dimensionalizing, Measuring, and Predicting etail Quality," *Journal of Retailing*, 79 (3), 183-98.

Yoo, Boonghee and Naveen Donthu (2001), "Developing a Scale to Measure the Perceived Quality of an Internet Shopping Site (Sitequal)," *Quarterly Journal of Electronic Commerce*, 2 (1), 31-46.

Young, Shirley and Barbara Feigen (1975), "Using the Benefit Chain for Improved Strategy Formulation," *Journal of Marketing*, 39 (July) 72-74.

Zeithaml, Valarie, A. (1988), "Consumer Perceptions of Price, Quality, and Value: A Conceptual Model and Synthesis of Research," *Journal of Marketing*, 52 (July), 2-22.

———, Leonard L. Berry, and A. Parasuraman (1996), "The Behavioral Consequences of Service Quality," *Journal of Marketing*, 60 (April), 31-46.

———, A. Parasuraman, and Arvind Malhotra (2000), "A Conceptual Framework for Understanding e-Service Quality: Implications for Future Research and Managerial Practice," working paper, report No. 00-115, Marketing Science Institute, Cambridge, MA.

———, ———, and ——— (2002), "Service Quality Delivery through Web Sites: A Critical Review of Extant Knowledge," *Journal of the Academy of Marketing Science*, 30 (4), 362-75.

A. Parasuraman is a professor and holder of the James W. McLamore Chair in Marketing (endowed by the Burger King Corporation) at the University of Miami. He has published more than 100 scholarly articles and research monographs. He has received many awards for his teaching, research, and professional contributions, including the AMA SERVSIG's Career Contributions to the Services Discipline Award (1998) and the Academy of Marketing Science's Outstanding Marketing Educator Award (2001). In 2004, he was named a Distinguished Fellow of the Academy of Marketing Science. He served as editor of the *Journal of the Academy of Marketing Science* (1997-2000) and currently serves on 10 editorial review boards. He is the recipient of the *JAMS* Outstanding Reviewer Award for 2000-2003 and the 2003 *Journal of Retailing* Outstanding Reviewer Award. He is the lead author of *Marketing Research*, a college textbook published in 2004, and is a coauthor of three other business books written for practitioners: *Delivering Quality Service: Balancing Customer Perceptions and Expectations* and *Marketing Services: Competing Through Quality*, and *Techno-Ready Marketing: How and Why Your Customers Adopt Technology*. He has conducted dozens of executive seminars on service quality, customer satisfaction, and the role of technology in service delivery in many countries.

Valarie A. Zeithaml is the Roy and Alice H. Richards Bicentennial Professor and MBA associate dean at the Kenan-Flagler Business School of the University of North Carolina at Chapel Hill. She is the coauthor of three books: *Delivery Quality Service: Balancing Customer Perceptions and Expectations*, now in its 13th printing, *Driving Customer Equity: How Customer Lifetime Value Is Reshaping Corporate Strategy*, and *Services Marketing: Integrating Customer Focus Across the Firm*, a textbook now in its third edition. In 2002, *Driving Customer Equity* won the first Berry-American Marketing Association Book Prize for the best marketing book of the past 3 years. In 2004, Professor Zeithaml received both the Innovative Contributor to Marketing Award given by the Marketing Management Association and the Outstanding Marketing Educator Award given by the Academy of Marketing Science. In 2001, she received the American Marketing Association's Career Contributions to the Services Discipline Award. She is also the recipient of numerous research awards including the Robert Ferber Consumer Research Award from the *Journal of Consumer Research*, the Harold H. Maynard Award from the *Journal of Marketing*, the Jagdish Sheth Award from the *Journal of the Academy of Marketing Science*, and the William F. O'Dell Award from the *Journal of Marketing Research*. She has consulted with more than 50 service and product companies on topics of service quality and service management. She served on the Board of Directors of the American Marketing Association from 2000 to 2003 and is currently an Academic Trustee of the Marketing Science Institute.

Arvind Malhotra is an assistant professor of information technology management at the University of North Carolina at Chapel Hill's Kenan-Flagler Business School. His areas of expertise include innovation, knowledge management, virtual teams, interorganizational information sharing, and strategic use of information technologies. He has received research grants from the Society for Information Managers Advanced Practices Council, Dell, Carnegie-Bosche Institute, NSF, RosettaNet consortium, UNC-Small Grants Program, and the Marketing Sciences Institute. His research projects include studying successful virtual teams and best practices, consumer adoption of wireless web services, adoption of Internet technologies by enterprises, managing IT complexity in organizations, and knowledge sharing in supply chains. He has served as a business researcher for the RosettaNet consortium and as a technical consultant for American Golf Corp. His articles have been published in leading academic journals such as *Harvard Business Review*, *MIS Quarterly, Manufacturing & Service Operations Management,* and *Communications of the ACM*. He received the Best Paper Award from *MIS Quarterly*, the top information science journal, in 2001. Two of his articles have earned the prestigious Society for Information Managers Best Paper Award.