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RESEARCH NOTE

# INTEGRATING SERVICE QUALITY WITH SYSTEM AND INFORMATION QUALITY: AN EMPIRICAL TEST IN THE E-SERVICE CONTEXT[1]

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*Wixom and Todd (2005) integrated the user satisfaction and the technology acceptance literatures to theorize about and account for the influence of the information technology artifact on usage. Based on Wixom and Todd's integrated model of technology usage, we propose the 3Q model by investigating the role of service quality (SQ), in addition to system quality (SysQ) and information quality (IQ), in website adoption. Attention to SQ is critical, as consumer websites have increasingly become the target of SQ assessment made by consumers, not just traditional SysQ and IQ evaluations. As part of our study, we further theorize and empirically test the relationships among these three types of quality constructs and hypothesize that perceived SysQ influences perceived IQ and perceived SQ, and perceived IQ influences perceived SQ. Our study extends the Wixom and Todd model in the e-service context and is the first of its kind to empirically examine the combined impact of perceived SQ, perceived SysQ, and perceived IQ on usage intention. Our study advances the theoretical understanding of SQ and the relationships among perceptions of SysQ, IQ, and SQ in the e-service context. The results also inform practitioners that high IQ and SysQ can directly or indirectly improve SQ in the e-service context.*

**Keywords**: Service quality (SQ), information quality (IQ), system quality (SysQ), service satisfaction, perceived enjoyment (PE), empirical, e-service

## Introduction

Wixom and Todd (2005), in their seminal paper, integrated the user satisfaction and the technology acceptance literatures to propose a research model that distinguishes the beliefs and attitudes *about* the system (i.e., *object-based* beliefs and attitudes) from those beliefs about *using* the system (i.e., *behavioral* beliefs and attitudes). They theorized that the object-based beliefs of *information quality* (IQ) and *system quality* (SysQ) influence the object-based attitudes of satisfaction, which in turn affect the behavioral beliefs of perceived usefulness and ease of use, and consequently, behavioral attitude.

In this study, we examined SysQ, IQ, and service quality (SQ) in an integrated model. With the growth of the Internet since

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the mid-1990s, many IT-based customer services are provided over the Internet, such as personalized advice services offered by Amazon.com and brokerage services offered by eBay.com. Not surprisingly, observers have considered IT-based services a source of dynamism in the economy (Zysman 2006). The Wixom and Todd model (WT model, Figure 1), while significantly advancing the information systems (IS) literature by providing an integrated model to theorize about and account for the influence of information technology (IT) on usage, leaves out an important variable: SQ. DeLone and McLean (2003), among others, have called for the inclusion of SQ in the study of IS success together with IQ and SysQ. In addition, the context of the WT model is, as with many similar models, job-oriented systems in an organizational setting. In this light, the WT model may not be comprehensive enough to capture the interactive and hedonic capabilities of new technologies, such as e-commerce websites and other related online media. Therefore, we deepen and extend the WT model to the e-service context by including a key dimension—SQ—which forms the third criterion of IT assessment along with IQ and SysQ, what we henceforth refer to as the 3Q model (Figure 2).

With the increasing service functionalities delivered by a website, the importance of SQ has been stressed by IS scholars (Cenfetelli et al. 2008; Kettinger et al. 2009). SQ is included in DeLone and McLean's (2003) updated IS success model, which explicitly identified the need to incorporate SQ in any assessment of IS success. The concept of SQ has been traditionally used to address the IT unit service, but its application has evolved to include website contexts. Indeed, SQ is a fundamental criterion of success for online companies (Shankar et al. 2003; Zeithaml et al. 2001); high SQ has been shown to boost online channel usage (e.g., Devaraj et al. 2002), increase loyalty to websites (e.g., Gefen 2002), and enhance customer satisfaction with a website (e.g., Cenfetelli et al. 2008; DeLone and McLean 2003). The marketing literature has considered SQ to be the evaluations and judgments that customers make regarding the excellence of service provision of an organization (Parasuraman et al. 1985, 1988). We consider service provision as those services identified in the customer service life cycle[2] (Cenfetelli et al. 2008; Ives and Mason 1990; Piccoli et al. 2001; Tan et al. 2013).

The inclusion of SQ in the website adoption model together with IQ and SysQ requires a well thought-out and valid theoretical justification. First, the assessment target of SQ in the website context is different from that in the traditional IS context. The IS department of an organization has primarily been the nexus of prior research and modeling of SQ. In this context, SQ is an internal criterion for how well the IS department employees deliver service (e.g., help desk support) to their clients within the organization. However, IQ and SysQ are related to a technology artifact and, by extension, SQ should also be considered an aspect of a technology artifact. From a customer's perspective, the website has become the common assessment target of service, system, and information. The relationships among the three types of quality in offline models might not be the same as those in the e-service context where there is a single target. Second, the assumption (*implied* in some papers such as Chen and Cheng 2009; Wang 2008; Wang and Liao 2008) that these three types of quality do not affect each other needs major rethinking. There is likewise a lack of understanding of the interrelationships among and theoretical conceptualization for SysQ, IQ, and SQ (Ding and Straub 2008).

The purpose of this study, therefore, is to make both theoretical and empirical advances concerning the relationships among the perceptions of IQ, SysQ, and SQ in the e-service context, as well as to examine how they influence the behavioral beliefs that influence IT adoption. Grounded on schema theory, the main hypothesis that we advance in this paper is that a high level of perceived SQ requires, and is contingent upon, high levels of perceived SysQ and perceived IQ in an e-service context.

In the next section, we review the prior literature and develop our 3Q model. We then develop the hypotheses, describe the research method, and present the analysis of results. Finally, we conclude the paper by discussing the theoretical and practical implications and limitations as well as suggesting areas for future research.

## Theoretical Background and Model Development

### Wixom and Todd Model

Wixom and Todd (2005) proposed a model (see Figure 1) that distinguishes the beliefs and attitudes about the system (i.e., object-based beliefs and attitudes) from the beliefs and attitudes about *using* the system (i.e., behavioral beliefs and attitudes). Using the theory of reasoned action (TRA), the technology acceptance model (TAM), and the unified theory of acceptance and use of technology (UTAUT) (Venkatesh et

[2]This cycle includes the series of interactions that take place between a customer and merchant before, during, and after the core purchase, including a customer's initial discovery and research of a product, acquisition and ownership of the product, and, finally, disposal or replacement of the product.

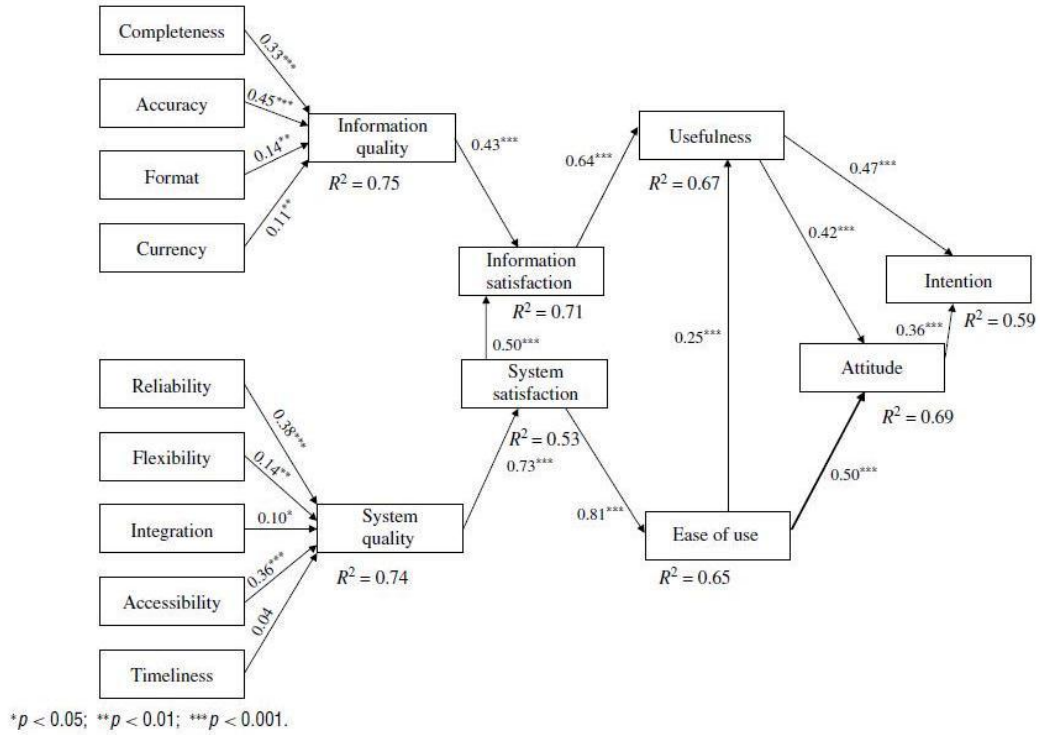



**Figure 1. Research Model by Wixom and Todd** (Source: Figure 4: Research Model Results in B. H. Wixom and P. A. Todd, "A Theoretical Integration of User Satisfaction and Technology Acceptance," *Information Systems Research* (16:1), 2005, pp. 85-102). Reprinted by permission. Copyright 2005 INFORMS. The Institute for Operations Research and Management, 7240 Parkway Drive, Suite 300, Hanover, MD 02176, USA.

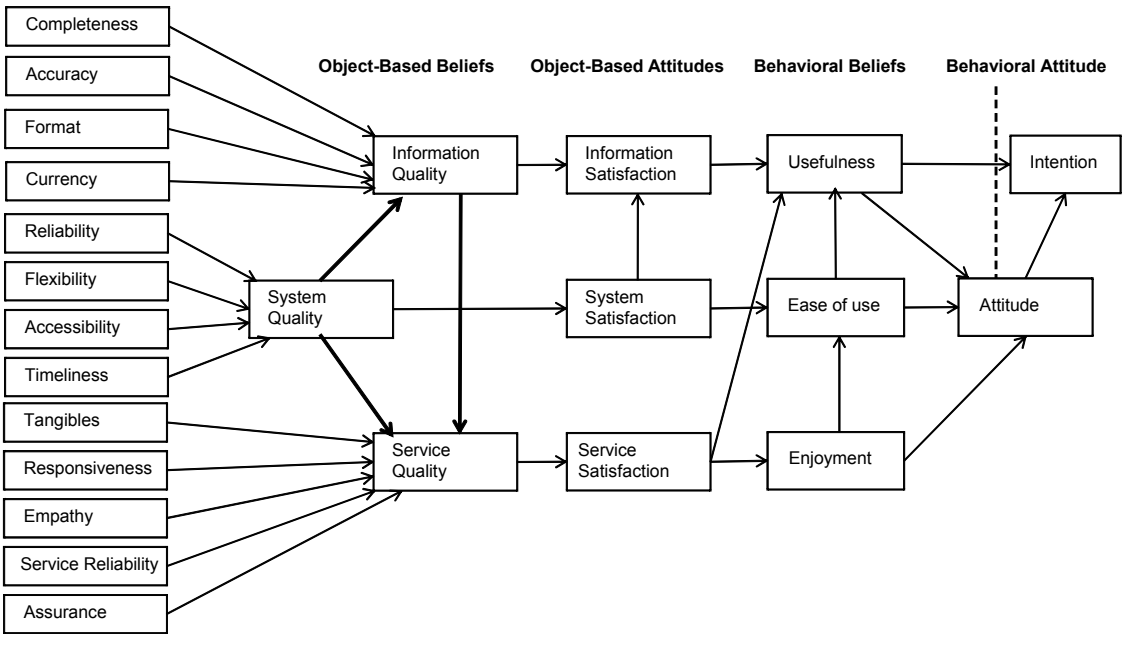



**Figure 2. Proposed 3Q Model**

**Table 1. Constructs Linked to Website Quality Literature**

| Constructs | Quality Dimensions | Aladwani and Palvia (2002) | Hassan and Li (2005) | Kim and Stoel (2004) | Lin and Lu (2000) | Liu and Arnett (2000) | Palmer (2002) | Van Iwaarden et al. (2004) | Webb and Webb (2004) | Yoo and Donthu (2001) | Zhang et al. (2001) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Perceived System Quality | Reliability | | | | | X | | | | | |
| | Flexibility | X | X | | | | X | X | | | |
| | Accessibility | X | X | | X | X | | X | X | X | X |
| | Timeliness | X | X | X | X | | X | X | | X | X |
| Perceived Information Quality | Completeness | X | X | X | X | X | X | | X | X | X |
| | Accuracy | X | X | X | X | X | | | X | | X |
| | Format | X | X | | | | X | | X | | X |
| | Currency | X | X | | | X | | | X | | X |
| Perceived Service Quality | Tangibles | X | X | X | | | | | X | X | X |
| | Responsiveness | | | | | X | X | X | X | | |
| | Empathy | | | X | | X | | | X | | |
| | Service Reliability | | | | | | | | X | X | |
| | Assurance | | | X | | X | | X | X | X | X |
| Satisfaction | | | | | | | X | | | | |
| Enjoyment | | | | X | | X | | | | | |
| PEOU | | | | X | X | X | | | | X | |
| PU | | | | X | X | | | | | | |
| Attitude | | | | | X | | | | | | |
| Intention | | | | | X | | X | | | | |

al. 2003), Wixom and Todd developed the right half of the model in Figure 1 (i.e., the behavioral beliefs portion of the model). Based on the user satisfaction literature (e.g., DeLone and McLean 1992) and the expectancy-value theory (Ajzen and Fishbein 1980), which states that external variables shape behavioral beliefs, they developed the left side of the model, which deals with beliefs about the technology attributes. In summary, Wixom and Todd asserted that IQ and SysQ beliefs (object-based) shape object-based attitudes about information and system satisfaction, which in turn influence behavioral beliefs, such as perceived usefulness (PU) and perceived ease of use (PEOU), and, consequently, behavioral attitude and usage intention.

In the e-service context, SysQ and IQ are still fundamental to our understanding of SQ. SysQ describes the structural characteristics of an e-commerce system and taps into its performance dynamics, such as availability, adaptability, and response time. IQ captures the e-service content, such as the degree to which it is complete and up to date (DeLone and McLean 2003). Website quality literature has demonstrated that SysQ and IQ are essential determinants of perceived website quality (Aladwani and Palvia 2002; Kim and Stoel 2004; Lin and Lu 2000; Liu and Arnett 2000; Palmer 2002; Zhang et al. 2001). As reviewed in Table 1, the subdimensions of IQ and SysQ identified by Wixom and Todd in an organizational warehouse setting have frequently emerged as key dimensions of website quality, notably, system accessibility, system timeliness, information completeness, and information accuracy (Aladwani and Palvia 2002; Kim and Stoel 2004; Liu and Arnett 2000; Palmer 2002; Zhang et al. 2001).

### *Service Quality*

The study of SQ was pioneered by marketing scholars (Parasuraman et al. 1985, 1988) and has been a long-standing and highly relevant construct within customer service contexts (Dabholkar and Overby 2005; Grönroos 1998; Johnston 1995). According to these scholars, SQ is a customer's global, subjective assessment of the quality of an interaction with a vendor, including the degree to which specific service needs have been met. SQ has been heretofore applied to offline environments, which are naturally more personal and contact-based. The most widely applied SQ framework is

SERVQUAL (Parasuraman et al. 1985, 1988), which articulates customers' salient perceptions about a vendor's service reliability, assurance, empathy, and responsiveness, as well as the tangible aspects of the vendor's infrastructure and/or appearance. These five dimensions have been incorporated into SQ research for the last 20 years. SERVQUAL is also typically understood as a customer's global assessment of service interactions, rather than of a specific service (Parasuraman et al. 1988; van Riel et al. 2001). Numerous research studies have relied on SERVQUAL for predicting and assessing customer reactions and responses, such as increased sales (Dabholkar 1996), a willingness to pay a price premium (Zeithaml et al. 1996), and customer satisfaction (Cronin et al. 2000; Cronin and Taylor 1992; Robinson 1999).

Given that the IS department within an organization increasingly provides a service function to its organizational clients, IS scholars have adapted SERVQUAL to the organizational context to measure IS success (Jiang et al. 2002; Kettinger and Lee 1994, 2005; Pitt et al. 1995). For example, Kettinger and Lee (2005) evaluated quality of service provided by an IS department by asking organizational users how they perceived their corporation's IS unit in terms of features such as reliability and assurance.

Although SQ has been typically applied to traditional offline contexts, it is also important for the relatively new domain of online business. Increasingly, firms are reaching out to customers via the web channel, with ever greater percentages of products and services being offered online. However, the imperative to provide excellent SQ is not abrogated by moving from an offline to an online channel. Instead, online vendors must discover, often through trial and error, the ways and means to provide consistent high quality services via this new technological medium (Bitner 2001; Zeithaml et al. 2002). Despite new technologies and new communications channels, customer demand for quality service shows no signs of abating (Bitner 2001). E-business has shifted the focus of IT utilization from internal management tools to customer-directed applications (Straub and Watson 2001), and it has compelled dramatic expansion of IT into the provision of all types of customer service (Bitner et al. 2000; Cenfetelli et al. 2008). Consequently, the deployment of IT is increasingly characterized not only by technical issues, but by SQ issues as well (Koufaris 2002). As such, it is as subject to SQ assessments by its customers as any other service provision mechanism.

However, SQ in the IS literature has been largely conceptualized as the overall support delivered by the IS department (e.g., DeLone and McLean 2003; Jiang et al. 2002; Kettinger and Lee 2005; Pitt et al. 1995). While this conceptualization is certainly valid when the research target is employees within the organization, its utility fades when e-commerce shoppers are the target of analysis. Since IT provides a medium for the delivery of service (e.g., through a retail website) (Gefen 2002; Koufaris 2002), we consider website SQ as customers' overall evaluations and judgments regarding the excellence of service provision *delivered by and via a website*.

The shift of emphasis from the "IS department" to "website" has important implications. When the service is provided by an IS department (that is, by the employees within the IS department), the SQ can be clearly distinguished from the SysQ and IQ. In contrast, when the service is provided through a website, it is more difficult to separate SQ from the system itself and the information it provides, since they are all computer-mediated. In the following section, we put forward our hypotheses regarding the interrelationship among the SysQ, IQ, and SQ in the e-service context.

## Relationships among SysQ, IQ, and SQ

Given the importance of SQ, surprisingly few studies have examined the joint effects of perceived SysQ, IQ, and SQ (e.g., Chen and Cheng 2009; Wang 2008; Wang and Liao 2008). While these earlier studies have increased our understanding of the *parallel* effects of these three types of quality, they have left unexplored the important relationships among them. Thus, there has been a call for a deeper theoretical understanding of how perceptions of SysQ, IQ, and SQ are related. Although Ding and Straub (2008) emphasized the need to recognize the mediating role of SQ in the revised DeLone and McLean model, they did not fully articulate the relationships among the three types of quality. In addition, we are not aware of any empirical testing of these relationships. Our objective here is to theorize the relationships among the three types of quality in an e-service context, and empirically test these relationships so as to understand how various components of quality influence each other and subsequently influence satisfaction (object-based belief), and ultimately shape behavior-based beliefs and attitude. Schema theory provides the conceptual foundation for this investigation (Bartlett 1932; Rumelhart 1980; Winn 2004).

A schema is a framework of organized concepts that are an individual's representation of their experience (Novak and Tyler 1977). Louis and Sutton (1991, p. 61) expanded on this definition, positing that a schema is "a cognitive structure that provides situational forecasts on which individuals rely." According to schema theory, people make judgments through a combination of top-down processes (conceptually driven) that call upon prior knowledge and bottom-up perception-

based processes (i.e., data driven). Bottom-up processes begin with incoming sensory data, while top-down processing facilitates the data assimilation if they are congruent with the person's conceptual expectations. The schemata accumulated through prior experiences provide a basis for interpreting new information while forming subsequent judgments. Research has shown that schemata are effective tools for interpreting the world and play an important role in value judgments across multiple fields, including IS applications (Armstrong and Hardgrave 2007; Dou et al. 2010; Khatri et al. 2006; Kim 2009).

Schema theory postulates that, in general, people construct various schemata with different objects based on their prior knowledge or past experience, such as products and services (Lautman 1991), as well as website schema (Bellman and Rossiter 2004). However, schema theory is silent on how different dimensions of quality being examined in this study are causally related to each other. Thus, we rely on prior research on SysQ, IQ, and SQ to determine the schemata that people are likely to have with respect to these quality constructs.

In terms of the relationships among the three types of quality, we first propose that beliefs about SysQ will influence one's beliefs about IQ. Perceived SysQ is a user's evaluation of the technical capabilities of the system and its usability, while perceived IQ is a user's evaluation of the system's conveyance of semantic meaning and/or communication of knowledge. Based on communication theory, Mason (1978) asserted that information is the output for many systems, such as accounting, data processing, research and development, education, communication media, and entertainment systems. As information is produced by a system (DeLone and McLean 1992; Mason 1978), problems with the system's quality can degrade the actual quality of the information it produces. For example, if a program does not operate reliably, this can create problems for the formatting, currency, accuracy, or completeness of data. As a consequence of interacting with various systems on a regular basis, we expect that users will learn that a good system is necessary to obtain good information. Thus, when users are asked to evaluate IQ, they will naturally consider SysQ as well. In other words, the schema about the relationships between SysQ and IQ would be formed in a user's mind: a user's schema of IQ would include SysQ. Accordingly, when customers evaluate IQ, they will not only access the relevant IQ elements in their mind (the dimensions of IQ in Figure 2) but they will also access and draw on their perception of SysQ in their mental schema. Thus, we propose the following:

**H1**: An individual's perceived SysQ positively influences that individual's perceived IQ.

We next propose that beliefs about SysQ and IQ will influence beliefs about SQ. Consistent with how perceived IQ and perceived SysQ are conceptualized as the overall evaluation of system and information, respectively, in the WT model, we conceptualize perceived SQ as a consumer's overall evaluation of the service provision of a website. The two theoretical linkages between perceived SysQ and perceived SQ, and between perceived IQ and perceived SQ, are based on the conceptualization that evaluation of SQ must include considerations of *both* content and delivery (Baker and Lamb 1993; Grönroos 1982, 1990; Grönroos et al. 2000; Mangold and Babakus 1991; Rust and Oliver 1994; Tan et al. 2013; Teo et al. 2008). When a customer perceives a higher quality of what is offered (i.e., content) and a higher quality of how it is offered (i.e., delivery) in a website, the customer's perceived SQ will also be higher (Grönroos et al. 2000). Empirically, prior research has confirmed that perceptions of service content and service delivery are two important predictors of customers'perceived SQ (van Riel et al. 2001; Tan et al. 2013).

Based on the abovementioned conceptual and empirical work, we expect that a customers' schema for SQ will include both IQ (i.e., content) and SysQ (i.e., delivery). Therefore, when customers evaluate SQ, they will not only access the relevant SQ elements in their mind (the dimensions of SQ in Figure 2) but they will also draw on their perception of IQ and SysQ in their mental schema. Accordingly, based on their accumulated experiences, customers who perceive the quality of a system to be low and that of the information to be poor will conclude the SQ of the system to be low. Conversely, when customers perceive a system to be of high quality and provide a high level of IQ, they would be led to perceive a higher degree of SQ.

The proposed effect of perceived IQ on perceived SQ is also consistent with the arguments made by Cenfetelli et al. (2008), who theorized the effect of perceived service functionality on perceived SQ. Service functionality is the extent to which a website uses IT to provide services, including *information provision*—such as advice service—that support a core product or service transaction, and help customers reach their shopping goals. They posit that the information generated by a website is one of the most important antecedents of service functionality. The quality of information perceived bears directly on the quality of service perceived. Thus, an increase in perceived IQ should lead to a more positive estimation of SQ. We therefore propose

**H2**: An individual's perceived SysQ positively influences that individual's perceived SQ.

**H3**: An individual's perceived IQ positively influences that individual's perceived SQ.

### Consequences of Service Quality

Just as SysQ and IQ represent object-based beliefs, so too does SQ (Tan et al. 2013). The attitude-behavior literature asserts that beliefs about objects (in this case, SysQ, IQ, and SQ) are linked to attitudes toward an object (in this case, system, information, and service satisfaction). Service satisfaction is recognized as an object-based attitude (Ajzen and Fishbein 1980; Wixom and Todd 2005), and is viewed as an aggregate cognitive and emotional reaction to held beliefs. Wixom and Todd theorize and empirically support the influence of quality on satisfaction. SQ, in particular, is widely supported in the marketing literature as a determinant of service satisfaction (e.g., de Ruyter et al. 1997; Oliver 1993; Patterson and Johnson 1993). Thus, we predict that SQ, which is an object-based belief, shapes attitudes about service satisfaction, an object-based attitude.

**H4**: An individual's perceived SQ influences that individual's service satisfaction.

Consistent with the argument made by Wixom and Todd that satisfaction influences behavioral beliefs (e.g., PU), service satisfaction also represents an object-based attitude that serves as an external variable shaping behavioral beliefs. We propose that perceived usefulness (PU) and perceived enjoyment (PE) serve as the two consequential behavioral beliefs of service satisfaction. PU is the extent to which potential users expect the use of an IT system to improve their task performance (Davis 1989). Within an e-service context, PU specifically refers to the degree to which a customer believes a website helps them achieve their shopping goals (Cenfetelli et al. 2008). PE is defined as *intrinsic reward derived through the use of the technology or service studied* (Igbaria et al. 1996; Nysveen 2005), which is of importance for the evaluation of e-services (Bauer et al 2006; van Riel et al. 2001) and can be measured as the extent to which customers find the IT-based service to be enjoyable, fun, and pleasant to use (Dabholkar 1996).

The links from service satisfaction to PE and PU can also be derived from the consumer research literature, which supports that shopping, and many other consumption activities, provide both utilitarian and hedonic value through responses evoked during the experience (Babin et al. 1994; Bloch and Bruce 1984; Overby and Lee 2006; Voss et al. 2003). Thus, a shopping experience should account for more than just functional utility (Bloch et al. 1986) such as PU (Childers et al. 2001). In addition, PE has been gaining a lot of interest from the IS community because of the hedonic aspects of the Internet and web-based systems (e.g., Koufaris 2002; Shang et al. 2005; Van der Heijden 2004; Yi and Hwang 2003); the construct is therefore appropriate for capturing a hedonic perspective of service (Childers et al. 2001; Fiore et al. 2005) in addition to the more utilitarian beliefs of PU. We expect that service satisfaction will influence both PE and PU. That is, the higher the satisfaction with the service provided, the more likely one will find the experience of using the website to be enjoyable and useful. The significant positive relationship between service satisfaction and PE has been supported in the service literature (e.g., Bauer et al. 2006; Hwang and Kim 2007). In addition, based on the arguments that object-based attitudes can be predictive of behavioral dispositions and beliefs about the consequences of using the object (Ajzen and Fishbein 2005; Wixom and Todd 2005), service satisfaction representing an object-based attitude will serve as an external variable shaping PE and PU, which in turn represent behavioral beliefs. Thus, we predict that

**H5**: An individual's service satisfaction positively influences that individual's PE and PU.

Further, scholars have established the principle that PE positively influences PEOU (Agarwal and Karahanna 2000; Venkatesh and Davis 2000), which is the degree to which a person believes that using a particular system would be "free of effort" (Davis 1989). This relationship is particularly true for a utilitarian system (Sun and Zhang 2006). Users with higher PE underestimate the difficulty associated with the technologies, resulting in a decreasing cognitive burden and an increase in PEOU (Agarwal and Karahanna 2000; Venkatesh and Davis 2000). Thus, we predict that

**H6**: An individual's PE positively influences that individual's PEOU.

Finally, PE has been found to be a significant antecedent of attitude toward using technology-based services (Dabholkar and Bagozzi 2002) and willingness to recommend such services (Johnson et al. 1998). PE is important not only offline (Blakney and Sekely 1994; Forman and Sriram 1991; Morris 1987) but also online where it can have a significant impact on attitude and intention toward online shopping (Eighmey 1997; Jarvenpaa and Todd 1997a, 1997b; Koufaris 2002). As articulated in flow theory (Csikszentmihalyi 1975) and its integration with TAM (Koufaris 2002), we predict that PE will positively influence attitude. Together with the WT model's linking PU and PEOU with attitude, we propose

**H7**: An individual's PE, PU, and PEOU positively influence that individual's attitude.[3]

[3]Other links in the 3Q model (e.g., attitude to intention) have already been established and justified in prior literature, and so, for the sake of brevity, are not repeated here.

# Methodology

## Study Setting

We tested the proposed 3Q model within the "information getting" stage of the e-service context (Ding and Straub 2008; Pavlou and Fygenson 2006). Getting information and purchasing products are the two prevalent online behaviors in business-to-consumer (B2C) e-commerce (Gefen and Straub 2000; Pavlou and Fygenson 2006). Information gathering is an activity intrinsic to the IT because the IT itself provides the actual service. In contrast, product purchase is a task extrinsic to the IT where the IT is not the central component of the process but is instrumental in completing the objective of product purchase (Gefen and Straub 2000). This information getting stage also represents one of the main trends in the use of IS today (Ding and Straub 2008), since information is often considered a fundamental aspect of e-service (Watson et al. 2002).

Specifically, we manipulated a discrete service functionality (i.e., advice service) to create variations in perceived IQ, SysQ, and SQ of a website. We employed the following service technologies:

(1) A comparison matrix service, summarizing the product information with rows displaying product attributes and columns displaying product models. The matrix provided some service, although limited, to customers because it simplified the product evaluations by providing side-by-side comparisons of products in terms of their attributes.

(2) A comparison matrix service and a software recommendation service providing product recommendations based on product preferences elicited from customers (Wang and Benbasat 2009; Xiao and Benbasat 2007).

(3) A comparison matrix service and a human service. Text chat was implemented in the human service condition.

(4) A hybrid service integrating software recommendation and human service, in addition to the comparison matrix.

Except for the ways in which the service was delivered in each treatment as just described, the websites used in each experimental condition were identical. The inclusion of the comparison matrix as a baseline in all four experimental conditions allowed us to determine the effects of the additional service technologies (i.e., software recommendation service, human service, or both). Although we manipulated a specific functionality (i.e., advice provision) of a website, we assessed the individual's *overall experience of a website.*

We expect that the different means of service provision—enabled through differing information and system designs—will result in different perceptions of SysQ that impact perceived IQ, which in turn influences perceived SQ. For example, a website system with only a comparison matrix (control group) should be perceived to be less flexible (a dimension of SysQ) and accordingly have lower SysQ than a system providing either software or human recommendation. This is because the latter two systems can be adapted to meet a variety of user requirements (i.e., different product preferences) while the matrix cannot adapt to user needs. As a result, a website with the comparison matrix only will be perceived to have less IQ than the one with software or human recommendation, because the latter two can provide product advice to customers. Given the lower perceived SysQ and IQ of the matrix, a customer will therefore perceive the matrix to have lower SQ. To illustrate, the comparison matrix with the same product content for all customers will be perceived to provide little empathy (a dimension of SQ) due to its lower perceived SysQ and IQ. In contrast, as the software or human recommendation provides personalized product advice based on each customer's specific indicated preferences, a website with software or human recommendation should be perceived to have high empathy (i.e., individualized care).

## Data Collection Procedures

Prior to the study, subjects were informed that they would each receive $10 for their participation. Participants were required to complete a questionnaire in order to record their demographic and control variables. Before the subjects were assigned to one of the four experimental conditions, each of them went through a baseline website that provided a comparison matrix service only. This baseline condition served as a benchmark for evaluating particular websites as suggested by the adaptation level theory (Helson 1964). As suggested by this theory, people's judgments are based largely on three criteria: (1) the sum of their past experiences, (2) the context and background of a particular experience, and (3) a stimulus. Keeping this in mind, we therefore randomly assigned subjects to different treatment conditions to ensure that the sum of the subjects' past experiences was balanced across the four conditions. Additionally, if a common benchmark (i.e., comparison matrix only) was provided to all subjects, we could be more confident that the context and background of their experimental experiences would be equivalent, such that the disparities across different conditions were caused only by different treatment stimuli.[4] This ap-

[4]This approach might not be necessary for measuring objective outcomes such as time and accuracy affected by an information system.

proach of using a common benchmark is consistent with those used by Jiang and Benbasat (2004-2005; 2007) and by Kamis et al. (2008).

Following the benchmark procedure, subjects were each assigned randomly to one of the four treatment conditions, with each group consisting of 32 subjects. The task presented to each subject was identical: shop online for a laptop computer on behalf of a fictitious friend. Researchers described the friend's product requirements to each participant in written form. Before they began the shopping task, subjects were informed about the corresponding service technology available on the website. The subjects were also briefed about the usage and functionalities of the service technology. However, subjects could voluntarily decide on whether or not to use the service technologies. Thus, subjects were surveyed on what service technologies they chose to use, not necessarily the full treatment.[5]

In the software recommendation service treatment, the software presented a set of multiple-choice questions to elicit users' personal preferences about product attributes. For example, a subject could specify that the desired hard drive attribute falls into the range of 101 to 150 GB and the price falls into the range of $400 to $600. The software then scanned the products based on the customer's indicated preferences and presented the top five product recommendations accordingly. The human service is similar to the software recommendation service except that a software service is a self-service provided by a computer, while the human service is provided by an actual customer service representative communicating through a technology medium (i.e., the website). In the hybrid service condition, subjects had the option of utilizing, or not, either or both the software recommendation and human services, the services of which were the same as those in the software recommendation and human service conditions, respectively.

After the shopping task, the subjects were asked to treat the baseline website as a benchmark against which to judge the experimental site. The survey items presented to the subjects were grouped by construct, the sequence of which was the same as that listed in Appendix A. When measuring perceived SysQ, IQ, and SQ, we provided additional instructions to the subjects about what aspect of the website they should pay attention to when answering questions related to information, system, and service, respectively. Specifically, we followed these procedures:

- Immediately before seeing the survey items related to IQ, the respondents were presented with the following statement: Questions 1 to 18 ask about the informational aspects of the website. "Information" refers to information regarding company, product, and/or advice, if any.

- Immediately before seeing the survey items related to SysQ, the respondents were presented with the following statement: Questions 19 to 36 ask about the system aspects of the website. "System" refers to the website system and is independent of the information that the website presented and generated.

- Immediately before seeing the survey items related to SQ, the respondents were presented with the following statement: Questions 37 to 60 ask about the service aspects of the website. "Service" refers to the process where the website provided support for your laptop selection task.

## Measurement Scales

This study adapted existing validated scales and experimental procedures whenever possible. The measures for subdimensions of SQ were faithfully taken from the well-established SERVQUAL scale (Parasuraman et al. 1988). This scale has been utilized both in SQ research for the last 25 years and in the website quality literature (see Table 1 for a review). The exact same, or similar, items have been used to measure SQ in the contexts of banking (Parasuraman et al. 1988), IS departments (Jiang et al. 2002; Kettinger and Lee 2005; Pitt et al. 1995; 1997; Watson, et al. 1998), and, in particular, a variety of e-commerce websites (e.g., Cenfetelli et al. 2008; Devaraj et al. 2002; Gefen 2002; Iwaarden et al. 2004; Liu and Arnett 2000; Webb and Webb 2004). Of note is that Devaraj et al. (2002) provided a strong validation of the SERVQUAL measures in the e-commerce context. Consistent with Wixom and Todd's treatment of the dimensions (e.g., information completeness and system accessibility) of IQ and SysQ as being antecedents to overall SysQ and IQ, we modeled the dimensions of SERVQUAL as *antecedents* to overall SQ. The measurements of the latter were adapted from leading service studies (e.g., Dabholkar et al. 2000; Spreng and Mackoy 1996; Wang et al. 2004).

Items for service satisfaction were based on those of Dabholkar et al. (2000) and Das et al. (1995) and adapted to the e-service context. PE was measured with a four-item scale adapted from Ghani et al. (1991) and Koufaris (2002). Other items related to information and systems were adapted from the study by Wixom and Todd. Appendix A shows the mea-

[5]However, subjects assigned to the conditions of (1) comparison matrix, (2) software recommendation service, and (3) human service all utilized the respective service technologies available in the treatment.

surement scales used in the questionnaire. Based on the adaptation level theory (Helson 1964) discussed in the previous subsection, all values of the dependent variables are comparative values based on a common reference point (i.e., the baseline website). All variables were measured using a Likert scale ranging from -5 to +5, where the neutral point (0) indicates that the subject perceives that the evaluated shopping website does not differ from the baseline website.

In line with the overall focus of IQ and SysQ in the WT model, SQ refers to users' overall experiences associated with selecting a laptop via the website. Thus, the target of the measurements is the complete website rather than a specific functionality (e.g., information provision) of the website.

### Subject Information

The 128 subjects[6] in the study were recruited from 14 faculties/schools within a public university representing more than 50 different majors. Among the 128 subjects, 88 (68.8%) were female and 40 (31.3%) were male. Five were nonstudents, 25 were graduate students, and the rest were undergraduate students. The average age of the participants was 23.4. There were no significant differences in gender (Pearson chi-square value = 3.49, $p = 0.84$) or age ($F = 1.56$, $p = 0.15$) distribution across the four treatment conditions.

## Data Analysis

Given that the empirical strategy is to create variance in perceived IQ, SysQ, and SQ of a website based on an experimental design, we use structural equation modeling (SEM) to test our proposed research model. SEM is appropriate because it is a traditional approach for analyzing multivariate models. As a second-generation technique, SEM has substantial advantages over other techniques, such as the ability to model relationships among multiple predictor and multiple criterion variables (Chin 1998a).

### Model Testing

The research model was tested using partial least squares (PLS) with PLS-Graph 3.0. All indicators were modeled as being reflective of their respective constructs. Appendix A depicts the means and standard deviations for the items of the constructs presented in the model. Assessments of measurement models should examine: (1) individual item reliability, (2) internal consistency, and (3) discriminant validity (Barclay et al. 1995). A general method for checking individual item reliability involves seeing whether individual item loadings are above 0.60 or, ideally, 0.70 (Barclay et al. 1995; Chin 1998b). The measurement items in the model used in the present study generally load heavily on their respective constructs (see Appendix B), with loadings above 0.70, thus demonstrating adequate reliability. Composite reliability and Cronbach's alpha scores are reported in Appendix C. Because all reliability scores are above 0.70 (Hair et al. 1998), the internal consistency criteria are met.

The third step to assess the measurement model involves examining its discriminant validity. Data shown in Appendix C satisfy this requirement. Discriminant validity is further confirmed when the loadings for the items on their targeted constructs are higher than loadings on other constructs in the model. Appendix B contains the loadings and cross-loadings for items used in this study; all items load more highly on their constructs than they load on any other constructs, and in all cases (except one case) the differences are greater than 0.10 with most of them greater than 0.15.

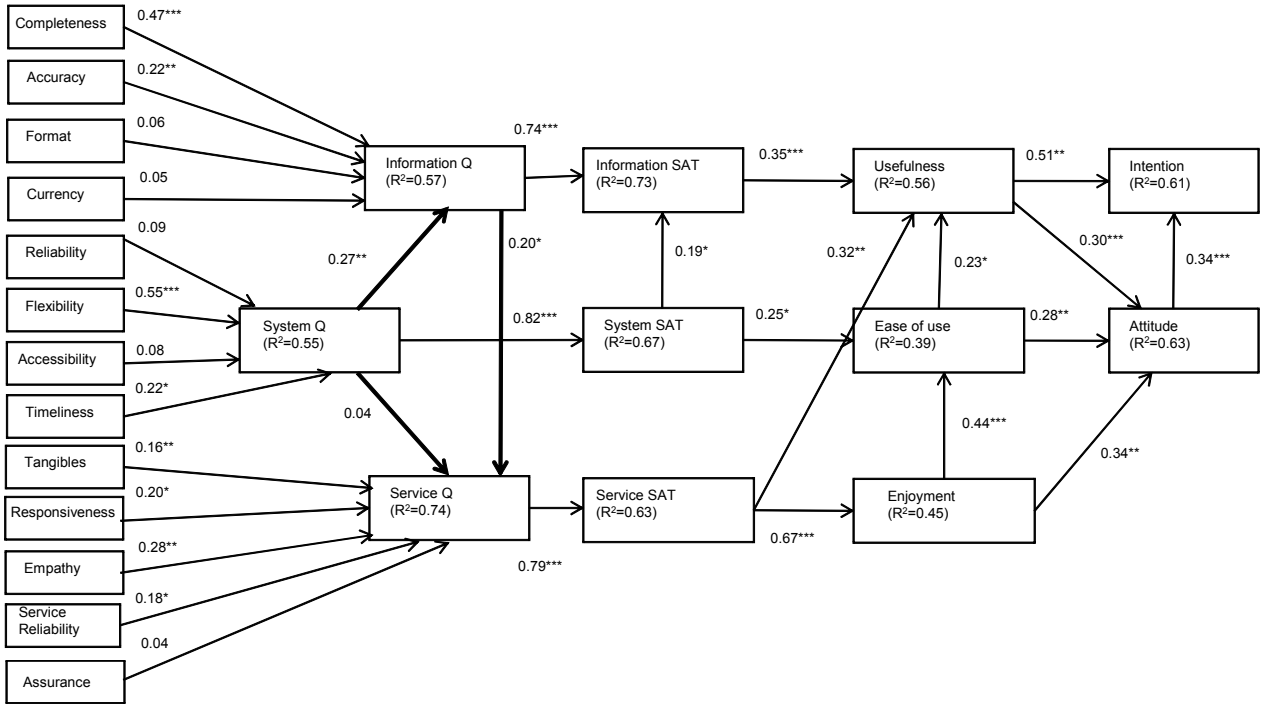
Figure 3 shows the results of the structural model testing. As with the approach used by Wixom and Todd, we used the $R^2$ and the path coefficients (significance) as criteria to indicate how well the data supported the hypothesized model.

Regarding the dimensions of SysQ, IQ and SQ:

- Flexibility ($\beta = 0.55$, $p < 0.001$) and timeliness ($\beta = 0.22$, $p < 0.05$) were significant antecedents of SysQ.
- Completeness ($\beta = 0.47$, $p < 0.001$) and accuracy ($\beta = 0.22$, $p < 0.01$) were significant antecedents of IQ.
- Empathy ($\beta = 0.28$, $p < 0.01$), tangibles ($\beta = 0.16$, $p < 0.01$), service reliability ($\beta = 0.18$, $p < 0.05$), and responsiveness ($\beta = 0.20$, $p < 0.05$) were significant antecedents of SQ.

As to the relationships among the three types of quality, we found that perceived SysQ influenced perceived IQ ($\beta = 0.27$, $p < 0.01$) but not perceived SQ ($\beta = 0.04$, $p > 0.05$), while perceived IQ influenced perceived SQ ($\beta = 0.20$, $p < 0.05$). Thus, H1 and H3 were supported, but not H2.

[6]Originally, the hybrid service group had 50 subjects and each of the other three service groups had 32 subjects. Although all subjects in the "software recommendation service only" and "human service only" conditions used the assigned service technology, 18 subjects in the hybrid service group did not utilize human service. As the exclusion of the 18 subjects did not influence the significance of our results, we excluded them in the subsequent data analysis to maintain an equal sample size of 32 across the four experimental groups.




*p < 0.05; **p < 0.01; ***p < 0.001; Q = Quality; SAT = Satisfaction

**Note:** The measurement indicators for each construct were not shown in the figure (see Appendix B instead). We specified the measurement indicators for each construct in the model (e.g., completeness, tangibles, information quality, system quality, service quality, and usefulness) as being reflective.

**Figure 3. Results of the 3Q Model**

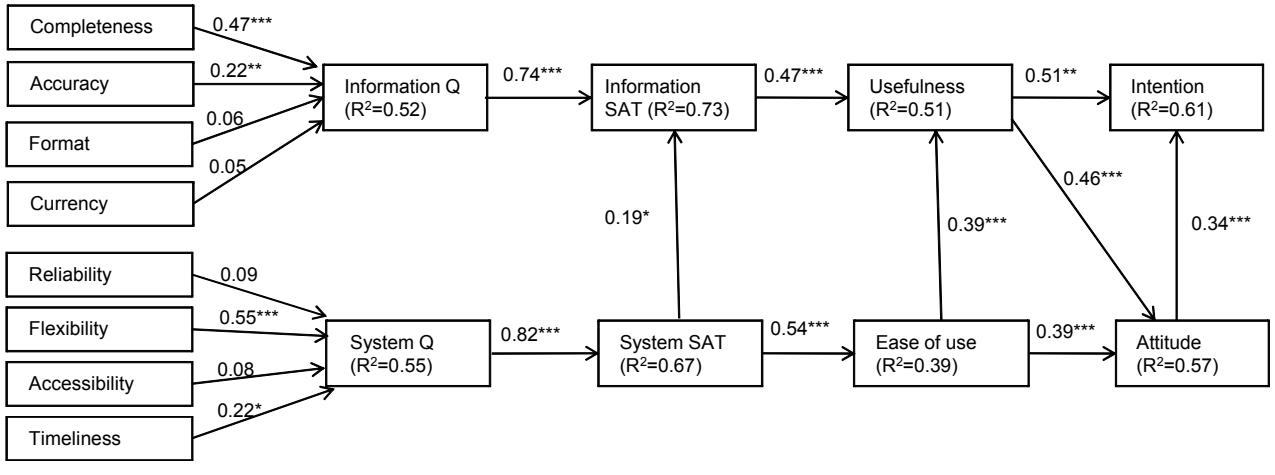



**Figure 4. Results of Wixom and Todd's Model in the E-Service Context (Adapted from Wixom and Todd 2005)**

Moving further downstream in the model, SQ ($\beta = 0.79$, $p < 0.001$) had a significant influence on service satisfaction, explaining 63 percent of the variance in that construct, supporting H4. Service satisfaction exerted a significant influence on PE ($\beta = 0.67$, $p < 0.001$) and PU ($\beta = 0.32$, $p < 0.01$), respectively, supporting H5. PE significantly influenced PEOU ($\beta = 0.44$, $p < 0.001$), supporting H6. Finally, PE ($\beta = 0.34$, $p < 0.01$), PU ($\beta = 0.30$, $p < 0.001$), and PEOU ($\beta = 0.28$, $p < 0.01$) significantly influenced attitude, supporting H7.

We then tested the increase in explanatory power due to the inclusion of the PE (and its antecedents) construct to the WT model in the e-service context (Figure 4). The amount of the variance explained in attitude increases by 6 percent to a total 63 percent when PE was added to the model. We used the "pseudo F-test" technique[7] to measure whether the substantive change in the explained variance ($R^2$) of target variable is statistically significant after the direct influences of the external variables were taken into account (Mathieson et al. 2001). We found the increased variance explained in attitude in our model was statistically significant at $p < 0.001$ with the inclusion of PE in the model.

## Discussion

Our study replicates and extends Wixom and Todd's study in the e-service context by including the construct of SQ and its relationships with SysQ and IQ. Although SysQ was not found to significantly influence SQ, it does significantly influence IQ, which influences SQ. In other words, SysQ has an indirect effect on SQ, indicating that customers relied less on SysQ and more on IQ (that itself is influenced by SysQ) in forming a perception of SQ.

Comparing the WT model (Figure 1, tested in the context of organizational data warehousing) to the corresponding elements of the 3Q model (Figure 4, tested in the e-service context), we found generally similar results in terms of $R^2$ and the significance of path coefficients. However, differences exist regarding the specific quality dimensions of SysQ and IQ. In the e-service context, format and currency do not have a significant effect on IQ, nor do accessibility and reliability have a significant effect on SysQ. However, timeliness does have a significant effect on SysQ. We contend that such differences in outcomes are largely caused by contextual differences. Wixom and Todd explained that decisions made within the data warehouse context are strategic in nature; a fast response time, for instance, is not as important as other factors, and timeliness may have a different relative effect with other kinds of systems. In an online customer service context, customers have a learned expectation that transactions will be rapid, and so place a higher value on timeliness (Pruyn and Smidts 1998; Tom and Lucey 1995).

The four quality dimensions —format, currency, accessibility, and reliability—were found to be nonsignificant in our study. When considered in the light of schema theory, people simply may not have these elements in their mental schema for evaluating websites because they are not normally relevant elements to consider. Thus, respondents might not have drawn on these aspects when forming their perceptions of SysQ and IQ. As website systems become more pervasive and intuitive with most of them accessible to customers "24/7," format, currency, accessibility, and reliability are no longer differentiators for SysQ and IQ. Instead, these quality dimensions are taken for granted.

As shown in Table 1, many of the subdimensions of SysQ, IQ, and SQ utilized in this study can be derived from an integration of factors in the website quality literature. Our results largely confirmed the importance of these factors. For example, the frequently studied dimensions of timeliness, completeness, accuracy, and tangibility in the website quality literature have shown statistical significance in the present study. In this aspect, the 3Q model that we propose supports the notion that the user satisfaction and SQ literature can mesh with the website quality literature to form a single, integrated research model.

Although the pseudo F-test indicates that the 3Q model predicts better that the WT model in the attitude construct in the e-service context, the absolute increase of explained variance is 6 percent. Arguably, the WT model sets a higher threshold to compete against, as it integrates two main research streams in IS: the user satisfaction literature and the technology acceptance literature. That said, an important goal we had in proposing the 3Q model was to add richness to an existing model in the hopes of recognizing the increased role that service plays in present-day information systems and consumer websites in particular. Much of the earlier work in IT adoption models—whether TAM, UTAUT, or the WT model (to name a few)—was premised primarily on systems used in the workplace (e.g., data warehouses in the Wixom and Todd case). These systems and the corresponding models did not need to consider service in the consumerist sense of the word. Today, however, IT has become foundational to virtually all aspects of not only business and e-commerce but also that of society. Therefore, the provision of quality service has become an essential and indispensable goal of such technology. Clearly, SQ now merits inclusion in technology acceptance and adoption models. Admittedly, we sacrificed some degree

[7] F is calculated as $(R^2_{full} - R^2_{submodel})/[(1 - R^2_{full})/df]$ where the submodel is the WT model.

of parsimony in our model by virtue of including additional constructs over and above the WT model. However, these additional constructs were necessary in order to capture the key influential variable of SQ and become more comprehensive and representative of the multiple and differing environments in which IT is utilized. The potential impact of SQ largely depends on the depth and importance of service in the particular context being evaluated. While our study's context was indeed service related, it was somewhat utilitarian in nature as well (e.g., selecting a laptop with multiple attributes). SQ, service satisfaction, and perceived enjoyment will likely have even stronger effects in more hedonic contexts (e.g., clothing, holiday travel, or music purchases) and other service-rich environments.

## Contributions, Limitations, Future Research, and Conclusions

### *Theoretical and Practical Contributions*

This study makes several contributions to the literature. First, given that the theoretical importance of integrating object-based belief and behavior-based belief has been recognized (e.g., Benbasat and Barki 2007; Venketash and Bala 2008; Wixom and Todd 2005), we propose the 3Q model of technology adoption. The 3Q model theorizes that SQ is an overlooked object-based belief to be considered in many aspects of technology and e-service adoption. Although previous research has recognized the importance of SQ, the effect of SQ on behavior-based beliefs and attitude has not been examined. This study contributes to the literature by adding SQ to the WT model and examining the relationships among the perceptions of SysQ, IQ, and SQ and proposing PU and PE (behavior-based beliefs) to serve as the consequence of service satisfaction to predict behavioral attitude.

Our findings reveal strongly significant relationships between object-based beliefs and object-based attitudes, between object-based attitudes and behavioral beliefs, and between behavioral beliefs and behavioral attitude. This study corroborates the theoretical foundation for integrating object-based beliefs and attitudes with behavioral beliefs and attitudes to predict usage behavior. The results show that the 3Q model is more explanatory of user adoption than the WT model alone.

While the dimensions of SysQ, IQ, and SQ were discussed in the website quality literature, few studies bring together all of the quality dimensions within a single study. For example, Aladwani and Palvia (2002) and Hassan and Li (2005) investigated two types of quality: SysQ and IQ. Kim and Stoel (2004) and Webb and Webb (2004) mainly studied dimensions of IQ and SQ. Iwaarden et al. (2004) examined the dimension of SysQ and SQ only, but not those of IQ. Thus, we also contribute to the website quality literature by studying the dimensions of all three types of quality and examining how they jointly influence user intention.

More importantly, we highlight that SysQ, IQ, and SQ are not independent from one another in the e-service context. We draw upon schema theory to theorize that perceived SysQ influences perceptions of IQ and SQ, and perceived IQ influences perceived SQ. While only a few studies have examined the parallel (i.e., independent) effects of these three types of quality on satisfaction, to our knowledge the relationships among SysQ, IQ, and SQ have not been fully conceptualized and empirically tested. The study of their relationships in the e-service context is important, as websites have increasingly become the target of the SQ assessment, together with the traditional SysQ and IQ evaluations. In contrast, the traditional IS literature typically focuses on the provision of service from the IS department of an organization, while information and systems were considered to be related to the technologies. As such, the relationships among the three types of quality in the organizational context might not be the same as those found in the e-service context. This study shed light on the relationships among the three types of quality constructs that may not be so salient in traditional organizational settings.

A related contribution of our study is in examining the key antecedents of *online* SQ. Considerable e-commerce research has supported the argument that good SQ can lead to desirable consequences, such as user satisfaction (Cenfetelli et al. 2008; Devaraj et al. 2002; Kettinger and Lee 1994) and customer loyalty (Gefen 2002). While these studies consistently indicate the importance of SQ in the online context, there has been surprisingly little empirical research into what types of customer perceptions drive online SQ. Our study highlights the reality that perceived SysQ and IQ can directly or indirectly impact online SQ.

Next, this study has proposed and tested a structural model that depicts how PE, PU, and PEOU simultaneously influence attitude. The path coefficient (0.34) from PE to attitude is slightly higher than those from PU (0.30) and PEOU (0.28) to attitude, respectively. In addition, the model demonstrates how service satisfaction influences PE (0.67) and PU (0.32) and therefore is able to assess the relative effects of service satisfaction on them. These findings not only shed light on the comparison of the effectiveness of PE, PU, and PEOU on improving customers' attitudes, but also offer insights on the comparison of the effectiveness of service satisfaction on improving PE and PU. Our findings provide some guidance

as to the importance of achieving more enjoyable and more useful websites.

Our proposed integrated model can be prescriptive to managers and designers on how to reliably investigate the impacts of SysQ and IQ on SQ. Improvements on all three types of quality ultimately lead to an increased likelihood of satisfaction and use. The significant relationships among the 3Q indicate that SQ is not isolated from SysQ and IQ. High online SQ will be difficult (if not impossible) to obtain without first having a high level of IQ, which in itself is difficult to achieve without a high level of SysQ. The proposed research model provides a mechanism for understanding and assessing the influences of SysQ and IQ on SQ, as well as the subsequent relative influences of PE, PU, and PEOU on attitude, which provides important guidance to e-service providers and system designers. Firms with an online presence would be well advised to focus their initial efforts on good website design and effective information content. SQ can then be built upon these foundations.

### Limitations and Future Research

There are several limitations to this study that should be noted. First, a fictitious website was created in order to avoid brand bias. However, we also sought to make the website as realistic as possible. Second, the participants in the experiment were mostly university students, as students shopping for computers is a common occurrence (Watters 2010) and a natural fit for our experimental design to have better control (Majchrzak et al. 2005). Nevertheless, readers should exercise caution in generalizing the results of this study to other demographic groups.

The third limitation of this study is that we placed the items of IQ and SysQ before those of SQ, thus it is not certain that the effect of IQ and SysQ on SQ represents a "real" effect of subjects drawing on their mental schema, a methodological effect of achieving consistency among sequential groups of questions on a questionnaire, or some combination of both. Another limitation of this study is that participants answered the single questionnaire at one time. Although the PEOU–PU relationship and PU–intention relationship in the present study are similar to those found by other IS scholars, longitudinal field studies (e.g., Venketash and Davis 2000) would be advisable to ascertain the generalizability of such findings. In addition, we focused only on the information getting stage of e-service. Thus, the results are applicable at the information getting stage of the e-service context, and might not hold in other stages (e.g., product purchasing) of the e-service context or in other contexts (e.g., organizational contexts). In summary, future research would benefit by employing a real website, selecting more diverse subjects, and collecting the measures in other contexts and at different times in order to increase the generalizability of the results of this study.

To test the proposed hypotheses, we manipulated different provisions of advice service to create variance on perceived IQ, SysQ, and SQ that subsequently influenced usage intention. To evaluate the impact of each quality dimension (e.g., information accuracy) on IQ, SysQ, and SQ, a full factorial design manipulating each dimension of IQ, SysQ, and SQ might be desirable to ensure that each quality dimension has sufficient variance. By doing so, it is possible that the significance of quality dimensions within the model will change. We call for future research to explore this possibility by manipulating low and high quality dimension of a website and examine whether it will change the significance of the dimensions on perceived IQ, SysQ, and SQ.

Another potential stream of research would be to utilize our proposed integrated model as a framework to evaluate different kinds of online IT artifacts and to explore how the model could be augmented with other possible moderators, such as culture and/or user experience. In particular, with the increasing adoption of human service online by merchants, we call for research to examine whether the relationships among the constructs in the 3Q model might change contingent on the service context: whether the service is provided by technology directly or it is provided by a human mediated through a technology interface. Finally, as IT becomes even more embedded in business and society, it is likely that even more variables, and more socially oriented variables, will need to be added. We call for future research to explore this important opportunity.

## Conclusions

Based on the theoretical importance of integrating object-based beliefs with behavior-based beliefs into one model, we propose a theory of e-service adoption (i.e., 3Q model) that explains and predicts the factors that influence whether a customer will adopt e-service. The 3Q model identifies the key components of object-based beliefs (i.e., SysQ, IQ, and SQ) that shape object-based attitude (i.e., three types of satisfaction), subsequent behavior-based beliefs (i.e., PE and PU), and attitude. The 3Q model was empirically tested and generally supported. Grounded on schema theory, the 3Q model delineates how perceived SysQ influences perceived IQ, and how perceived IQ influences perceived SQ in the e-service context. Overall, by developing and testing the 3Q model linking object-based beliefs with behavior-based beliefs, this research contributes to a nascent body of knowledge investigating the impacts of 3Q on website adoption.

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RESEARCH NOTE

# INTEGRATING SERVICE QUALITY WITH SYSTEM AND INFORMATION QUALITY: AN EMPIRICAL TEST IN THE E-SERVICE CONTEXT

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# Appendix A

## Measurement Items for the Constructs

| Item No. | Construct | Items | CM | S | H | SH | Mean | SD |
|---|---|---|---|---|---|---|---|---|
| **Instructions: Questions 1 to 18 ask about the informational aspects of the website. "Information" refers to information regarding company, product, and/or advice, if any.** | | | | | | | | |
| 1 | Currency | The website provided me with the most recent information for the laptop selection task. | -0.06 | 0.41 | 1.06 | 0.81 | 0.55 | 1.27 |
| 2 | | The website produced the most current information for the laptop selection task. | 0.16 | 0.41 | 1.06 | 0.97 | 0.65 | 1.23 |
| 3 | | The information from the website was always up to date for the laptop selection task. | 0.03 | 0.41 | 0.88 | 1.06 | 0.59 | 1.23 |
| 4 | Completeness | The website provided me with a complete set of information for the laptop selection task. | 0.03 | 0.75 | 1.38 | 1.22 | 0.82 | 1.54 |
| 5 | | The website produced comprehensive information for the laptop selection task. | -0.03 | 1.47 | 1.78 | 1.84 | 1.27 | 1.72 |
| 6 | | The website provided me with all the information I needed for the laptop selection task. | 0.00 | 1.19 | 1.63 | 2.31 | 1.28 | 1.70 |
| 7 | Format | The information provided by the website was well formatted for the laptop selection task. | 0.16 | 1.69 | 0.97 | 1.69 | 1.13 | 1.62 |
| 8 | | The information provided by the website was well laid out for the laptop selection task. | 0.19 | 1.38 | 0.63 | 1.13 | 0.83 | 1.40 |
| 9 | | The information provided by the website was clearly presented on the screen for the laptop selection task. | 0.13 | 1.00 | 0.66 | 1.13 | 0.73 | 1.53 |

| Item No. | Construct | Items | CM | S | H | SH | Mean | SD |
|---|---|---|---|---|---|---|---|---|
| 10 | Accuracy | The website produced correct information for the laptop selection task. | 0.22 | 0.84 | 0.75 | 0.19 | 0.50 | 1.09 |
| 11 | | The information I obtained from the website for the laptop selection task was error-free. | 0.06 | 0.31 | 0.34 | 0.25 | 0.24 | 1.14 |
| 12 | | The information provided by the website was accurate for the laptop selection task. | 0.09 | 0.41 | 0.88 | 0.88 | 0.56 | 1.21 |
| 13 | Information quality | Overall, I would give the information from the website high marks for the laptop selection task. | 0.16 | 1.41 | 1.84 | 2.22 | 1.41 | 1.55 |
| 14 | | Overall, I would give the information provided by the website a high rating in terms of quality for the laptop selection task. | 0.19 | 1.69 | 2.03 | 2.31 | 1.55 | 1.60 |
| 15 | | In general, the website provided me with high-quality information for the laptop selection task. | 0.13 | 1.41 | 1.72 | 1.94 | 1.30 | 1.60 |
| 16 | Information satisfaction | Overall, the information I got from the website was very satisfying to select a laptop. | 0.13 | 1.47 | 1.72 | 1.81 | 1.28 | 1.61 |
| 17 | | I am very satisfied with the information I received from the website to select a laptop. | 0.13 | 1.81 | 1.81 | 2.28 | 1.51 | 1.66 |
| 18 | | The website provided very satisfactory information for me to select a laptop. | 0.22 | 1.47 | 1.81 | 2.09 | 1.40 | 1.51 |
| **Instructions: Questions 19 to 36 ask about the system aspects of the website. "System" refers to the website system and is independent of the information that the website presented and generated.** | | | | | | | | |
| 19 | Reliability | The website system operated reliably for the laptop selection task. | 0.03 | 1.16 | 0.47 | 0.91 | 0.64 | 1.28 |
| 20 | | The website system performed reliably for the laptop selection task. | 0.09 | 1.41 | 0.56 | 0.94 | 0.75 | 1.37 |
| 21 | | The operation of the website system was dependable for the laptop selection task. | 0.00 | 0.88 | 0.69 | 0.97 | 0.63 | 1.36 |
| 22 | Accessibility | The website system was readily accessible to me in the laptop selection task. | 0.09 | 1.41 | 1.00 | 1.38 | 0.97 | 1.41 |
| 23 | | The website system was very accessible during the laptop selection task. | 0.00 | 1.44 | 1.31 | 1.47 | 1.05 | 1.55 |
| 24 | | The website system was easy to access during the laptop selection task. | 0.06 | 1.75 | 1.53 | 0.91 | 1.06 | 1.61 |
| 25 | Flexibility | The website system was able to be adapted to meet a variety of needs during the laptop selection task. | 0.06 | 2.50 | 2.44 | 2.88 | 1.97 | 1.77 |
| 26 | | The website system was able to flexibly adjust to new demands or conditions during the laptop selection task. | 0.06 | 2.16 | 2.44 | 2.53 | 1.80 | 1.83 |
| 27 | | The website system was flexible in addressing needs as they arise during the laptop selection task. | 0.06 | 2.31 | 2.84 | 3.00 | 2.05 | 1.84 |
| 28 | Timeliness | It took too long for the website system to respond to my requests during the laptop selection task. (dropped) | -0.13 | -1.06 | -0.16 | -0.28 | -0.41 | 1.58 |
| 29 | | The website system responded in a timely fashion during the laptop selection task. | 0.09 | 1.06 | 1.44 | 1.00 | 0.90 | 1.68 |
| 30 | | The website system answered my requests quickly during the laptop selection task. | 0.09 | 1.72 | 2.09 | 1.41 | 1.33 | 1.78 |
| 31 | System quality | In terms of system quality, I would rate the website highly for the laptop selection task. | 0.16 | 2.16 | 2.25 | 2.00 | 1.64 | 1.58 |
| 32 | | Overall, the website system that I used was of high quality for the laptop selection task. | 0.06 | 2.22 | 2.13 | 2.19 | 1.65 | 1.53 |
| 33 | | Overall, I would give the quality of the website system a high rating for the laptop selection task. | 0.09 | 2.25 | 2.22 | 2.41 | 1.74 | 1.53 |

| Item No. | Construct | Items | CM | S | H | SH | Mean | SD |
|---|---|---|---|---|---|---|---|---|
| 34 | System satisfaction | All things considered, I am very satisfied with the website system to select a laptop. | 0.06 | 2.25 | 2.06 | 2.03 | 1.60 | 1.58 |
| 35 | | Overall, my interaction with the website system to select a laptop was very satisfying. | 0.00 | 2.16 | 2.16 | 2.41 | 1.68 | 1.61 |
| 36 | | The website system was very satisfying for me to select a laptop. | -0.03 | 2.34 | 1.91 | 2.16 | 1.59 | 1.57 |
| **Instructions: Questions 37 to 60 ask about the service aspects of the website. "Service" refers to the process where the website provided support for your laptop selection task.** | | | | | | | | |
| 37 | Empathy | The website gave me individual attention during the laptop selection task. | 0.00 | 2.66 | 3.47 | 3.94 | 2.52 | 1.99 |
| 38 | | The website had my best interests in mind during the laptop selection task. | 0.06 | 2.69 | 2.75 | 3.22 | 2.18 | 1.83 |
| 39 | | The website had mechanisms that gave me personal attention during the laptop selection task. | 0.03 | 3.03 | 3.41 | 3.72 | 2.55 | 1.89 |
| 40 | | The website understood my specific needs during the laptop selection task. | 0.09 | 3.06 | 3.38 | 3.72 | 2.56 | 1.83 |
| 41 | Service reliability | When the website promised to do something by a certain time, it did so during the laptop selection task (dropped). | 0.03 | 1.97 | 2.09 | 2.56 | 1.66 | 1.71 |
| 42 | | I believe that what I asked for was what I got during the laptop selection task in the website. | -0.03 | 2.25 | 1.84 | 2.22 | 1.57 | 1.75 |
| 43 | | The website performed the service right during the laptop selection task. | 0.00 | 2.09 | 2.38 | 2.63 | 1.77 | 1.74 |
| 44 | | The website provided its service at the time it promised to do so during the laptop selection task. | 0.00 | 1.84 | 2.16 | 2.38 | 1.59 | 1.72 |
| 45 | Tangible | The website was up to date. | -0.03 | 0.28 | 1.03 | 0.78 | 0.52 | 1.20 |
| 46 | | The website was visually appealing. | 0.13 | 0.47 | 0.84 | 0.59 | 0.45 | 0.99 |
| 47 | | The website was neat in appearance. | -0.09 | 0.44 | 0.53 | 0.50 | 0.34 | 1.18 |
| 48 | | The appearance of the website was in keeping with the services it provides. | 0.00 | 0.53 | 0.97 | 0.69 | 0.55 | 1.10 |
| 49 | Assurance | I felt confident about the online laptop selection decision in the website. | 0.06 | 1.50 | 1.44 | 1.53 | 1.13 | 1.55 |
| 50 | | I felt safe in my interaction with the website during the laptop selection task. | 0.13 | 0.97 | 0.72 | 1.72 | 0.88 | 1.62 |
| 51 | | The website had answers to all my questions about the laptop during the laptop selection task (dropped). | 0.06 | 1.47 | 2.72 | 3.25 | 1.88 | 1.80 |
| 52 | Responsive-ness | I believe the website was responsive to my needs during the laptop selection task. | -0.03 | 2.09 | 2.84 | 3.34 | 2.06 | 1.80 |
| 53 | | In the case of any problem, I think the website would give me prompt service during the laptop selection task. | 0.06 | 1.69 | 2.91 | 3.41 | 1.98 | 1.78 |
| 54 | | The website addressed any concerns that I had during the laptop selection task. | -0.03 | 1.72 | 2.91 | 3.53 | 2.03 | 1.85 |
| 55 | Service quality | Overall, the level of service quality I received from the website during the laptop selection task was good. | 0.06 | 2.00 | 2.63 | 2.84 | 1.88 | 1.58 |
| 56 | | Overall, the level of service quality I received from the website during the laptop selection task was excellent. | 0.09 | 1.69 | 2.47 | 2.66 | 1.73 | 1.52 |
| 57 | | Overall, the level of service quality I received from the website during the laptop selection task was high. | 0.06 | 2.00 | 2.47 | 2.78 | 1.83 | 1.52 |
| 58 | Service satisfaction | Overall, the service I received from the website was very satisfying to select a laptop. | -0.06 | 2.28 | 2.28 | 3.06 | 1.89 | 1.64 |
| 59 | | I am very satisfied with the service I received from the website to select a laptop. | 0.03 | 2.19 | 2.22 | 3.03 | 1.87 | 1.60 |
| 60 | | In terms of selecting a laptop, the service provided by the website was very satisfying. | 0.06 | 2.16 | 2.56 | 3.22 | 2.00 | 1.64 |

| Item No. | Construct | Items | CM | S | H | SH | Mean | SD |
|---|---|---|---|---|---|---|---|---|
| 61 | Perceived enjoyment | Using the website to select a laptop was enjoyable. | 0.06 | 1.94 | 1.72 | 2.13 | 1.46 | 1.47 |
| 62 | | Using the website to select a laptop was exciting. | 0.06 | 1.25 | 1.38 | 1.88 | 1.14 | 1.33 |
| 63 | | Using the website to select a laptop was interesting. | 0.00 | 1.72 | 1.69 | 2.03 | 1.36 | 1.47 |
| 64 | | Using the website to select a laptop was fun. | -0.03 | 1.97 | 1.94 | 2.25 | 1.53 | 1.57 |
| 65 | | Using the website to select a laptop was pleasant. | 0.00 | 1.66 | 1.78 | 2.13 | 1.39 | 1.63 |
| 66 | Perceived ease of use | It was easy to get the website to do what I wanted it to do. | 0.00 | 1.53 | 2.03 | 2.00 | 1.39 | 1.78 |
| 67 | | Overall, I found that the website was easy to use to select a laptop. | 0.16 | 2.41 | 2.09 | 2.09 | 1.69 | 1.72 |
| 68 | | It was easy for me to select a laptop using the website. | -0.06 | 2.41 | 1.69 | 1.63 | 1.41 | 1.82 |
| 69 | | Learning to use the website to select a laptop was easy. | -0.09 | 1.84 | 1.47 | 1.44 | 1.16 | 1.76 |
| 70 | | My interaction with the website to select a laptop was clear and understandable. | 0.09 | 1.91 | 1.66 | 1.69 | 1.34 | 1.74 |
| 71 | Perceived usefulness | Using the website to choose a laptop increased my productivity in choosing a laptop. | 0.00 | 1.16 | 1.38 | 1.91 | 1.11 | 1.58 |
| 72 | | I found the website useful in choosing a laptop. | 0.00 | 2.03 | 1.75 | 2.41 | 1.55 | 1.58 |
| 73 | | Using the website enhanced the effectiveness in choosing a laptop. | 0.09 | 1.97 | 1.69 | 2.44 | 1.55 | 1.53 |
| 74 | | Using the website improved the performance in choosing a laptop. | 0.16 | 1.69 | 1.72 | 2.38 | 1.48 | 1.48 |
| 75 | Attitude | All things considered, using the website to select a laptop will be a good idea. | 0.13 | 2.13 | 2.03 | 2.91 | 1.80 | 1.65 |
| 76 | | All things considered, using the website to select a laptop will be a wise move. | 0.03 | 2.09 | 2.13 | 2.47 | 1.68 | 1.69 |
| 77 | | All things considered, using the website to select a laptop will be a positive step. | 0.13 | 2.13 | 2.25 | 2.53 | 1.76 | 1.66 |
| 78 | | All things considered, using the website to select a laptop will be an effective idea. | 0.03 | 2.34 | 2.19 | 2.75 | 1.83 | 1.77 |
| 79 | Intention | Next time I need to shop for a laptop, I would like to use this kind of website. | 0.16 | 2.00 | 2.09 | 2.63 | 1.72 | 1.93 |
| 80 | | Assuming I had access to the website, I intend to use it to select a laptop in the future. | 0.09 | 1.81 | 2.19 | 2.16 | 1.56 | 1.76 |
| 81 | | Given that I had access to the website, I predict that I would use it to select a laptop in the future. | 0.19 | 2.09 | 2.34 | 2.50 | 1.78 | 1.77 |

**Notation:** CM = Comparison Matrix; S = Software; H = Human; SH = Software and Human service; M = Mean; SD = Standard Deviation.

**Note:** As mentioned in the subsection "Measurement Scales" in the paper, subjects were asked to evaluate the respective website (matrix, software, human, or hybrid) as compared to the website with matrix only. Thus, the mean values are comparative values. If the evaluated shopping website was not perceived to differ from the baseline condition-matrix, the mean will be close to 0, as shown in the case of the matrix column.[1] For another example, the software condition was perceived to have 1.9 points (out of 5 possible points) higher than matrix in terms of perceived SQ, while the human website was perceived to have 2.52 points higher than the matrix in terms of perceived SQ.

[1]Due to possible learning effects, it is important to include the matrix condition as a control to evaluate the true impact of the other conditions (e.g., software, and human).

# Appendix B

## Loading and Cross Loading of Measures

| | REL | ACE | FLE | TIM | SYSQ | COM | FOR | ACU | CUR | IQ | EMP | SER | TAN | ASS | RES | SQ | SYS | INS | SES | PEU | PU | EN | ATT | INT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| REL1 | **0.95** | 0.51 | 0.27 | 0.10 | 0.30 | 0.18 | 0.33 | 0.34 | 0.02 | 0.19 | 0.24 | 0.30 | 0.21 | 0.38 | 0.25 | 0.30 | 0.25 | 0.24 | 0.22 | 0.30 | 0.34 | 0.29 | 0.35 | 0.26 |
| REL2 | **0.93** | 0.45 | 0.25 | 0.11 | 0.29 | 0.17 | 0.35 | 0.31 | 0.08 | 0.19 | 0.21 | 0.28 | 0.18 | 0.33 | 0.22 | 0.27 | 0.25 | 0.22 | 0.17 | 0.30 | 0.33 | 0.29 | 0.32 | 0.25 |
| REL3 | **0.86** | 0.40 | 0.36 | 0.10 | 0.30 | 0.17 | 0.28 | 0.38 | 0.13 | 0.23 | 0.29 | 0.26 | 0.26 | 0.39 | 0.30 | 0.39 | 0.31 | 0.30 | 0.29 | 0.30 | 0.38 | 0.30 | 0.37 | 0.39 |
| ACE1 | 0.52 | **0.93** | 0.36 | 0.43 | 0.44 | 0.23 | 0.31 | 0.16 | 0.11 | 0.22 | 0.38 | 0.36 | 0.25 | 0.32 | 0.35 | 0.43 | 0.43 | 0.19 | 0.40 | 0.41 | 0.42 | 0.35 | 0.41 | 0.34 |
| ACE2 | 0.46 | **0.96** | 0.45 | 0.48 | 0.46 | 0.18 | 0.25 | 0.22 | 0.12 | 0.24 | 0.38 | 0.39 | 0.35 | 0.35 | 0.37 | 0.49 | 0.43 | 0.24 | 0.42 | 0.38 | 0.40 | 0.32 | 0.37 | 0.28 |
| ACE3 | 0.40 | **0.91** | 0.41 | 0.53 | 0.41 | 0.10 | 0.25 | 0.16 | 0.09 | 0.20 | 0.35 | 0.38 | 0.36 | 0.37 | 0.31 | 0.48 | 0.47 | 0.18 | 0.40 | 0.40 | 0.35 | 0.36 | 0.41 | 0.27 |
| FLE1 | 0.43 | 0.53 | **0.85** | 0.35 | 0.62 | 0.39 | 0.31 | 0.29 | 0.24 | 0.41 | 0.66 | 0.59 | 0.33 | 0.35 | 0.59 | 0.65 | 0.53 | 0.41 | 0.58 | 0.41 | 0.58 | 0.55 | 0.52 | 0.37 |
| FLE2 | 0.20 | 0.35 | **0.93** | 0.35 | 0.61 | 0.50 | 0.33 | 0.31 | 0.25 | 0.58 | 0.64 | 0.48 | 0.30 | 0.30 | 0.58 | 0.58 | 0.63 | 0.52 | 0.50 | 0.39 | 0.49 | 0.55 | 0.51 | 0.32 |
| FLE3 | 0.24 | 0.30 | **0.92** | 0.36 | 0.66 | 0.49 | 0.37 | 0.23 | 0.24 | 0.56 | 0.70 | 0.52 | 0.30 | 0.30 | 0.63 | 0.54 | 0.70 | 0.55 | 0.53 | 0.43 | 0.52 | 0.60 | 0.62 | 0.45 |
| TIM1 | 0.10 | 0.49 | 0.36 | **0.95** | 0.45 | 0.10 | 0.13 | 0.16 | 0.17 | 0.22 | 0.34 | 0.39 | 0.28 | 0.26 | 0.30 | 0.38 | 0.50 | 0.26 | 0.36 | 0.34 | 0.40 | 0.33 | 0.37 | 0.24 |
| TIM2 | 0.12 | 0.49 | 0.39 | **0.96** | 0.47 | 0.14 | 0.18 | 0.21 | 0.17 | 0.24 | 0.36 | 0.38 | 0.26 | 0.25 | 0.35 | 0.39 | 0.53 | 0.25 | 0.33 | 0.33 | 0.39 | 0.29 | 0.42 | 0.20 |
| SYSQ1 | 0.30 | 0.45 | 0.63 | 0.46 | **0.94** | 0.33 | 0.35 | 0.21 | 0.08 | 0.42 | 0.58 | 0.46 | 0.16 | 0.24 | 0.49 | 0.49 | 0.72 | 0.37 | 0.48 | 0.30 | 0.43 | 0.54 | 0.45 | 0.27 |
| SYSQ2 | 0.34 | 0.45 | 0.66 | 0.46 | **0.96** | 0.46 | 0.45 | 0.32 | 0.24 | 0.54 | 0.59 | 0.49 | 0.22 | 0.29 | 0.53 | 0.56 | 0.78 | 0.48 | 0.55 | 0.38 | 0.48 | 0.55 | 0.47 | 0.32 |
| SYSQ3 | 0.30 | 0.44 | 0.70 | 0.46 | **0.96** | 0.50 | 0.42 | 0.29 | 0.23 | 0.61 | 0.67 | 0.53 | 0.19 | 0.32 | 0.57 | 0.59 | 0.83 | 0.53 | 0.58 | 0.39 | 0.52 | 0.58 | 0.52 | 0.36 |
| COM1 | 0.10 | 0.22 | 0.29 | 0.12 | 0.28 | **0.79** | 0.27 | 0.23 | 0.55 | 0.40 | 0.23 | 0.15 | 0.36 | 0.10 | 0.31 | 0.33 | 0.27 | 0.26 | 0.22 | 0.17 | 0.28 | 0.30 | 0.18 | 0.20 |
| COM2 | 0.13 | 0.05 | 0.38 | 0.06 | 0.41 | **0.78** | 0.43 | 0.18 | 0.34 | 0.50 | 0.39 | 0.24 | 0.09 | 0.24 | 0.31 | 0.34 | 0.38 | 0.43 | 0.37 | 0.17 | 0.34 | 0.30 | 0.29 | 0.25 |
| COM3 | 0.21 | 0.18 | 0.53 | 0.13 | 0.40 | **0.87** | 0.47 | 0.30 | 0.38 | 0.66 | 0.47 | 0.32 | 0.31 | 0.27 | 0.49 | 0.48 | 0.37 | 0.51 | 0.38 | 0.27 | 0.44 | 0.50 | 0.47 | 0.25 |
| FOR1 | 0.27 | 0.18 | 0.32 | 0.09 | 0.40 | 0.53 | **0.85** | 0.32 | 0.13 | 0.40 | 0.32 | 0.21 | 0.15 | 0.30 | 0.24 | 0.28 | 0.37 | 0.35 | 0.32 | 0.26 | 0.31 | 0.34 | 0.34 | 0.24 |
| FOR2 | 0.30 | 0.29 | 0.27 | 0.17 | 0.37 | 0.41 | **0.88** | 0.31 | 0.11 | 0.41 | 0.30 | 0.19 | 0.19 | 0.32 | 0.23 | 0.26 | 0.38 | 0.35 | 0.31 | 0.30 | 0.30 | 0.28 | 0.31 | 0.22 |
| FOR3 | 0.30 | 0.24 | 0.34 | 0.13 | 0.29 | 0.29 | **0.77** | 0.38 | 0.03 | 0.40 | 0.21 | 0.20 | 0.28 | 0.29 | 0.29 | 0.32 | 0.28 | 0.42 | 0.32 | 0.29 | 0.30 | 0.34 | 0.38 | 0.25 |
| ACU1 | 0.28 | 0.23 | 0.23 | 0.18 | 0.23 | 0.18 | 0.41 | **0.69** | 0.13 | 0.24 | 0.08 | 0.08 | 0.11 | 0.14 | 0.13 | 0.16 | 0.21 | 0.35 | 0.09 | 0.12 | 0.22 | 0.15 | 0.24 | 0.18 |
| ACU2 | 0.37 | 0.12 | 0.08 | 0.08 | 0.13 | 0.07 | 0.23 | **0.78** | 0.20 | 0.21 | 0.05 | 0.21 | 0.16 | 0.33 | 0.13 | 0.12 | 0.13 | 0.23 | 0.14 | 0.08 | 0.10 | 0.11 | 0.13 | 0.12 |
| ACU3 | 0.30 | 0.14 | 0.34 | 0.18 | 0.29 | 0.36 | 0.34 | **0.92** | 0.29 | 0.50 | 0.21 | 0.26 | 0.27 | 0.25 | 0.29 | 0.30 | 0.22 | 0.50 | 0.27 | 0.15 | 0.34 | 0.27 | 0.34 | 0.34 |
| CUR1 | 0.12 | 0.07 | 0.25 | 0.07 | 0.16 | 0.49 | 0.06 | 0.26 | **0.91** | 0.29 | 0.13 | 0.16 | 0.39 | 0.09 | 0.23 | 0.23 | 0.17 | 0.17 | 0.23 | 0.16 | 0.20 | 0.18 | 0.21 | 0.18 |
| CUR2 | 0.01 | 0.09 | 0.22 | 0.17 | 0.13 | 0.41 | 0.04 | 0.17 | **0.90** | 0.20 | 0.11 | 0.04 | 0.40 | 0.04 | 0.15 | 0.17 | 0.15 | 0.09 | 0.17 | 0.11 | 0.19 | 0.13 | 0.16 | 0.16 |
| CUR3 | 0.08 | 0.13 | 0.25 | 0.23 | 0.22 | 0.45 | 0.13 | 0.29 | **0.89** | 0.32 | 0.20 | 0.20 | 0.44 | 0.16 | 0.20 | 0.30 | 0.28 | 0.29 | 0.29 | 0.18 | 0.36 | 0.22 | 0.30 | 0.33 |
| IQ1 | 0.13 | 0.25 | 0.51 | 0.23 | 0.53 | 0.63 | 0.47 | 0.34 | 0.31 | **0.89** | 0.51 | 0.38 | 0.29 | 0.25 | 0.49 | 0.55 | 0.50 | 0.67 | 0.49 | 0.24 | 0.44 | 0.45 | 0.42 | 0.30 |
| IQ2 | 0.23 | 0.22 | 0.50 | 0.16 | 0.48 | 0.58 | 0.41 | 0.45 | 0.33 | **0.92** | 0.52 | 0.43 | 0.24 | 0.34 | 0.51 | 0.58 | 0.44 | 0.75 | 0.56 | 0.30 | 0.52 | 0.46 | 0.50 | 0.45 |
| IQ3 | 0.24 | 0.18 | 0.54 | 0.26 | 0.50 | 0.58 | 0.44 | 0.42 | 0.20 | **0.91** | 0.52 | 0.45 | 0.26 | 0.54 | 0.51 | 0.58 | 0.51 | 0.76 | 0.48 | 0.31 | 0.53 | 0.50 | 0.54 | 0.39 |
| EMP1 | 0.23 | 0.37 | 0.68 | 0.37 | 0.59 | 0.44 | 0.28 | 0.09 | 0.14 | 0.53 | **0.93** | 0.66 | 0.31 | 0.42 | 0.81 | 0.72 | 0.57 | 0.49 | 0.72 | 0.46 | 0.62 | 0.62 | 0.61 | 0.46 |
| EMP2 | 0.31 | 0.29 | 0.60 | 0.22 | 0.52 | 0.42 | 0.30 | 0.18 | 0.14 | 0.48 | **0.87** | 0.68 | 0.22 | 0.48 | 0.67 | 0.71 | 0.54 | 0.47 | 0.72 | 0.53 | 0.65 | 0.63 | 0.60 | 0.56 |
| EMP3 | 0.24 | 0.33 | 0.74 | 0.40 | 0.64 | 0.44 | 0.34 | 0.17 | 0.13 | 0.55 | **0.95** | 0.72 | 0.28 | 0.45 | 0.82 | 0.71 | 0.67 | 0.53 | 0.76 | 0.52 | 0.64 | 0.67 | 0.65 | 0.51 |
| EMP4 | 0.24 | 0.46 | 0.72 | 0.37 | 0.62 | 0.42 | 0.31 | 0.19 | 0.21 | 0.55 | **0.94** | 0.74 | 0.29 | 0.46 | 0.78 | 0.75 | 0.66 | 0.50 | 0.81 | 0.57 | 0.65 | 0.66 | 0.70 | 0.55 |
| SER1 | 0.21 | 0.32 | 0.52 | 0.39 | 0.47 | 0.25 | 0.14 | 0.17 | 0.23 | 0.36 | 0.63 | **0.82** | 0.32 | 0.51 | 0.59 | 0.60 | 0.52 | 0.42 | 0.68 | 0.58 | 0.56 | 0.60 | 0.53 | 0.59 |
| SER2 | 0.33 | 0.34 | 0.48 | 0.30 | 0.40 | 0.25 | 0.24 | 0.24 | 0.07 | 0.45 | 0.68 | **0.88** | 0.29 | 0.57 | 0.54 | 0.66 | 0.53 | 0.48 | 0.61 | 0.62 | 0.62 | 0.62 | 0.61 | 0.53 |
| SER3 | 0.27 | 0.42 | 0.59 | 0.36 | 0.51 | 0.28 | 0.24 | 0.19 | 0.11 | 0.46 | 0.74 | **0.92** | 0.31 | 0.53 | 0.68 | 0.68 | 0.57 | 0.45 | 0.71 | 0.62 | 0.56 | 0.64 | 0.60 | 0.52 |
| SER4 | 0.27 | 0.35 | 0.47 | 0.40 | 0.43 | 0.29 | 0.23 | 0.26 | 0.17 | 0.37 | 0.60 | **0.90** | 0.38 | 0.53 | 0.61 | 0.60 | 0.49 | 0.36 | 0.66 | 0.62 | 0.52 | 0.51 | 0.55 | 0.53 |
| TAN1 | 0.18 | 0.23 | 0.25 | 0.12 | 0.16 | 0.28 | 0.15 | 0.12 | 0.37 | 0.19 | 0.21 | 0.17 | **0.79** | 0.21 | 0.30 | 0.33 | 0.31 | 0.26 | 0.29 | 0.35 | 0.22 | 0.27 | 0.28 | 0.29 |
| TAN2 | 0.22 | 0.31 | 0.24 | 0.25 | 0.11 | 0.26 | 0.32 | 0.20 | 0.31 | 0.27 | 0.21 | 0.31 | **0.76** | 0.32 | 0.20 | 0.30 | 0.24 | 0.32 | 0.26 | 0.43 | 0.25 | 0.21 | 0.28 | 0.33 |
| TAN3 | 0.19 | 0.33 | 0.27 | 0.16 | 0.24 | 0.23 | 0.26 | 0.20 | 0.36 | 0.28 | 0.18 | 0.27 | **0.77** | 0.33 | 0.28 | 0.33 | 0.29 | 0.25 | 0.24 | 0.28 | 0.22 | 0.27 | 0.17 | 0.23 |
| TAN4 | 0.16 | 0.19 | 0.29 | 0.31 | 0.11 | 0.18 | 0.07 | 0.23 | 0.34 | 0.16 | 0.28 | 0.36 | **0.72** | 0.32 | 0.34 | 0.41 | 0.21 | 0.28 | 0.33 | 0.37 | 0.35 | 0.25 | 0.28 | 0.30 |

| | REL | ACE | FLE | TIM | SYSQ | COM | FOR | ACU | CUR | IQ | EMP | SER | TAN | ASS | RES | SQ | SYS | INS | SES | PEU | PU | EN | ATT | INT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ASS1 | 0.33 | 0.36 | 0.36 | 0.17 | 0.30 | 0.28 | 0.32 | 0.21 | 0.08 | 0.34 | 0.51 | 0.56 | 0.33 | **0.91** | 0.46 | 0.50 | 0.43 | 0.40 | 0.51 | 0.52 | 0.46 | 0.51 | 0.42 | 0.40 |
| ASS2 | 0.39 | 0.28 | 0.24 | 0.31 | 0.22 | 0.18 | 0.33 | 0.32 | 0.12 | 0.30 | 0.33 | 0.50 | 0.32 | **0.85** | 0.41 | 0.41 | 0.36 | 0.43 | 0.50 | 0.44 | 0.44 | 0.36 | 0.41 | 0.50 |
| RES1 | 0.26 | 0.37 | 0.67 | 0.38 | 0.61 | 0.49 | 0.32 | 0.24 | 0.25 | 0.56 | 0.79 | 0.63 | 0.37 | 0.50 | **0.92** | 0.70 | 0.60 | 0.54 | 0.74 | 0.49 | 0.57 | 0.57 | 0.63 | 0.43 |
| RES2 | 0.32 | 0.32 | 0.64 | 0.32 | 0.50 | 0.47 | 0.33 | 0.28 | 0.24 | 0.57 | 0.80 | 0.68 | 0.34 | 0.47 | **0.94** | 0.76 | 0.53 | 0.55 | 0.73 | 0.45 | 0.69 | 0.57 | 0.66 | 0.57 |
| RES3 | 0.20 | 0.34 | 0.55 | 0.25 | 0.43 | 0.36 | 0.18 | 0.18 | 0.12 | 0.41 | 0.74 | 0.60 | 0.35 | 0.41 | **0.93** | 0.66 | 0.46 | 0.40 | 0.68 | 0.38 | 0.50 | 0.47 | 0.53 | 0.45 |
| SQ1 | 0.32 | 0.46 | 0.64 | 0.35 | 0.55 | 0.46 | 0.30 | 0.22 | 0.26 | 0.58 | 0.76 | 0.69 | 0.45 | 0.45 | 0.73 | **0.95** | 0.57 | 0.54 | 0.75 | 0.56 | 0.71 | 0.67 | 0.63 | 0.53 |
| SQ2 | 0.33 | 0.49 | 0.62 | 0.44 | 0.58 | 0.45 | 0.35 | 0.29 | 0.25 | 0.65 | 0.73 | 0.69 | 0.45 | 0.52 | 0.74 | **0.96** | 0.63 | 0.62 | 0.78 | 0.54 | 0.72 | 0.64 | 0.63 | 0.57 |
| SQ3 | 0.37 | 0.49 | 0.62 | 0.37 | 0.53 | 0.47 | 0.34 | 0.27 | 0.25 | 0.59 | 0.76 | 0.70 | 0.42 | 0.53 | 0.73 | **0.97** | 0.59 | 0.58 | 0.76 | 0.56 | 0.75 | 0.66 | 0.69 | 0.62 |
| SysS1 | 0.33 | 0.43 | 0.66 | 0.53 | 0.78 | 0.40 | 0.42 | 0.26 | 0.22 | 0.55 | 0.63 | 0.58 | 0.32 | 0.46 | 0.53 | 0.60 | **0.96** | 0.61 | 0.59 | 0.54 | 0.54 | 0.64 | 0.67 | 0.53 |
| SysS2 | 0.26 | 0.47 | 0.66 | 0.53 | 0.80 | 0.39 | 0.34 | 0.24 | 0.24 | 0.51 | 0.66 | 0.59 | 0.34 | 0.42 | 0.59 | 0.62 | **0.97** | 0.55 | 0.63 | 0.51 | 0.54 | 0.64 | 0.64 | 0.52 |
| SysS3 | 0.27 | 0.47 | 0.66 | 0.50 | 0.79 | 0.43 | 0.44 | 0.20 | 0.20 | 0.49 | 0.63 | 0.56 | 0.33 | 0.44 | 0.54 | 0.59 | **0.97** | 0.53 | 0.58 | 0.51 | 0.52 | 0.69 | 0.63 | 0.49 |
| INS1 | 0.19 | 0.19 | 0.50 | 0.32 | 0.40 | 0.40 | 0.36 | 0.43 | 0.22 | 0.76 | 0.50 | 0.44 | 0.31 | 0.41 | 0.46 | 0.55 | 0.55 | **0.92** | 0.48 | 0.38 | 0.63 | 0.47 | 0.57 | 0.57 |
| INS2 | 0.30 | 0.18 | 0.54 | 0.22 | 0.52 | 0.52 | 0.47 | 0.45 | 0.22 | 0.81 | 0.50 | 0.50 | 0.36 | 0.48 | 0.48 | 0.58 | 0.58 | **0.92** | 0.53 | 0.38 | 0.55 | 0.47 | 0.54 | 0.44 |
| INS3 | 0.29 | 0.24 | 0.47 | 0.20 | 0.44 | 0.49 | 0.42 | 0.47 | 0.16 | 0.75 | 0.49 | 0.39 | 0.35 | 0.40 | 0.54 | 0.54 | 0.47 | **0.92** | 0.51 | 0.32 | 0.53 | 0.40 | 0.51 | 0.50 |
| SES1 | 0.26 | 0.40 | 0.55 | 0.36 | 0.53 | 0.39 | 0.36 | 0.23 | 0.27 | 0.54 | 0.79 | 0.70 | 0.35 | 0.55 | 0.75 | 0.73 | 0.59 | 0.54 | **0.97** | 0.63 | 0.64 | 0.62 | 0.70 | 0.58 |
| SES2 | 0.25 | 0.43 | 0.60 | 0.33 | 0.54 | 0.37 | 0.36 | 0.22 | 0.24 | 0.53 | 0.79 | 0.72 | 0.35 | 0.56 | 0.72 | 0.77 | 0.59 | 0.52 | **0.98** | 0.58 | 0.63 | 0.65 | 0.70 | 0.58 |
| SES3 | 0.23 | 0.45 | 0.59 | 0.37 | 0.59 | 0.43 | 0.39 | 0.25 | 0.26 | 0.57 | 0.80 | 0.78 | 0.40 | 0.57 | 0.78 | 0.81 | 0.64 | 0.55 | **0.97** | 0.61 | 0.66 | 0.69 | 0.71 | 0.63 |
| PEOU1 | 0.22 | 0.26 | 0.40 | 0.36 | 0.28 | 0.25 | 0.22 | 0.19 | 0.19 | 0.31 | 0.49 | 0.64 | 0.40 | 0.44 | 0.47 | 0.56 | 0.42 | 0.34 | 0.49 | **0.82** | 0.55 | 0.55 | 0.53 | 0.62 |
| PEOU2 | 0.31 | 0.44 | 0.52 | 0.31 | 0.46 | 0.33 | 0.37 | 0.15 | 0.21 | 0.38 | 0.56 | 0.63 | 0.47 | 0.41 | 0.47 | 0.56 | 0.55 | 0.39 | 0.62 | **0.90** | 0.55 | 0.59 | 0.65 | 0.52 |
| PEOU3 | 0.33 | 0.40 | 0.41 | 0.33 | 0.36 | 0.17 | 0.31 | 0.13 | 0.10 | 0.24 | 0.50 | 0.64 | 0.34 | 0.49 | 0.37 | 0.46 | 0.51 | 0.30 | 0.54 | **0.93** | 0.45 | 0.56 | 0.59 | 0.50 |
| PEOU4 | 0.31 | 0.40 | 0.34 | 0.29 | 0.30 | 0.18 | 0.31 | 0.05 | 0.09 | 0.24 | 0.49 | 0.55 | 0.43 | 0.53 | 0.39 | 0.50 | 0.47 | 0.33 | 0.55 | **0.87** | 0.47 | 0.48 | 0.54 | 0.51 |
| PEOU5 | 0.27 | 0.36 | 0.34 | 0.28 | 0.24 | 0.19 | 0.29 | 0.17 | 0.16 | 0.21 | 0.45 | 0.62 | 0.43 | 0.57 | 0.39 | 0.47 | 0.43 | 0.36 | 0.53 | **0.91** | 0.50 | 0.46 | 0.57 | 0.60 |
| PU1 | 0.28 | 0.28 | 0.39 | 0.39 | 0.35 | 0.30 | 0.23 | 0.21 | 0.26 | 0.37 | 0.45 | 0.42 | 0.25 | 0.36 | 0.44 | 0.55 | 0.40 | 0.47 | 0.50 | 0.40 | **0.83** | 0.50 | 0.50 | 0.60 |
| PU2 | 0.34 | 0.48 | 0.62 | 0.40 | 0.53 | 0.41 | 0.34 | 0.33 | 0.27 | 0.49 | 0.68 | 0.62 | 0.32 | 0.44 | 0.62 | 0.70 | 0.53 | 0.52 | 0.65 | 0.50 | **0.89** | 0.64 | 0.63 | 0.63 |
| PU3 | 0.35 | 0.42 | 0.58 | 0.39 | 0.49 | 0.45 | 0.37 | 0.26 | 0.26 | 0.55 | 0.70 | 0.65 | 0.35 | 0.48 | 0.59 | 0.74 | 0.55 | 0.62 | 0.63 | 0.58 | **0.95** | 0.62 | 0.68 | 0.71 |
| PU4 | 0.40 | 0.33 | 0.51 | 0.32 | 0.42 | 0.44 | 0.36 | 0.31 | 0.26 | 0.55 | 0.64 | 0.60 | 0.34 | 0.54 | 0.61 | 0.73 | 0.49 | 0.60 | 0.59 | 0.55 | **0.93** | 0.62 | 0.64 | 0.71 |
| EN1 | 0.29 | 0.30 | 0.51 | 0.31 | 0.60 | 0.34 | 0.29 | 0.16 | 0.14 | 0.41 | 0.66 | 0.63 | 0.19 | 0.41 | 0.53 | 0.60 | 0.61 | 0.39 | 0.63 | 0.51 | 0.62 | **0.84** | 0.65 | 0.59 |
| EN2 | 0.24 | 0.24 | 0.57 | 0.27 | 0.46 | 0.41 | 0.40 | 0.31 | 0.19 | 0.48 | 0.57 | 0.57 | 0.36 | 0.42 | 0.50 | 0.60 | 0.58 | 0.48 | 0.60 | 0.49 | 0.62 | **0.89** | 0.62 | 0.62 |
| EN3 | 0.32 | 0.39 | 0.60 | 0.36 | 0.52 | 0.38 | 0.30 | 0.24 | 0.19 | 0.45 | 0.66 | 0.65 | 0.34 | 0.48 | 0.54 | 0.62 | 0.65 | 0.46 | 0.62 | 0.55 | 0.67 | **0.93** | 0.66 | 0.69 |
| EN4 | 0.29 | 0.35 | 0.60 | 0.25 | 0.52 | 0.51 | 0.35 | 0.21 | 0.24 | 0.51 | 0.65 | 0.57 | 0.32 | 0.45 | 0.56 | 0.64 | 0.65 | 0.47 | 0.59 | 0.55 | 0.56 | **0.91** | 0.65 | 0.53 |
| EN5 | 0.29 | 0.36 | 0.49 | 0.23 | 0.48 | 0.42 | 0.38 | 0.18 | 0.14 | 0.46 | 0.55 | 0.57 | 0.25 | 0.47 | 0.45 | 0.56 | 0.53 | 0.35 | 0.53 | 0.57 | 0.45 | **0.86** | 0.56 | 0.45 |
| ATT1 | 0.36 | 0.39 | 0.63 | 0.44 | 0.50 | 0.37 | 0.32 | 0.33 | 0.29 | 0.51 | 0.69 | 0.69 | 0.35 | 0.50 | 0.66 | 0.66 | 0.67 | 0.58 | 0.75 | 0.62 | 0.70 | 0.68 | **0.93** | 0.73 |
| ATT2 | 0.39 | 0.37 | 0.55 | 0.36 | 0.46 | 0.41 | 0.44 | 0.28 | 0.23 | 0.50 | 0.64 | 0.59 | 0.31 | 0.40 | 0.59 | 0.63 | 0.61 | 0.52 | 0.64 | 0.60 | 0.62 | 0.66 | **0.95** | 0.62 |
| ATT3 | 0.36 | 0.42 | 0.57 | 0.38 | 0.47 | 0.39 | 0.40 | 0.30 | 0.22 | 0.54 | 0.65 | 0.59 | 0.31 | 0.43 | 0.62 | 0.66 | 0.61 | 0.58 | 0.66 | 0.63 | 0.66 | 0.67 | **0.95** | 0.64 |
| ATT4 | 0.35 | 0.42 | 0.57 | 0.38 | 0.48 | 0.38 | 0.41 | 0.30 | 0.24 | 0.49 | 0.64 | 0.60 | 0.30 | 0.46 | 0.62 | 0.62 | 0.64 | 0.54 | 0.67 | 0.62 | 0.61 | 0.67 | **0.96** | 0.61 |
| INT1 | 0.33 | 0.35 | 0.45 | 0.26 | 0.37 | 0.31 | 0.31 | 0.30 | 0.26 | 0.44 | 0.54 | 0.61 | 0.38 | 0.54 | 0.52 | 0.56 | 0.57 | 0.54 | 0.62 | 0.58 | 0.67 | 0.67 | 0.68 | **0.94** |
| INT2 | 0.31 | 0.28 | 0.40 | 0.18 | 0.28 | 0.27 | 0.26 | 0.29 | 0.23 | 0.42 | 0.56 | 0.59 | 0.37 | 0.48 | 0.51 | 0.59 | 0.48 | 0.54 | 0.58 | 0.59 | 0.74 | 0.61 | 0.65 | **0.97** |
| INT3 | 0.31 | 0.29 | 0.37 | 0.22 | 0.30 | 0.25 | 0.24 | 0.28 | 0.25 | 0.35 | 0.53 | 0.57 | 0.37 | 0.45 | 0.47 | 0.57 | 0.48 | 0.49 | 0.57 | 0.62 | 0.73 | 0.59 | 0.65 | 0.97 |

**Notes:** ACE = Accessibility, ACU = Accuracy, ASS = Assurance, ATT = Attitude, COM = Completeness, CUR = Currency, EMP = Empathy, EN = Enjoyment, FLE = Flexibility, FOR = Format, IQ = Information Quality, INS = Information Satisfaction, INT = Intention, PEU = Perceived Ease of Use, REL = Reliability, RES = Responsive, SQ = Service Quality, SER = Service Reliability, SES = Service Satisfaction, SysQ = System Quality, SYS = System Satisfaction, TAN = Tangible, TIM = Timeliness, PU = Perceived Usefulness

# Appendix C

## Correlations, Internal Consistency, and Discriminant Validity of Constructs

| | CA | CR | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ACE | 0.92 | 0.95 | 0.93 | | | | | | | | | | | | | | | | | | | | | | | |
| ACU | 0.73 | 0.84 | 0.19 | 0.80 | | | | | | | | | | | | | | | | | | | | | | |
| ASS | 0.71 | 0.87 | 0.38 | 0.29 | 0.88 | | | | | | | | | | | | | | | | | | | | | |
| ATT | 0.96 | 0.97 | 0.42 | 0.32 | 0.47 | 0.95 | | | | | | | | | | | | | | | | | | | | |
| COM | 0.75 | 0.85 | 0.18 | 0.29 | 0.26 | 0.40 | 0.82 | | | | | | | | | | | | | | | | | | | |
| CUR | 0.88 | 0.92 | 0.11 | 0.27 | 0.11 | 0.25 | 0.50 | 0.91 | | | | | | | | | | | | | | | | | | |
| EMP | 0.94 | 0.95 | 0.39 | 0.17 | 0.48 | 0.69 | 0.46 | 0.16 | 0.92 | | | | | | | | | | | | | | | | | |
| EN | 0.93 | 0.94 | 0.37 | 0.24 | 0.50 | 0.70 | 0.46 | 0.20 | 0.69 | 0.89 | | | | | | | | | | | | | | | | |
| FLE | 0.88 | 0.92 | 0.43 | 0.30 | 0.34 | 0.61 | 0.51 | 0.26 | 0.74 | 0.62 | 0.90 | | | | | | | | | | | | | | | |
| FOR | 0.77 | 0.87 | 0.28 | 0.40 | 0.36 | 0.41 | 0.49 | 0.08 | 0.33 | 0.38 | 0.37 | 0.83 | | | | | | | | | | | | | | |
| IQ | 0.88 | 0.93 | 0.23 | 0.44 | 0.36 | 0.53 | 0.65 | 0.30 | 0.57 | 0.51 | 0.56 | 0.48 | 0.91 | | | | | | | | | | | | | |
| INS | 0.91 | 0.94 | 0.21 | 0.48 | 0.46 | 0.58 | 0.51 | 0.21 | 0.53 | 0.48 | 0.54 | 0.44 | 0.84 | 0.92 | | | | | | | | | | | | |
| INT | 0.96 | 0.97 | 0.31 | 0.29 | 0.54 | 0.68 | 0.28 | 0.25 | 0.56 | 0.65 | 0.42 | 0.28 | 0.41 | 0.54 | 0.96 | | | | | | | | | | | |
| PEOU | 0.93 | 0.95 | 0.42 | 0.15 | 0.54 | 0.65 | 0.25 | 0.17 | 0.56 | 0.60 | 0.45 | 0.34 | 0.31 | 0.39 | 0.62 | 0.88 | | | | | | | | | | |
| REL | 0.89 | 0.93 | 0.49 | 0.37 | 0.40 | 0.38 | 0.18 | 0.08 | 0.27 | 0.32 | 0.32 | 0.35 | 0.22 | 0.28 | 0.32 | 0.32 | 0.91 | | | | | | | | | |
| RES | 0.92 | 0.95 | 0.37 | 0.25 | 0.49 | 0.65 | 0.47 | 0.22 | 0.83 | 0.58 | 0.66 | 0.30 | 0.55 | 0.53 | 0.52 | 0.47 | 0.28 | 0.93 | | | | | | | | |
| SQ | 0.96 | 0.96 | 0.50 | 0.27 | 0.52 | 0.67 | 0.47 | 0.26 | 0.78 | 0.68 | 0.65 | 0.34 | 0.62 | 0.60 | 0.59 | 0.57 | 0.35 | 0.76 | 0.96 | | | | | | | |
| SER | 0.90 | 0.93 | 0.40 | 0.24 | 0.59 | 0.65 | 0.30 | 0.16 | 0.75 | 0.67 | 0.58 | 0.24 | 0.46 | 0.48 | 0.61 | 0.69 | 0.30 | 0.68 | 0.72 | 0.88 | | | | | | |
| SES | 0.97 | 0.98 | 0.43 | 0.23 | 0.57 | 0.72 | 0.41 | 0.26 | 0.81 | 0.67 | 0.59 | 0.38 | 0.55 | 0.54 | 0.61 | 0.62 | 0.25 | 0.77 | 0.79 | 0.75 | 0.97 | | | | | |
| SysQ | 0.95 | 0.97 | 0.46 | 0.28 | 0.30 | 0.50 | 0.45 | 0.19 | 0.64 | 0.58 | 0.69 | 0.42 | 0.55 | 0.48 | 0.33 | 0.37 | 0.32 | 0.55 | 0.57 | 0.51 | 0.56 | 0.95 | | | | |
| SYS | 0.96 | 0.97 | 0.47 | 0.24 | 0.45 | 0.66 | 0.42 | 0.23 | 0.66 | 0.68 | 0.68 | 0.41 | 0.53 | 0.58 | 0.53 | 0.54 | 0.29 | 0.57 | 0.62 | 0.59 | 0.62 | 0.81 | 0.96 | | | |
| TAN | 0.76 | 0.84 | 0.34 | 0.24 | 0.36 | 0.33 | 0.30 | 0.45 | 0.29 | 0.33 | 0.34 | 0.25 | 0.29 | 0.36 | 0.38 | 0.46 | 0.23 | 0.38 | 0.45 | 0.36 | 0.37 | 0.20 | 0.34 | 0.76 | | |
| TIM | 0.89 | 0.95 | 0.51 | 0.19 | 0.26 | 0.41 | 0.12 | 0.17 | 0.36 | 0.32 | 0.39 | 0.15 | 0.24 | 0.26 | 0.22 | 0.35 | 0.11 | 0.33 | 0.40 | 0.40 | 0.36 | 0.48 | 0.53 | 0.28 | 0.95 | |
| PU | 0.92 | 0.95 | 0.41 | 0.30 | 0.51 | 0.68 | 0.44 | 0.29 | 0.69 | 0.66 | 0.58 | 0.36 | 0.55 | 0.61 | 0.73 | 0.56 | 0.38 | 0.63 | 0.75 | 0.64 | 0.65 | 0.50 | 0.55 | 0.35 | 0.41 | 0.90 |

**Notes:** CA = Cronbach's alpha, CR = Composite Reliability, ACE = Accessibility, ACU = Accuracy, ASS = Assurance, ATT = Attitude, COM = Completeness, CUR = Currency, EMP = Empathy, EN = Enjoyment, FLE = Flexibility, FOR = Format, IQ = Information Quality, INS = Information Satisfaction, INT = Intention, PEU = Perceived Ease ofUuse, REL = Reliability, RES = Responsive, SQ = Service Quality, SER = Service Reliability, SES = Service Satisfaction, SysQ = System Quality, SYS = System Satisfaction, TAN = Tangible, TIM = Timeliness, PU = Perceived Usefulness

Diagonal elements are the square root of AVE. These values should exceed the interconstruct correlations for adequate discriminant validity. This condition is satisfied for each construct.

# Appendix D

## Screen Shots for the Various Treatments

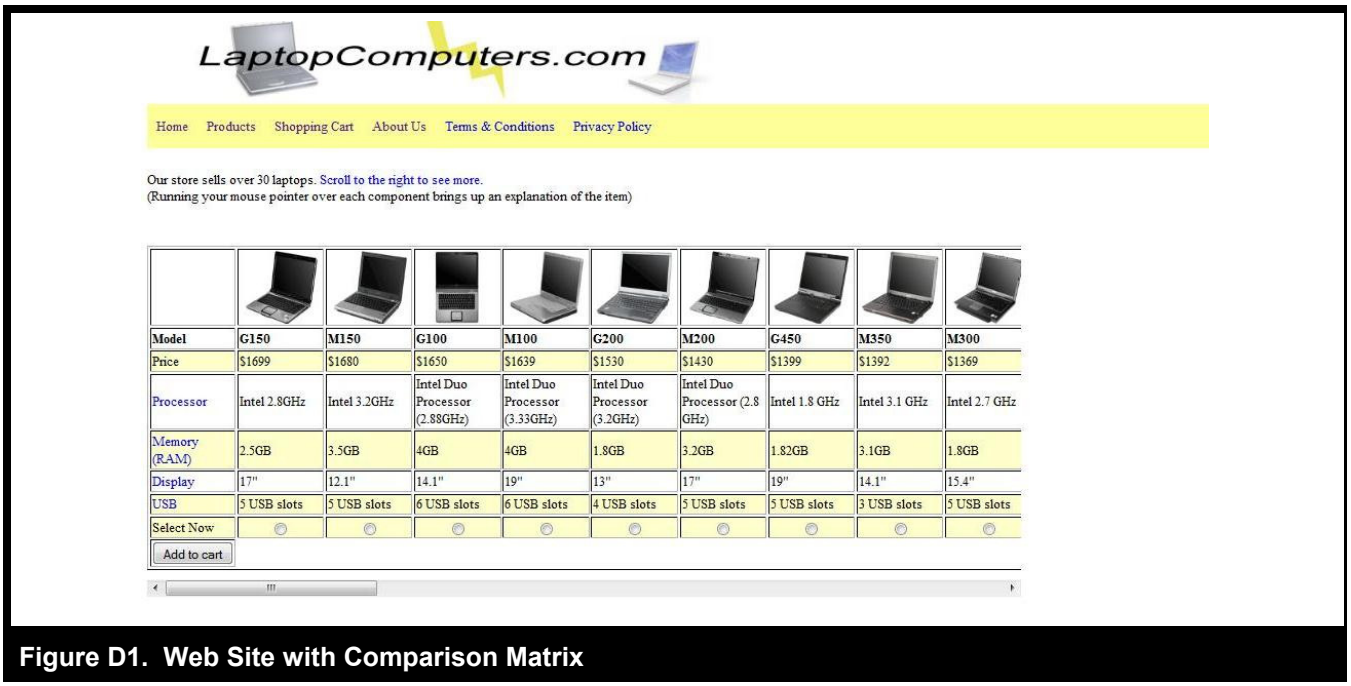


**Figure D1. Web Site with Comparison Matrix**

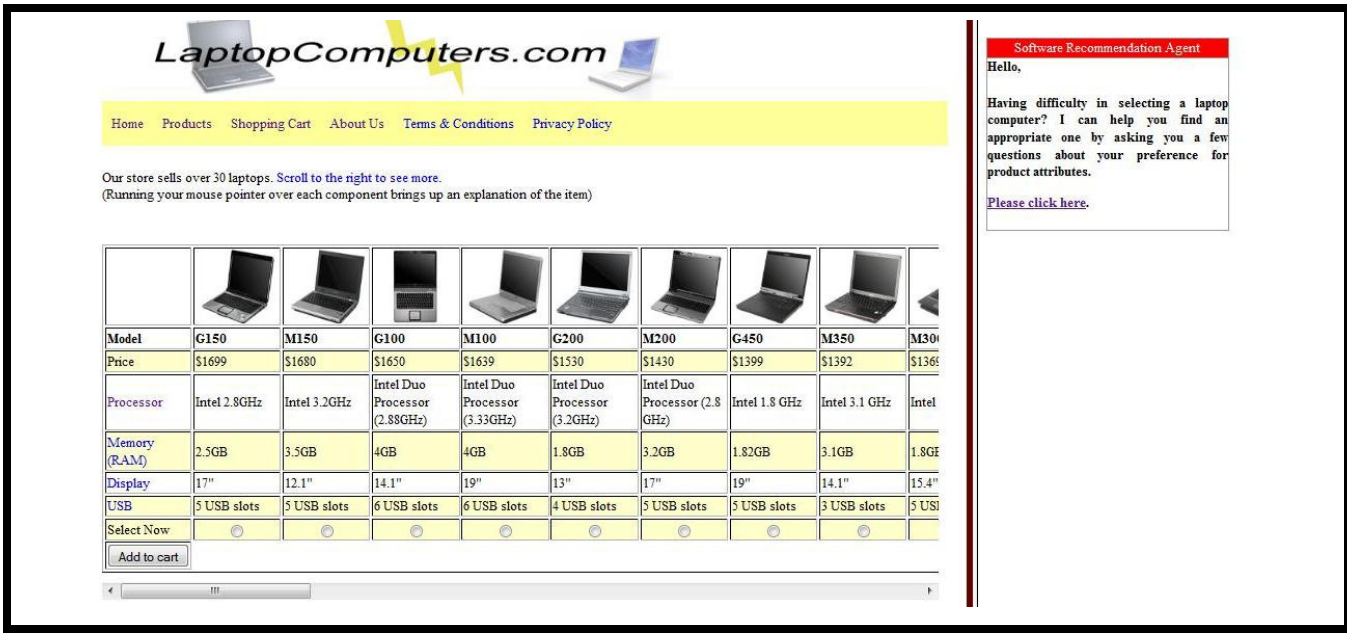


**Figure D2. Web Site with Software Recommendation Service**

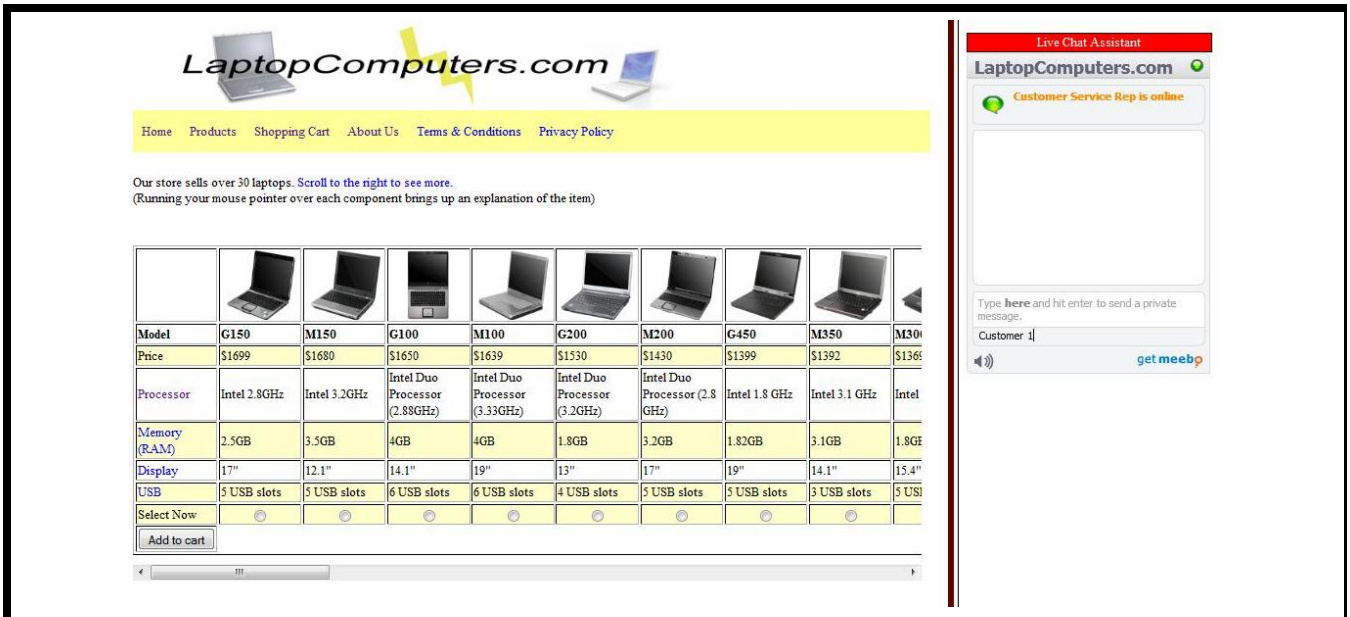


**Figure D3. Web Site with Human Service**

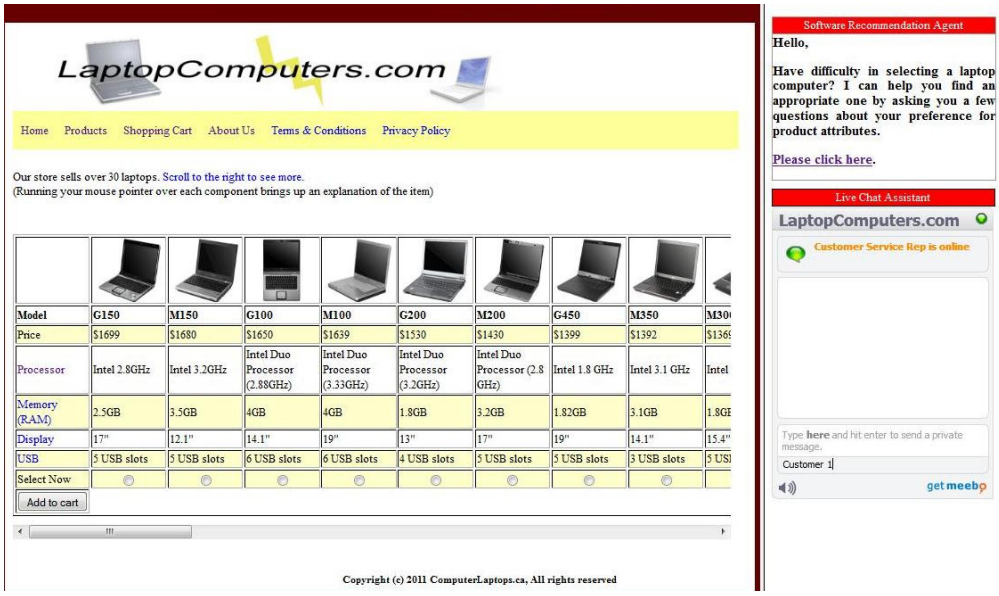


**Figure D4. Web Site with Both Software Recommendation and Human Service**