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Antecedents of B2C Channel Satisfaction and Preference: Validating e-Commerce Metrics

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Although electronic commerce (EC) has created new opportunities for businesses as well as consumers, questions about consumer attitudes toward Business-to-Consumer (B2C) e-commerce vis-à-vis the conventional shopping channels continue to persist. This paper reports results of a study that measured consumer satisfaction with the EC channel through constructs prescribed by three established frameworks, namely the Technology Acceptance Model (TAM), Transaction Cost Analysis (TCA), and Service Quality (SERVQUAL). Subjects purchased similar products through conventional as well as EC channels and reported their experiences in a survey after each transaction. Using constructs from the three frameworks, a model was constructed and tested to examine the determinants of the EC channel satisfaction and preference using the survey data.

Structural equation model analyses indicate that metrics tested through each model provide a statistically significant explanation of the variation in the EC consumers' satisfaction and channel preference. The study found that TAM components—perceived ease of use and usefulness—are important in forming consumer attitudes and satisfaction with the EC channel. Ease of use also was found to be a significant determinant of satisfaction in TCA. The study found empirical support for the assurance dimension of SERVQUAL as determinant in EC channel satisfaction. Further, the study also found general support for consumer satisfaction as a determinant of channel preference.

(*Electronic Commerce*; *Online Shopping*; *Channel Preference*; *Satisfaction*; *Technology Acceptance Model (TAM)*; *Transaction Cost Analysis (TCA)*; *Service Quality (SERVQUAL)*)

1. Introduction

Business-to-Consumer (B2C) electronic commerce (EC) has demonstrated promise as the channel of choice for consumers. According to a recent study by the Pew Internet and American Life Project, the Internet has gone from novelty to utility for many, and an increasing number of customers are spending more time shopping electronically for books, music, and airline tickets (Horrigan and Raini 2002). This is supported by a U.S. Census Bureau report that in the year 2000 retail e-sales reached $29 billion, as compared to $15 billion in 1999 (U.S. Census Bureau 2002). These online shopping trends indicate a remarkable potential and an alternative to the traditional brick-and-mortar shopping channel. Nevertheless, attracting new online customers and retaining existing ones will not be easy. There are lingering customer concerns of security, service quality, and the overall effort involved in shopping online (Rose et al. 1999). It is important to understand what drives consumers' satisfaction and their choice of

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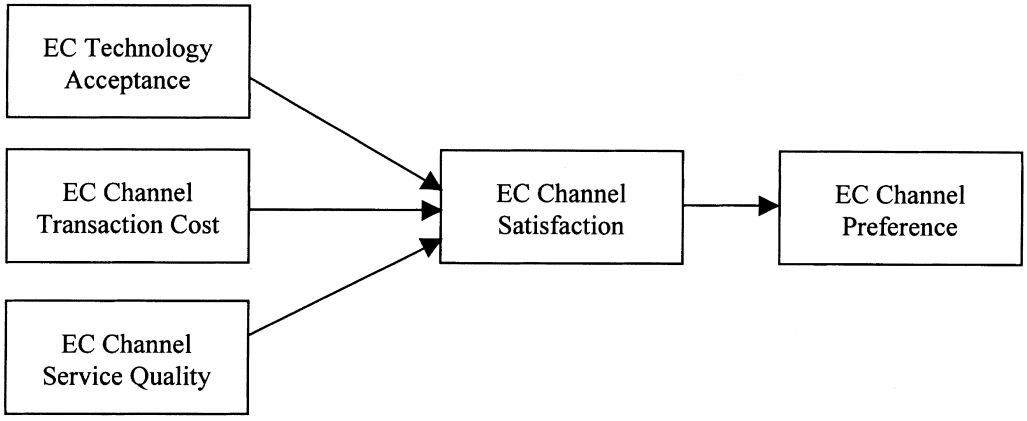
Figure 1 **Theoretical framework**



a shopping channel, particularly the online channel. Metrics well grounded in theory, and tested through EC data, are required for the field to continue to make progress. Understanding consumer-level interaction with the online shopping channel will enhance our understanding of consumer behavior, Web site design issues, and drivers of consumer satisfaction with and preference for the EC channel.

The purpose of this paper is to conceptualize, develop, and validate independent variables that result in consumers' satisfaction and preference for the EC channel. We examine and validate antecedents of consumer satisfaction and preference toward EC channel, utilizing constructs from three theoretical frameworks in an integrated model while examining consumer satisfaction as an antecedent of channel preference. Our analysis, using structural equation modeling (SEM), suggests that these frameworks offer metrics that provide a statistically significant explanation of the variation in the EC consumers' satisfaction and channel preference.

Our theoretical framework, presented in Figure 1, aims to explain the antecedents that affect channel satisfaction as well as the consequences of consumer satisfaction. We utilize constructs from the Technology Acceptance Model (TAM), Transaction Cost Analysis (TCA), and Service Quality (SERVQUAL) as the lens to examine online consumers' satisfaction and channel preference. We propose that the usefulness and ease of use of online shopping, followed by low economic costs such as time and effort involved in finding the right product, price, shipping and handling costs, and service quality are factors that affect consumers' satisfaction and consequently determine their channel preference.

2. Theoretical Background

Due in part to the contemporary nature of the B2C EC, few empirical studies have examined overall EC metrics by combining existing theoretical frameworks and the underlying EC processes. Past studies have examined online customer loyalty resulting from the practices of the retailer (Hoffman and Novak 2000), as well as the importance of customers' concerns in determining satisfaction with the EC channel (Hoffman et al. 1999). Other studies have examined the factors that lead to customers' channel preference (Kiang et al. 2000), acceptance of the channel based on the transaction costs (Liang and Huang 1998), and the importance of customer economic issues in their revisiting the channel based on their online behavior (Novak et al. 2000). Previous studies have also explored the antecedents of consumer satisfaction through the steps in the consumer decision-making process, such as activities specified by the Consumer Mercantile Model (CMM) (Kalakota and Whinston 1997). The CMM consists of three phases—prepurchase interaction, purchase consummation, and post-purchase interaction. The prepurchase interaction consists of product search,

comparison shopping, and negotiation of terms; purchase consummation consists of order placement, payment authorization, and receipt of product; and post-purchase interaction involves customer service and support. Antecedents for B2C success explored by past studies underscore supporting consumers at each step of their interaction with EC. Convenient access to information, while the purchase is being considered, is suggested in the "intelligence" phase of Simon's decision-making model (Butler and Peppard 1998, Kalakota and Whinston 1997, Simon 1977). Prior research in EC found support for consumers' continuance intention, referred to here as channel preference, as being driven by perceived usefulness and satisfaction with initial service (Bhattacherjee 2001a). Shaped during the online purchase process, consumers' attitudes and beliefs regarding convenience and security concerns have significant effects on their intention to purchase online (Limayem et al. 2000). Once a consumer has decided to purchase, the transaction should be efficient and satisfactory (Liang and Huang 1998). Finally, service provided during and following the purchase is essential to EC consumer's repeat purchases (Shanker et al. 2000).

From the review of past research, it is clear that EC consumer satisfaction is driven by three constructs—comfort and acceptance of the enabling computer technology, the costs of executing the transaction, and the quality of service provided by e-retailers—and leads to continuance or preference of the EC channel. These constructs are also proposed by TAM, TCA, and SERVQUAL. TAM has a rich tradition of measuring perceptual and behavioral attitudes toward technology applications (Davis et al. 1989, Davis 1989) and is based on the theory of planned behavior (TPB) (Ajzen 1991). TCA examines the transaction costs associated with various structures in an attempt to measure the economic costs incurred by consumers. The SERVQUAL framework compliments the two with established constructs to measure customer service quality. An inclusive and integrated analysis will provide a multidisciplinary view of EC consumer satisfaction and channel preference. Below, we overview the theoretical foundations of the frameworks and make the case for integrating them in assessing channel satisfaction and preference.

2.1. Channel Satisfaction and Preference

Satisfaction is an ex post evaluation of consumers' experience with the service and is captured as a positive feeling, indifference, or a negative feeling (Anderson 1973). Channel satisfaction is an important construct in studying channel relationships because it affects participants' motivation to stay with the channel and makes them less prone to exit the channel (Geyskens et al. 1999, Ping 1999).

Today, consumers have greater and easier access to alternative sources to purchase products and services. However, to continue to use the online channel, the consumer must believe that the EC channel offers better choices than the alternatives. In the marketing literature, consumers' channel-choice behavior is studied in the service outputs model (Bucklin 1972), which argues that channel systems exist and remain viable by performing duties and providing benefits to end-users. For online retailers, spatial convenience of shopping at home, reducing online waiting time and delivery time, increased product choice, and customer service are critical service outputs (Coughlan et al. 2001). Overall, consumers' satisfaction is affected by both economic and noneconomic factors (Geyskens and Steenkamp 2000, Geyskens et al. 1999). When consumers find online shopping convenient, time efficient, and price saving, they will be satisfied with the general effectiveness and efficiency of the electronic channel. In addition, consumers will find the purchase experience gratifying if online vendors are responsive, concerned, and reliable during the shopping process and subsequent interactions with the customers. Therefore, we examine channel satisfaction based on an integrated analysis using multiple constructs of technology acceptance, transaction costs, and service quality.

While satisfaction is an attitude construct that affects customer's behavioral intention, channel preference is a consumer behavior choice resulting from prior experience (Coughlan et al. 2001), and consumer preferences vary with the purchasing experience (Heilman et al. 2000). When consumers enter a new market, they generally show little evidence of product preference. As they gather more information for a product and with increased purchasing experience, the probability of their choosing a particular product increases. Consumers' store-choice behavior is also largely affected

by their most recent purchase experience (Aaker and Jones 1971, Rao 1969). In the online environment, as the overall satisfaction with the online channel increases, it is likely that consumers will use the online channel again (Bhattacherjee 2001a).

2.2. The Technology Acceptance Model (TAM)

TAM is a widely referenced theoretical model for predicting intention to use and acceptance of information systems by individuals. It proposes that perceived ease of use (PEOU) and perceived usefulness (PU) determine the attitude toward an information system (IS). The attitude, in turn, leads to one's intention to use an IS and the eventual acceptance of the IS technology (Bhattacherjee 2001b, Davis et al. 1989, Lucas and Spitler 1999, Moon and Kim 2001, Venkatesh and Davis 2000). "Intention" in TAM represents the impact of social norms and attitudes that can be mediated by other variables (Ajzen and Fishbein 1980). It has been argued that if no other variables intervene, as is the case in many information technology applications, then "intention" can be excluded (Moore and Benbasat 1991). Therefore, recent TAM-based studies have excluded "intention" without any loss of information (Lederer et al. 2000, Straub et al. 1995, Venkatesh and Davis 2000). Consistent with previous work (Karahanna and Straub 1999, Venkatesh 2000), our research setting does not consist of a situation where other variables intervened and therefore the use of "intention" is not warranted.

Nevertheless, we believe that "attitude" is captured in several items for channel preference. Recent findings suggest that customer satisfaction in the online environment is significantly higher than traditional channels due to the ease of use in acquiring information (Shanker et al. 2000). Ease of use can also affect the transaction costs when the ease of use pertains to information search (discussed below).

Utilizing the Theory of Planned Behavior (TPB), a foundation of TAM, Bhattacherjee (2001b) examined the motivations underlying individual acceptance of B2C EC services. Another TPB-based study found that behavioral costs and intentions significantly influenced online shopping behavior (Limayem et al. 2000). While TPB explains the system use by incorporating subjective norms and perceived behavioral control with attitude toward using technology, TAM is better suited to EC because it helps to understand the technology acceptance based on ease of use and usefulness. Thus, based on recent research in EC, we apply TAM constructs to examine consumer satisfaction with the online channel.

2.3. Transaction Cost Analysis (TCA)

Transaction cost theory was developed primarily to understand the organization and governance structures of its economic activities (Williamson 1975, Williamson 1987). TCA has experienced significant development in the last two decades. Part of the development is termed the "New Institutional Economics" (NIE) (Furubotn and Richter 1997, Williamson 1975), in which TCA is used to study a variety of economic and social phenomena, ranging from vertical integration, corporate finance, and financial markets, to marketing, contracting, franchising, regulation, business models, and political systems (Shelanski and Klein 1995). The central message of TCA and NIE is that when it comes to economic performance, institutional structure matters and certain institutional structures affect governance better than others (Shelanski and Klein 1995). The governance structure in TCA is described as a spectrum, ranging from free markets to hierarchies with a variety of hybrid models in the middle. Traditionally, firms have received more attention than markets in TCA studies. With the rapid growth of the Internet and EC, markets as an institution play a more important role in economic activities as more firms are involved in B2B commerce and individuals are participating in various types of electronic markets.

The framework of TCA builds on the interplay between two main assumptions of human behavior—*bounded rationality* and *opportunism*, and three dimensions of transactions—*uncertainty*, *asset specificity*, and *frequency*. The "uncertainty" reflects the inability to predict relevant contingencies from two sources—unpredictable changes and information asymmetry resulting from strategic nondisclosure or distortion of information by the sellers (Williamson and Masten 1995). Asset specificity arises when certain business investments are made to support a particular transaction. This makes it difficult for the buyer as well as the supplier to switch. Frequency refers to the recurring nature of the transactions. However, frequency has received only limited attention in empirical TCA work

(Rindfleisch and Heide 1997). In this study we focus upon the analysis based on uncertainty and asset specificity.

As a key assumption of TCA, opportunism claims that given the circumstance, participants in a transaction relationship may seek their self-interest (Williamson 1985). Opportunism increases transaction costs in the presence of uncertainty and asset specificity. Decision makers may behave opportunistically and, therefore, create behavior uncertainties (Rindfleisch and Heide 1997). One effect of behavior uncertainty is that decision makers may choose not to disclose complete or accurate information. Another effect of behavior uncertainty is a performance evaluation problem. For example, a buyer may have difficulty determining whether an online travel agent is making full effort to find the best deal. Opportunism poses additional problems when specific assets support a transaction relationship. Asset specificity will then create a safeguarding problem because market competition no longer serves as a restraint for opportunism (Rindfleisch and Heide 1997). Despite its importance in TCA, opportunism is generally operationalized through the transaction dimensions—uncertainty and asset specificity (Rindfleisch and Heide 1997, Shelanski and Klein 1995). By providing extensive information on products and shopping processes, and offering a wide range of choices including vendors and products, the online channel can potentially become a "truly" competitive market and allow consumers to make informed decisions. This will reduce the vendors' incentive to behave opportunistically and reduce customer surprises such as hidden charges, delivery of wrong products, and shipping delays.

Williamson (1987) notes that a transaction occurs when goods or services are transferred across a technologically separable interface. Transaction costs are added to production costs and should include the market transaction costs and the costs of intrafirm managerial transactions (Furubotn and Richter 1997, Masten 1991). Transaction costs for retail market organizations such as online stores consist of (i) market transaction costs for searching, bargaining, and after-sale activities and (ii) managerial transaction costs to run a store. The market transaction costs measure the efficiency level of the interactions of buyers and sellers during a particular market setting, while the managerial transaction costs measure the process efficiency in market organizations. In the context of market transaction costs, as a potential consumer attempts to make an online purchase, the site may provide the product image, description, price, and feedback from other customers, in an easy-to-read format. Essentially, transaction costs are captured with two constructs to measure the benefits to the market: perceived ease of use (PEOU) and time efficiency. PEOU, also a TAM construct, measures the effort in shopping including searching, bargaining, and after-sale monitoring. Time efficiency is a measure of the transaction time costs. The pioneering work of Becker (1965) in consumer behavior suggests that the consumer maximizes his or her utility subject to not only income constraints but also time constraints (Dellaert et al. 1998, Tat et al. 1988). By reducing information asymmetry and surprises, such as delivering wrong products and missing delivery dates, customers find online shopping easy to use and less time consuming.

Price savings can be considered as a measure of store efficiency because as managerial costs decrease, savings could be passed on to consumers. In the finance literature, the transaction costs of financial markets generally include commission fees, bid-ask spread, and price impact costs (Berkowitz et al. 1988, Hasbrouck 1993, Konana et al. 2000). These costs are the compensation to market makers or dealers and are considered as a measure of market efficiency. As market institutions become more efficient, the cost of trading is lowered and consumers get better prices.

Overall, the three dimensions of transaction costs—PEOU, time efficiency, and price saving—measure different aspects of the efficiency of retail transactions. While PEOU and time efficiency are measures of the costs between buyer and seller interactions, relative price saving is a measure of online or conventional store transaction efficiency. Thus TCA extends TAM constructs to the cost dimension of online transactions.

2.4. Service Quality (SERVQUAL)

In EC, service quality measures have been applied to assess the quality of search engines (Xie et al. 1998) and factors associated with Web site success (Liu and

Arnett 2000). However, consumers' perceptions of online service quality remain unexplored. There are indications that EC service issues go beyond product price and may be the reason for consumers' preference for the channel (Reichheld and Schefter 2000). SERVQUAL, a widely utilized instrument in marketing research to measure customers' expectation and perception of service, was recently adapted to measure IS service quality (Kettinger and Lee 1994, Pitt et al. 1995, Watson et al. 1998). SERVQUAL measures the difference between expected service and perceived service to assess the service "gap." Although gap assessment is a distinguishing feature of SERVQUAL, its accuracy and applicability to IS has been challenged (VanDyke et al. 1997). Because perception is the result of the evaluation process of the service and expectation, the dual-survey approach may not be necessary in IS (Kettinger and Lee 1997, VanDyke et al. 1997). We utilize the SERVQUAL items in a single survey to operationalize consumers' perceived service quality through reliability, responsiveness, empathy and assurance of the online channel.

2.5. An Integrated View of EC Metrics

Recently, Orlikowski and Iacono (2001) related TAM as an individual's perception of a new technology based as an internal cost-benefit analysis. The perceived ease of use construct, discussed above, refers to the degree to which the prospective user expects the system to be free of effort, while the usefulness represents the user's perception that using a system will increase performance (Davis et al. 1989). Essentially, perceived ease of use is a *cost* construct and perceived usefulness a *benefit* construct. Expanding Orlikowski and Iacono's proposal that TAM represents internal cost-benefit, TCA explains the "external" transaction costs, consisting of market and managerial transaction costs in EC. Further, consumers expect the online channel to provide good and consistent service quality. SERVQUAL constructs expand the usefulness construct beyond the IS interface to the experience of the online channel. Thus, TCA and SERVQUAL complement TAM in capturing consumers' perception of EC.

The integration of constructs can also be viewed from the perspective of the consumer's decision-making process in EC transactions. Consumers' EC shopping process models such as CMM and service outputs model include purchase demand, information search, evaluation, choice and purchase, and post-purchase. This behavioral process is captured appropriately by constructs in TAM, TCA, and SERVQUAL. Several past studies have applied these constructs, albeit in a unidimensional approach. For instance, Liao and Cheung (2001) found that the willingness to shop on the Internet was determined largely by transaction costs such as security and accuracy, quality of service such as returns and exchanges, or altering an order, and the ease of use. Consumer adoption of EC by combining TAM and TCA constructs has also been previously proposed (Brohman 1997). The link between service quality and customer satisfaction is also well established in the marketing literature (Dabholkar 1995, Dabholkar et al. 2000, Parasuraman and Grewal 2000). Our theory development integrates these three frameworks and tests their intrinsic relationships with consumers' satisfaction and channel preference.

3. Research Design and Results

Novak et al. (2000) suggest that very little is known about the factors that make using the Web a compelling experience for its users. Through a structural model, they attempt to understand the experience of the consumer beyond the online shopping navigation experience. Similarly, we undertake a study to examine antecedents of consumer EC channel satisfaction.

3.1. Study

We solicited participation from online shoppers from the community, and undergraduate as well as graduate students in business administration at a private university. The community shoppers were contacted through a membership list of a social and cultural organization. The solicitation was primarily through phone and e-mail, followed by in-person contact once the individuals agreed to participate in the study. Students were solicited in-person by one of the researchers, following a request to the instructor of each course. Out of approximately 200 individuals contacted, 171 agreed to participate in the study. Each participant was asked to register by filling out a brief demographics survey. A research assistant tracked the registered participants' progress and sent e-mail reminders to those

who did not complete the study. The choice of each set of shoppers was based on their ability and willingness to conduct and respond to a conventional as well as an online shopping transaction experience. Participants were introduced to the study requirements and then directed to a Web site created for the purpose of supporting this study. The Web site also listed frequently asked questions (FAQ), links to online comparison-shopping Web sites, researchers' contact information, and the two online survey questionnaires. Each participant completed one survey for each channel. There was a gap of about one week between the online transaction/survey and the conventional transaction/survey. Both surveys captured the participants' perceptions of shopping, their satisfaction, and preference toward the channel. During the introduction to the study, we emphasized that the surveys pertain to their experience with the channel in question as opposed to the vendor. In addition, each survey began with a statement reiterating the same. For the purposes of this study, we analyzed the online channel responses only. The respondents, however, were not aware if one or both surveys were part of the study analysis. The language of the online survey items (listed in Appendix A) was modified for the in-store purchase survey. All survey responses were captured online and automatically stored in a database. Pitkow and Recker (1995) recommend using online automated surveys and suggest ease of use, low overhead, and reliability as some of the advantages of online surveys.

Subjects in the study purchased a product through a conventional brick-and-mortar channel and completed the online survey. Each participant also purchased the same or similar product through the online channel and completed another survey. As in previous studies, we recommended that subjects should purchase consumer items such as books or CDs (Brynjolfsson and Smith 2000, Hoffman and Novak 2000, Liang and Huang 1998, Loebbecke et al. 1999). As an incentive to complete the tasks of the study and offset part of the purchase cost, each participant who completed the online as well as conventional brick-and-mortar shopping survey was provided with a gift certificate of $20. The gift certificates were redeemable at any business establishment in a local shopping mall or the college bookstore. Although the nature of purchases did not lend to controlled laboratory settings, we required that the subjects list the seller for online and conventional purchases, item purchased, price of the item, amount of time spent in purchase, and the date of purchase. This provided confirmation that the subjects indeed shopped for the product in completing the study requirements. The seven-point Likert scale survey questions were derived from published literature.

3.2. Respondent Profile

Our final sample consisted of 134 complete and valid responses. The age of respondents varied from 19 to 49 years with a mean age of 24 years. Of these, 41% were female and 59% male. Work experience ranged from none to 22 years, with a mean of 4 years. 86.6% of the respondents had prior experience in purchasing products online.

3.3. Construct Validation—Confirmatory Factor Analysis (CFA)

Most of the measures employed in this study are extracted from extant literature on TAM, TCA, and SERVQUAL. Appendix A provides scale items, and reliabilities of the constructs utilized in this study. Appendix B presents the correlation matrix. TAM constructs are based upon questions used in past TAM studies (Davis et al. 1989, Davis 1989, Gefen and Straub 2000, Gefen et al. 2000, Venkatesh and Davis 1996). An examination of the statistical properties of the scales in the survey yielded a Cronbach's alpha value of 0.88 for both perceived ease of use, and usefulness. Thus, the developed scales demonstrated reliabilities above the recommended threshold range of 0.6–0.7. The percent of variation extracted was 75.02, and 74.31 for perceived ease of use and usefulness, respectively.

From a TCA perspective, the external factors that affect market transaction costs, e.g., the time efficiency and ease of transaction are (i) asset specificity and (ii) uncertainty as proposed and applied in past studies (Liang and Huang 1998, Strader and Shaw 1999, Sutcliffe 2000), which we applied for the EC task. The coefficient of reliability, α, is 0.81, 0.71, and 0.79, for uncertainty, asset specificity, and time, respectively.

For SERVQUAL, the dimensions were based upon questions measuring the constructs (i) empathy, (ii) reliability, (iii) responsiveness, and (iv) assurance (Parasuraman et al. 1985, Parasuraman et al. 1988). All

four scales demonstrated reliabilities in the acceptable range of 0.72–0.84.

In previous literature, preference has been operationalized by capturing intention to repeat use (Bolton et al. 2000, Yim and Kannan 1999) and recommendation to others (Sirohi et al. 1998). We capture the channel preference construct through questions that include intention to continue online purchases and intention to recommend the online channel to others. The channel preference scale had a reliability of 0.78 explaining 64.7% of the variation in that construct.

Satisfaction was measured as a three-item scale that assessed consumers' overall satisfaction with the online experience, information content, and their ability to make an effective purchase. The Cronbach's α for satisfaction was 0.81, indicating a high degree of internal consistency for this construct. The percent of variation explained was 73.24%.

Common method variance can be a potential source of bias in survey research. One of the procedures used to test for evidence suggesting the presence, or absence of common method bias in a data set is the Harman's one-factor test (Podsakoff and Organ 1986). An exploratory factor analysis was performed on the variables of interest. If a single factor is obtained or if one factor accounts for a majority of the covariance in the independent and criterion variables, then the threat of common method bias is high. Factor analysis, done by combining the independent and dependent variables, did not indicate a single-factor structure that explained significant covariance, suggesting that common method bias is not a cause for concern in our sample.

Structural equation modeling was used to perform a confirmatory factor analysis (CFA) for the measurement model. CFA allows for tests to be conducted for unidimensionality, convergent validity, and divergent validity of the scales employed in the study. We briefly describe the procedure adopted for each. To conduct CFA, a measurement model consisting of the collection of scales, each defined according to a weighted linear combination of the items, is first specified. During the analysis, the fit of the hypothesized model to the sample data is assessed. For this purpose, a sample covariance matrix (S) is generated. Next, a covariance matrix implied by the specified model (Σ) is computed. Finally, a specific fit function, such as maximum likelihood (ML) function, which measures the difference between Σ and S, is minimized by iteratively changing estimates of the model parameters. The final model fit index and significance of estimated factor loadings confirm the validity of the hypothesized measurement model (Jöreskog and Sörbom 1989, Long 1983).

Unidimensionality. Unidimensionality is the extent to which empirical measures (indicators) are strongly associated with each other and represent a single concept. Unidimensionality is a necessary condition for reliability analysis and construct validation (Anderson and Gerbing 1991). The benefit of using CFA (as opposed to an exploratory exercise such as principal component factor analysis) is the availability of tests for every factor loading to check for statistical significance.

Convergent Validity. Convergent validity is the extent to which varying approaches to construct measurement yield the same results (Campbell and Fiske 1959). The convergent validity of a scale can be checked using the Bentler-Bonett coefficient (Δ) (Bentler and Bonnet 1980). The Bentler-Bonett coefficient (Δ) is the ratio of the difference between the chi-square value of the null measurement model and the specified measurement model to the chi-square value of the null model. The null model has no hypothesized factor loading on a common construct in the confirmatory factor analysis. Values of Δ between 0.80 and 0.90 are acceptable, though a value of 0.90 or above demonstrates strong convergent validity.

Discriminant Validity. Discriminant validity assesses the extent to which a concept and its indicators differ from another concept and its indicators (Bagozzi et al. 1991). Confirmatory factor analysis can also be used to assess discriminant validity for a pair of scales (Long 1983). This approach compares two CFA models: one in which the correlation of a pair of constructs is constrained to equal one (model-a), and another in which the correlation is free to vary (model-b). The chi-square difference test checks the statistical significance of the statistic (chi-a minus chi-b) at $p < 0.01$ (Venkatraman 1989). A statistically significant value of (chi-a minus chi-b) (threshold 32.0) demonstrates that the two constructs under consideration are distinct. This procedure is repeated for all pairs of scales in the instrument.

3.4. Results of CFA

We developed measurement models for each of the theoretical frameworks, TAM, TCA, and SERVQUAL (one of which is shown in Appendix C), as well as a measurement model that combined constructs from the three frameworks. Tests for unidimensionality indicated that the factor loadings associated with the constructs were statistically significant ($p < 0.01$) for all four models. The Bentler-Bonett coefficient (Δ) values were 0.969, 0.950, 0.963, and 0.942, respectively. Finally, for each pair of constructs, the chi-square test was statistically significant ($p < 0.01$) providing support for discriminant validity of constructs in all the measurement models.

3.5. Analyses

We present the correlation matrix and descriptive statistics in Appendix B. We applied structural equation modeling (SEM) using AMOS 4.0 to investigate the measurement characteristics and the measurement of effects of TAM, TCA, and SERVQUAL on the electronic channel satisfaction. The SEM analysis also examined the impact of satisfaction on channel preference.

SEM Analysis. SEM analysis has been widely applied in the social sciences and marketing literature. IS researchers have also recognized the advantages of SEM as a second-generation technique, and recent papers in leading IS journals bear testimony to its use (Gefen, et al. 2000). The SEM consists of two parts—the measurement model and the structural model. The measurement model, described earlier, considers the adequacy of the measures used for theoretical constructs employed in the study. The structural model specifies the relationship of each construct with EC channel customer satisfaction. The SEM methodology incorporates these two aspects to ascertain the fit between the variance-covariance matrix observed in the sample data and that implied by the theoretical or research model.

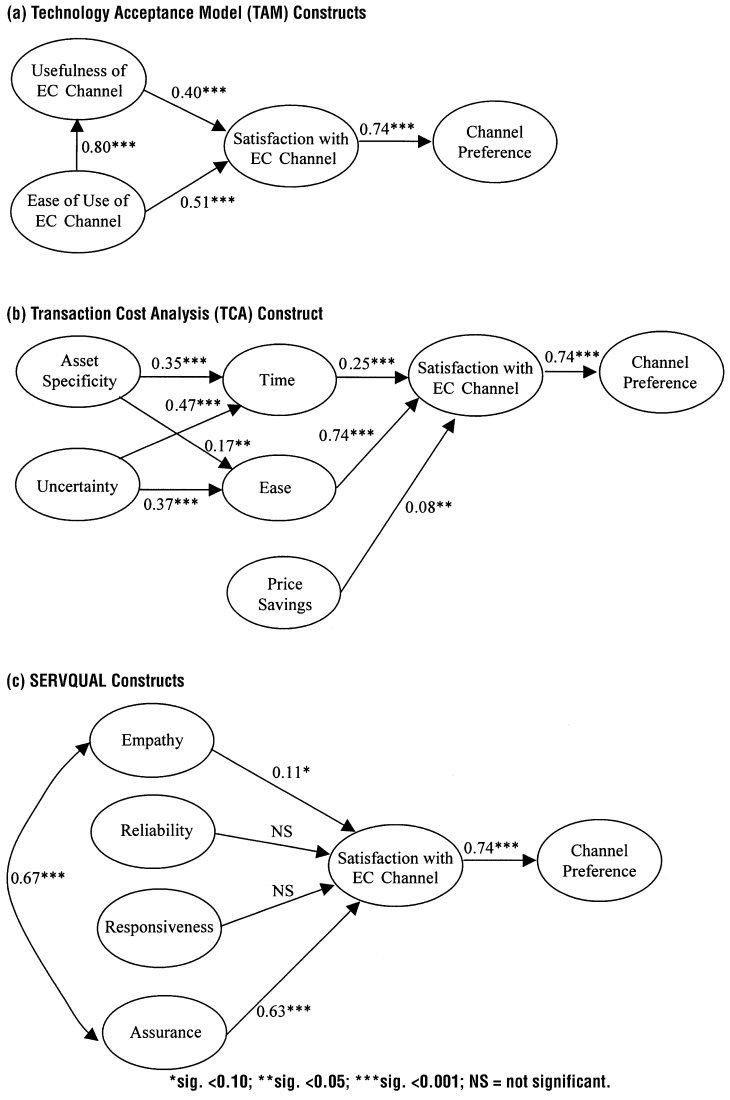
This fit is expressed using measures of goodness of fit. Because there is no consensus on a single or a set of measures to assess fit (Maruyana 1998), it is standard practice to report several measures. We report goodness-of-fit index (GFI) (Bentler and Bonnet 1980), adjusted goodness-of-fit index (AGFI) (Bagozzi and Yi 1988), comparative-fit index (CFI), and normed-fit index (NFI) (Bentler and Bonnet 1980), and the root mean square error of approximation (RMSEA) (Steiger 1990). Values higher than 0.90 for GFI, CFI, and NFI indicate a good fit (Gefen et al. 2000), while AGFI values higher than 0.80 suggest a good fit of the hypothesized model with a null model (no relationships among constructs). For RMSEA, a value less than 0.1 is considered a good fit, and a value less than 0.05 is considered a very good fit of the data to the research model. Figure 2 presents a graphical representation of the SEM models with path coefficients for each construct. The fit indices for each construct are listed in Table 1.

Assumptions. First, the residuals of the model were plotted against the standard normal quantiles (Q-Q plot) to check for violations of normality and linearity assumptions. We also examined the estimates and standard errors of the individual effects and covariances to check their fit. Estimates that are small may suggest that a specific path might not be required. Correlation estimates that are close to zero may indicate that the parameters involved may be constrained. None of the standard errors were large.

SEM Results (TAM). TAM results explaining customer satisfaction and channel preference show strong support for the hypothesized relationships. Specifically, the paths from satisfaction to channel preference, ease of use to satisfaction, and ease of use to usefulness are all positive and significant at the 1% level. The link from usefulness to satisfaction was positive and significant at the 5% level. The percent of variation explained in channel preference, satisfaction, and usefulness is 55, 76, and 63%, respectively. Thus the results, in general, provide support for using metrics derived from TAM to explain customers' attitudes towards EC.

TCA Model. The results for the TCA model indicate several strong relationships. Uncertainty is significantly (at the 1% level) associated both with time and ease, implying that good product and price information was provided through the online channel that contributed to transaction ease and time saving. Asset specificity, on the other hand, is significant at the 1% level with time and at the 5% level with ease indicating that the wider choice among online stores contributes positively to transaction ease and time saving. Time

Figure 2 LISREL Models



and ease, in turn, are positively related (at the 1% level) to satisfaction. As before, satisfaction is significantly (at the 1% level) related to channel preference. Also, price saving is positively associated with satisfaction at the 5% level. The percent of variation explained in satisfaction and channel preference is 72% and 55%, respectively.

SERVQUAL Model. An examination of the SEM results for the SERVQUAL-based metrics shows that the links between satisfaction to channel preference, and assurance to satisfaction are significant at the 1% level. The relationship between empathy and satisfaction is significant at the 10% level. The percent of variation explained in channel preference and satisfaction is 55% and 56%, respectively. In conjunction with the goodness-of-fit statistics reported in Table 1, these results provide reasonably strong support for certain constructs of the SERVQUAL-based model. Together, Table 1 and Figure 2 provide evidence of valid metrics for explaining EC satisfaction and channel preference based on separate analysis of the three frameworks.

The goodness-of-fit indices for all three models are

Table 1 Model Statistics for Each Construct

Model	GFI	AGFI	CFI	NFI	RMSEA
Model a: TAM	0.99	0.98	1.0	1.0	0.01
Model b: TCA	0.96	0.88	0.98	0.96	0.09
Model c: SERVQUAL	0.98	0.94	1.0	0.97	0.037

within the desired range and indicate a good fit of the data to the proposed models. While all three models explain statistically significant variation (based on the *R*-square values of SEM in Figure 2) in satisfaction and channel preference, the TAM explained the highest amount of variation in satisfaction (76%). TCA came close to TAM and explained 72% of the variation in satisfaction. Of the three frameworks, SERVQUAL received only partial support because only empathy and assurance were significantly associated with satisfaction. We discuss these results in greater detail in the following section.

Integrated Model. The results of the integrated model in Figure 3 highlight some interesting findings that reinforce the value of integrating established theoretical frameworks to better understand the phenomena of our interest, i.e., satisfaction with and preference of the EC channel. First, the overall model fits the data well as indicated by the various criteria assessing the goodness of fit. In fact, the percent of variation in satisfaction explained by the integrated model is 82%, which is significantly higher than any of the models examined separately. We also observe that among the constructs representing the theoretical frameworks, TAM and TCA dominate those represented by SERVQUAL.

The results also suggest that among the four SERVQUAL constructs, only "Assurance" significantly affects satisfaction when examined in conjunction with constructs from the other frameworks. This is different from a separate analysis of SERVQUAL metrics when both "Assurance" and "Empathy" were significant. In other words, the metrics representing TAM and TCA dominate the impact on satisfaction deeming "Empathy" as not significant.

Another interesting observation is that the strength of certain constructs increased in the integrated model when compared to the separate models. Specifically, the TCA metrics representing "Time" and "Price Savings" receive increased support in explaining satisfaction in the integrated model. This lends further support to the validity of the TCA metrics.

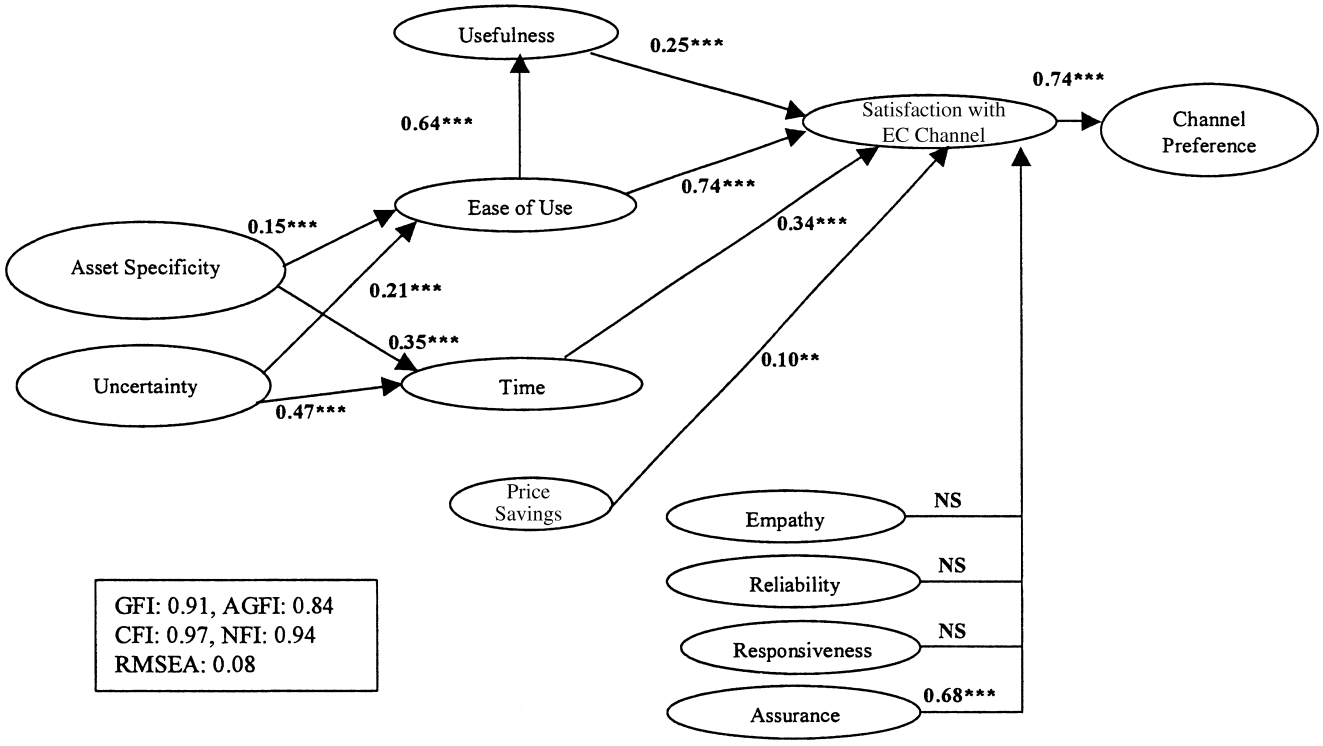
4. Discussion and Conclusions

Customers' choice and subsequent commitment to the channel is often called into question because of security issues, uncertainty, and transaction costs involved. In a general sense, it can be assumed that EC users' preference depends upon their comfort with the shopping channel. Through the analysis reported in this paper, we empirically test metrics of consumer attitudes toward EC.

TAM is well established in the information technology acceptance literature (for a summary of past studies, see Gefen et al. 2000, Straub et al. 1995). Our findings generally support the results of previous TAM-based EC studies (Gefen and Straub 2000, Henderson et al. 1998, Liu and Arnett 2000) and indicate that satisfaction with the EC channel leads to consumer channel preference. We find support that perceived usefulness and ease of use are key determinants of consumers' attitude, assessed by their satisfaction with the EC channel (Figure 2a). Consistent with past studies, we find support that ease of use has an indirect effect on satisfaction through the usefulness of the EC channel (Gefen and Straub 2000, Straub et al. 1995).

Although EC characteristics extend TAM beyond that of an IS, few studies have examined the post-acceptance behavior of consumers in continuance of information systems or EC (Bhattacherjee 2001b). The likelihood of online purchases increases as the consumer's experience with the EC channel increases (Bhatnagar et al. 2000). However, the customers will return only if they find the transaction costs acceptable. Our development of EC metrics and their test through TCA constructs examined the role of uncertainty and asset specificity in determining the efficiency and ease of the transaction for the consumer. Consistent with past TCA research, results indicate that time efficiency and effort expended by the consumer are a function of asset specificity and uncertainty of the EC channel. Price of a product is usually a component of transaction costs, particularly if a consumer has to consider

Figure 3 Integrated Model



the price difference with trade-offs such as delivery, ability to return or exchange, or touch and feel the product. An interesting finding was that percent saving in price was also positively associated with satisfaction. Thus, in addition to time and ease, a quantifiable benefit such as the price savings is viewed as an important antecedent to satisfaction.

After the consumer deems the transaction costs as acceptable, and chooses to continue online shopping, the service and support provided by the channel determines the continued satisfaction. The "commerce" aspect of EC also potentially exposes the consumers' confidential data such as credit card information, products purchased, and account balances to others. Therefore, it places responsibility upon the channel sellers and providers to provide a reliable and secure channel in serving the customer. Our examination of consumer satisfaction in the individual model indicates only assurance and empathy as the two significant determinants in explaining consumer satisfaction. Also, the strong relationship between assurance and empathy suggests that assurance might be achieved when the seller empathizes with the customer's needs. This is consistent with past findings that consumers perceive safety of transactions and seller empathy as important. Security, in particular, has been a serious issue in online purchases and an impediment to the acceptance of the EC channel (Rose et al. 1999). In the integrated model, assurance, that includes security, is the only significant relationship with satisfaction. We did not find support for reliability or responsiveness components of the SERVQUAL construct. One explanation for these findings is that the consumer responses in our research were cross-sectional and did not present an opportunity to examine the responsiveness or reliability. Usually, EC channel responsiveness and reliability are established over time or over multiple transactions such as returns or exchanges, and request for services or additional information.

In summary, our findings suggest that consumers will use EC only if it is useful, easy to use, efficient, and secure. The results of our theory-driven analysis

support the robustness of the EC metrics drawn from the TAM, TCA, and SERVQUAL frameworks and provide a basis for future research as well as offer guidance to online channel providers regarding the antecedents of consumer satisfaction and channel preference.

5. Implications, Limitations, and Areas for Future Research

The implications of the findings from this study can be broadly classified in two categories—theoretical contribution and implications for EC-based businesses. As a theoretical contribution, we present and test three established theoretical frameworks (TAM, TCA, and SERVQUAL) in the EC domain, specifically consumers' experiences and attitudes towards online shopping. We examine the simultaneous impact of metrics constituting these frameworks. We expect that this work will spur further research in examining the boundaries and extensions of these theoretical frameworks. Further, we find that success criteria used in IS research can also be applied to the EC environment. For instance, the TAM components *ease of use* and *usefulness* are important factors in determining satisfaction and channel preference. In addition, we have enriched the EC satisfaction model by introducing constructs based on TCA and SERVQUAL. Methodologically, this paper focuses on the validation of metrics from established theoretical frameworks. To that effect, we demonstrate that metrics derived from traditional models in marketing, economics, and psychology can be successfully applied in EC to determine customer preference. We found strong support for the validity of these metrics with about 82% of the variance in satisfaction attributable to these metrics.

Our findings have equally significant implications for EC-based businesses such as online shopping malls (e.g., ⟨mallpark.com⟩ and ⟨all-internet.com⟩), online auction sites (e.g., ⟨ebay.com⟩ and ⟨ubid.com⟩), and Web authentication and guaranteeing services (e.g., *VeriFone E-Payment Services* and *VeriSign Digital Trust Services*) that seek to increase the volume of online shopping and are eager to learn about what it takes to satisfy online consumers. While the findings of this paper can provide online businesses with insights that can strengthen relationships with existing consumers and gain new ones, they also caution that positive attitude toward the EC channel alone is not sufficient for consumers to change their shopping behavior. It is only the first step leading customers to browse the site. Competitive pricing, easy navigation, superior search, and high-quality, usable information will help keep the consumers' transaction costs low. While this may satisfy the consumers, businesses should realize that to gain consumers' commitment the consumers should feel assured of high-quality service.

As various businesses recognize the value of online shopping, the use of the B2C online channel activity is likely to increase. For instance, the airline industry recognized that online customer transactions cost less than brick-and-mortar transactions and that customers' online preference can cut administrative cost and improve profits. This gave rise to an online shopping channel that consists of services such as ⟨cheaptickets.com⟩, ⟨travelocity.com⟩ and ⟨orbitz.com⟩, all of which are interested in increasing consumers' online channel preference. We believe that our findings will help online channel providers in devising a process to turn inquiring visitors into long-term consumers. This is also important for businesses because consumers who prefer the online channel are likely to increase the volume of their purchases and also recommend the channel to others (Reichheld and Schefter 2000).

Notwithstanding the above findings, the study has some limitations. First, although the sample included actual EC consumers, it was not a random sample. Given the extent of purchase activity involved, it was not possible to select random subjects at large. Although the sample chosen appears to reflect typical EC consumers, there can be differences in comfort level with EC among the general population. Second, our research design did not include multiple instances of same product purchases.

Future studies can examine historical customer purchase data for each channel, examine if satisfaction changed over time, and study the cumulative effects of customer interactions with the online channel. In addition, future studies can utilize this framework to

examine EC satisfaction differences between products and services, digital products and physical products, and consumer products and upscale luxury products. This research can be expanded to examine the antecedents of channel satisfaction among B2B (Business-to-Business) users such as electronic intermediaries and exchanges. Other constructs, such as trust, that can play a useful role in explaining satisfaction might also be examined in future research. We encourage researchers to explore other established constructs and compare them with those used in this study.

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Appendix A. Scale Items and Reliabilities

Construct and Items

Satisfaction α = 0.8141 Variation Explained = 73.24%
SAT1: Overall, I was satisfied with this online experience.
SAT2: The online site information content met my needs.
SAT3: It was possible for me to buy the product of my choice easily.

Channel Preference α = 0.7830 Variation Explained = 64.76%
PREF1: I plan to use online shopping again.
PREF2: I strongly recommend shopping online to others.
PREF3: For products I can buy online, I intend to completely switch over to online shopping.
PREF4: I intend to increase my use of shopping online in the future.

TECHNOLOGY ACCEPTANCE MODEL (TAM)

Perceived Ease of Use α = 0.8835 Variation Explained = 75.02%
EQU1: Overall, I believe that shopping online is easier.
EQU2: It is easy for me to shop online.
EQU3: My interactions during shopping online were clear and understandable.
EQU4: I believe that it is easy to do what I want to do while shopping online.

Perceived Usefulness α = 0.8828 Variation Explained = 74.31%
USE1: Shopping online gives me greater control.
USE2: Shopping online improves the quality of decision making.
USE3: Shopping online is a more effective way to make purchases.
USE4: Overall, I find shopping online very useful.

TRANSACTION COST ANALYSIS (TCA)

Uncertainty α = 0.7354 Variation Explained = 56.58%
UNC1: It was easy for me to get relevant quantitative (price, taxes etc.) information.
UNC2: I believe that it was possible for me to evaluate the various alternatives.
UNC3: The store's Web site provided adequate information.
UNC4: The online site provided sufficient information for the product.

Asset Specificity α = 0.710 Variation Explained = 50.48%
ASSET1: There are many sites where this product is available.
ASSET2: I was satisfied with the number of sites where I could buy this product.
ASSET3: Online shopping gives me a wider choice of different stores compared to conventional stores.
ASSET4: Online shopping gives me a wider range of product choices compared to shopping at conventional stores.

Time α = 0.7975 Variation Explained = 71.71%
TIME1: Shopping online helps me accomplish tasks more quickly.
TIME2: I did not have to spend too much time to complete the transaction.
TIME3: I did not have to spend too much effort to complete the transaction.

SERVQUAL

Reliability α = 0.8375 Variation Explained = 68.08%
REL1: I believe that online shopping is reliable.
REL2: I believe that what I ask for is what I get in online shopping.
REL3: I think that the online store I purchased from performs the service right.
REL4: I trust the online store to deliver the product on time.

Responsiveness α = 0.8467 Variation Explained = 76.63%
RESP1: I believe the the online store is responsive to my needs.
RESP2: In the case of any problem, I think the online store will give me prompt service.
RESP3: The customer service team at the online store will address any concerns that I have.

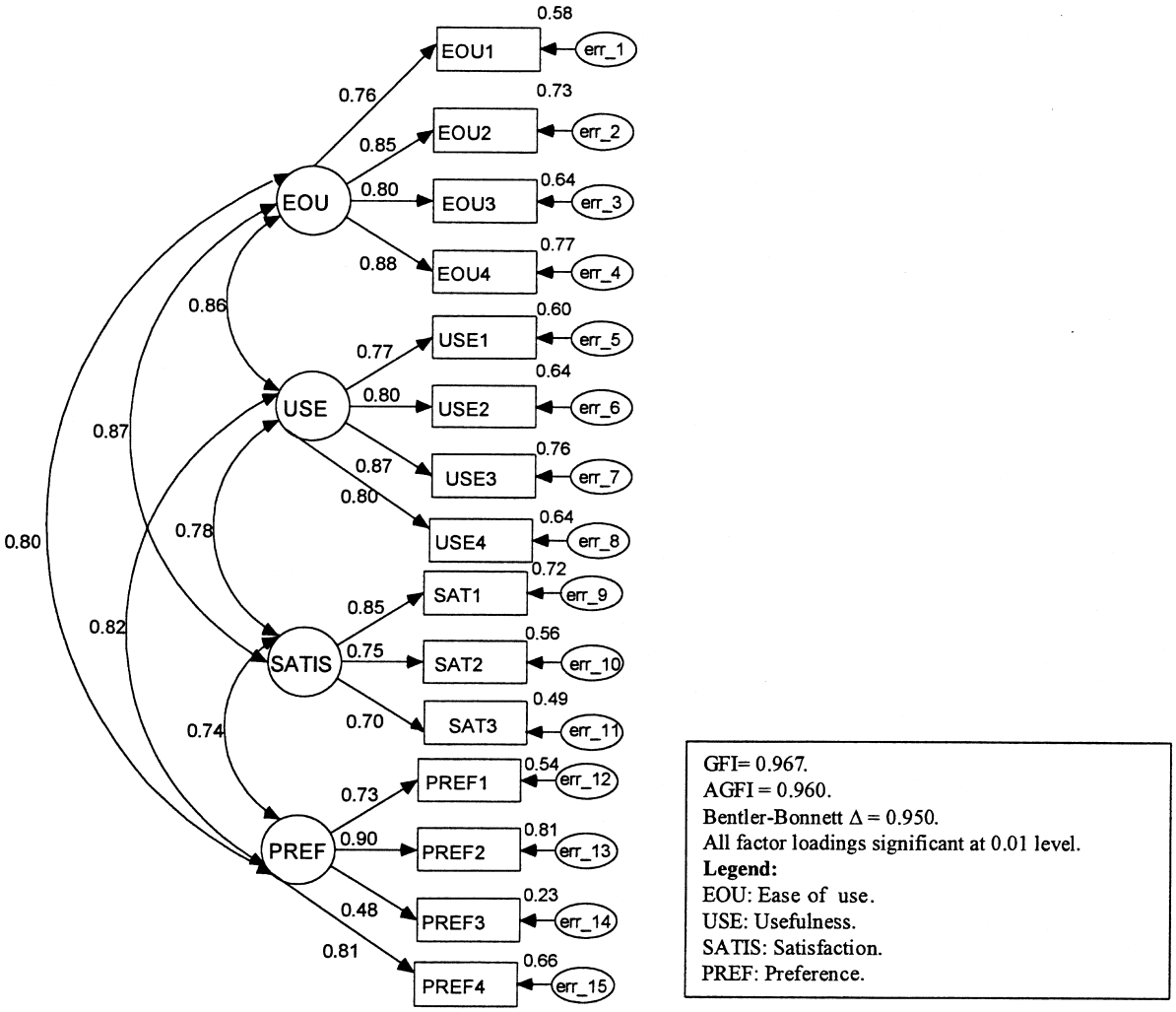
Empathy α = 0.7203 Variation Explained = 64.6%
EMP1: The online store remembers/recognizes me as a repeat customer (after the first time).
EMP2: I think online shopping can address the specific needs of each customer.
EMP3: I was satisfied with the payment options (e.g., different credit cards) at the store I shopped.

Assurance α = 0.7776 Variation Explained = 70.76%
ASS1: I felt confident about the online purchase decision.
ASS2: I feel safe in my transactions with the online store.
ASS3: The online store had answers to all my questions about the product.

Appendix B. Correlation Matrix and Descriptive Statistics for Constructs

Construct	Mean	Std. Dev.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Usefulness (1)	5.0775	1.0548											
Ease of Use (2)	5.3810	1.0294	0.796										
Reliability (3)	5.4574	0.8275	−0.093	−0.126									
Responsiveness (4)	4.7923	1.0576	0.495	0.517	0.087								
Assurance (5)	4.9470	1.0556	0.673	0.711	−0.014	0.677							
Empathy (6)	5.3486	0.8972	0.603	0.695	0.040	0.574	0.712						
Asset (7)	5.3000	0.9591	0.537	0.604	−0.010	0.458	0.587	0.537					
Uncertainty (8)	5.7462	0.7333	0.688	0.710	0.006	0.605	0.811	0.665	0.515				
Time (9)	5.6487	0.9134	0.705	0.704	0.081	0.534	0.640	0.872	0.519	0.657			
Ease (10)	5.2995	1.0826	0.813	0.984	−0.091	0.520	0.699	0.673	0.600	0.694	0.693		
Channel Preference (11)	5.1328	0.9891	0.739	0.681	−0.111	0.433	0.575	0.514	0.492	0.641	0.549	0.699	
Satisfaction (12)	5.7590	0.7471	0.660	0.733	−0.051	0.487	0.741	0.683	0.627	0.759	0.694	0.721	0.546

Appendix C. Confirmatory Factor Analysis—TAM



Note. We conducted similar CFA for TCA and SERVQUAL constructs, and the integrated model. In the interest of brevity we show the figure only for the TAM measurement model.

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