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ABSTRACT

Information system organizations frequently offer complex IT applications and services to its users. These organizations would want the users of these systems to imbue positive "intentions to use" toward the systems. According to the literature, the construct "intention to use" is influenced by the "perceived satisfaction" derived by the particular user when using or consuming a particular product. For complex systems such as non-trivial IT products, user satisfaction is extremely important in terms of use of that particular system. In this paper, we posit that there are two components of "perceived satisfaction", namely "product subsystem satisfaction" and "service subsystem satisfaction" and that these two components jointly influence the users' "intention to use". When users encounter both a product and its service, they are likely to form separate perceptions about product quality and service quality. Product and service qualities would in-turn cause product subsystem satisfaction and service subsystem satisfaction. The satisfaction subsystems independently influence the "intention to use". We are conducting a field study to confirm the relationships between the quality subsystem, the service subsystem, the intention to use, and the interaction between service and product quality subsystems. The field study is being conducted in a firm which has implemented a company wide ERP system. In this paper, we expect to reveal relationships between the constructs of perceived quality, satisfaction and behavioral intentions in the "service subsystem" and the "product subsystem". Moreover, the study will also provide evidence to the extent of interaction between the two subsystems.

INTRODUCTION

Information system organizations (IS departments and external service providers) now offer diverse IT applications and services to the users of these technologies. In early days, the role of IT departments was limited to providing relatively simpler tasks such as main frame and help desk support. However, contemporary organizations provide multiple and quite often complex products and services. Here, products refer to the delivered technological systems and artifacts, as well as the information provided by the systems as a result of data processing. Services mainly include help desk and end user support that facilitate IT adoption and use, rather than outputs of the systems. These organizations would want the users of these systems to imbue positively in respect of their intention to use the systems. While much IS research has examined users' acceptance of information technology using theories such as the technology acceptance model (TAM) Davis (1989); Davis and Venkatesh (2004); Venkatesh and Davis (2000) the theory of reasoned action (TRA) Taylor and Todd (1995), the theory of planned behavior (TPB)

Taylor and Todd (1995), and the unified theory of acceptance and use of technology (UTAUT) Venkatesh et al. (2003), these models do not distinguish products and services. For example, in TAM, the two major constructs – perceived usefulness and perceived ease of use – treat a technology as one integrated artifact, even though it may have separate product and service components. There is also literature suggesting that the "intention to use" a product is influenced by the "perceived satisfaction" derived by the particular user when using or consuming the product. For complex systems such as non-trivial IT products, user satisfaction is extremely important in terms of use of that particular system. In this paper, rather than using TAM and treating a technology as an integrated artifact including both product and service, we posit that there are two components of "perceived satisfaction", namely "product subsystem satisfaction" and "service subsystem satisfaction" and that these two components jointly influence the users' "intention to use." This proposition is based on the premises that product and service qualities are distinct constructs. Literature suggests that quality is an antecedent to satisfaction. When users encounter both a product and its service, they are likely to form separate perceptions about product quality and service quality. Product and service qualities would in-turn cause product subsystem satisfaction and service subsystem satisfaction. Therefore, by deductive reasoning, there must be two distinct components of "perceived satisfaction."

Information system organizations (IS departments and external service providers) now offer diverse IT applications and services to the users of these technologies. In early days, the role of IT departments was limited to providing relatively simpler tasks such as main frame and help desk support. However, contemporary organizations provide multiple and quite often complex products and services. These organizations would want the users of these systems would imbue positively in respect of their intention to use the systems. Vast body of literature suggests that the "intention to use" a product is influenced by the "perceived satisfaction" derived by the particular user when using or consuming the product. For complex systems such as non-trivial IT products, user satisfaction is extremely important in terms of use of that particular system. In this paper, we posit that there are two components of "perceived satisfaction", namely "product subsystem satisfaction" and "service subsystem satisfaction" and that these two components jointly influence the users' "intention to use". This proposition is based on the premises that the product and service qualities are distinct constructs. Literature suggests that *Quality* is an antecedent to *satisfaction*. Where users encounter both product and its service, they are likely to form separate perceptions about product quality and service quality. Product and service qualities would in-turn cause product subsystem satisfaction and service subsystem satisfaction. Therefore, by deductive reasoning, there must be two distinct components of "perceived satisfaction"

We propose that satisfaction derived by the users because of positive perceptions of the service of an IT system would result in positive intentions to use of the product. In this study we seek to investigate user satisfaction jointly from a service and a product perspective by considering a product sub-system and a service sub-system and find out interaction processes between them.

RELATED RESEARCH

Product and Service Quality

Consumer satisfaction and perceived product and service qualities have been widely studied in the marketing literature. Early IS literature focused exclusively on information quality, and in the quality of system development processes. Review of recent literature points to a greater interest in IS to investigate processes involving user satisfaction Susarla et al. (2003); Bhattacharjee and Premkumar (2004). User involvement in system design has been found to be a key determinant of IS system quality Ives and Olson (1984). Satisfaction with the output of an information system has been found to impact IS effectiveness Baroudi and Orlikowski (1988). System quality, information quality, use, user satisfaction, individual impact and organizational impact have been suggested as

important factors of IS success DeLone and McLean (1992). In this model, *system quality* and *information quality* imply technical dimensions of quality in IS namely the system itself that processes the information and the output information from the system DeLone and McLean (1992). Similarly, based on TAM, Wixom and Todd (2005) identify information and system quality as antecedents to perceived usefulness and perceived ease of use, respectively.

For the reasons mentioned in section , distinction should be drawn between service quality and product quality. IS literature has identified *information accuracy, output timeliness, reliability, completeness, relevance, precision, and accuracy* as dimensions of product quality. USISF, a scale to measure user satisfaction with an information system function, includes *reliability, accuracy and precision* of information, equipment, software and documentation Kettinger and Lee (1994) Most measures in this category tap engineering-oriented performance characteristics. They combine the system and information quality aspects identified in earlier research DeLone and McLean (1992); Wixom and Todd (2005). Pitt (1995) argued that IS departments (organizations) are not just providers of products but also providers of service . Consequently, service quality has been identified as an important factor in determining IS success Pitt et al. (1995). According to Parasuraman (1985), characteristics of service quality are intangibility, heterogeneity, and inseparability. Importance of accurately measuring both product quality and service quality in IS settings has also been emphasized Pitt et al. (1995).

Service quality has been described as a form of attitude, related but not equivalent to satisfaction that results from comparison of expectations with performance Parasuraman et al. (1988); Bolton and Drew (1991a). In an exploratory study using series of focus group interviews, ten determinants of service quality were identified Parasuraman et al. (1985). These ten factors were later refined to five factors (see table 1) Parasuraman et al. (1988). These measures are popularly known as *SERVQUAL. SERVQUAL* comprises of 22 item scales for each of the factor which are required to be administered twice, eliciting users' expectations (E) and perceived performance (P) of service for each item. *SERVQUAL* measures service quality as a gap score between expected service and post encounter perceived service ($Q = E - P$) Parasuraman et al. (1988). These scores may be averaged across the 22 pairs of items to obtain an overall quality score. The way expectation (E) is operationalized can affect perceived quality. Expectations have been classified as *will*, *should* and *ideal* expectations Boulding et al. (1993). *Ideal* expectations are normative expectations which the customers think as an ideal scenario expectations. *Should* expectations may be lower than ideal expectations and these imply what ought to happen. Finally, *will* expectations are the customer's beliefs about what actually might happen. *Will* and *should* expectations are known to be recursive constructs and are a function of the previous cumulative expectations and the perceived performance of the last encounter with the product or service. The initial version of *SERVQUAL* operationalized expectations as ideal expectations and therefore elicited unrealistically high scores Parasuraman and Zeithaml (1991). In the revised *SERVQUAL* instrument, expectations were refined to measure *should* expectations. Some researchers have pointed out that *SERVQUAL* is likely to give erroneous results due to difficulty in controlling expectations, especially in a non-laboratory setting Boulding et al. (1993); Teas (1993). For instance, users are known to have unrealistically high expectations from IS products Van Dyke et al. (1997).

SERVQUAL Factor	Definition
Tangibles	Physical facilities, equipment, and appearance of personnel
Reliability	Ability to perform the promised service dependably and accurately
Responsiveness	Willingness to help customers and provide prompt service
Assurance	Knowledge and courtesy of employees and their ability to inspire trust and confidence
Empathy	caring, individualized attention the firm provides the customers

Table 1: SERQUAL Dimensions

Although there has been a broad agreement over the relevance of five *SERVQUAL* factors in measuring service quality, the measures themselves have generated an intense debate in marketing as well as IS literature. The disconfirmation framework used in measuring perceived quality by *SERVQUAL* has been said to cause ambiguity

between constructs of satisfaction and service quality Bolton and Drew (1991a). Critics of *SERVQUAL* instrument have suggested service quality to be conceptualized as "similar to an attitude" Cronin and Taylor (1992). They have suggested that the perceived quality measures should be based on adequacy-importance model of attitudes Mazis et al. (1975). Accordingly, a performance perception measure of service quality has been suggested based on adequacy-importance attitude model Cronin and Taylor (1992); Bolton and Drew (1991b); Boulding et al. (1993); Brown et al. (1993); Van Dyke et al. (1997). These measures have been named *SERVPERF*.

The appropriateness of *SERVQUAL* to measure service quality in the IS domain has been also debated Pitt and Watson (1997); Van Dyke et al. (1997). *SERVQUAL* measures of service quality used in the marketing literature have been investigated in the IS context and have been found to be relevant Parasuraman et al. (1988); Pitt et al. (1995); Watson et al. (1998). However, uncertainties with nomological and discriminant validities have been reported in responsiveness, assurance and empathy factors Pitt et al. (1995). *SERVQUAL* has been used to measure service quality of an IS organization in a longitudinal study Watson et al. (1998). Watson et al. (1998) suggest SERVQUAL possesses good diagnostic value and is appropriate for use in IS contexts. Although universal applicability of *SERVQUAL* factors has been suggested by Parasuraman et. al (1988), Brown (1993) and Van Dyke (1997) suggest that the appropriateness of factors to the domain in which it is to be used should be ascertained. Van Dyke (1997) points to three-factor and seven-factor loadings of *SERVQUAL* factors in its application to two IS organizations Pitt et al. (1995).

The two measures were evaluated in IS domain and their relative superiority was assessed across dimensions of data richness, construct validity, reliability, data collection efficiency, predictive power and diagnostic value Kettinger and Lee (1997). While *SERVQUAL* instrument revealed higher data richness and diagnostic value, *SERVPERF* scored a higher rating along dimensions of data collection efficiency and predictive power. Kettinger (1997) suggests that the measure should be selected based on criteria more appropriate to the study.

Satisfaction

User satisfaction (consumer satisfaction in marketing) has been a widely researched topic in marketing and IS disciplines. Research has focused on understanding how users form satisfaction perceptions, what antecedents to satisfaction decisions are and how it impacts their intentions to continue using the technology. Researchers have also investigated the relationship between closely related concepts of quality and satisfaction. However, most studies have examined satisfaction and/or quality from either the service dimension or from the product dimension. It has been recognized that customer satisfaction positively impacts market share and profitability Anderson and Sullivan (1993). Satisfied customers are more likely to engage in positive word-of-mouth communications, thereby lowering the cost of attracting new customers Oliver (1997). Satisfaction has been found to have a strong link with repurchase intentions Cronin and Taylor (1992); Anderson and Sullivan (1993). In literature, satisfaction has been defined as "the customer's fulfillment response." It is a judgment that a product or service feature, or the product or service itself, provided a pleasurable level of consumption-related fulfillment, including levels of under or over fulfillment Oliver (1997). Oliver(1993) suggests that positive and negative affects could exist concurrently caused by simultaneous operation of multifaceted product or service attributes, thereby providing differentially valanced product experience. Oliver (1993) suggests differentiating between attribute satisfaction and attribute performance. The attribute experiences can not be compared at the level of performance units but at the level of satisfaction units. Thus positive affect should be a function of the amount of positive attribute level units of satisfaction. Attribute satisfaction is a decision heuristic applied to attribute performance and, as such, is a higher order concept in consumer's product judgment Bettman (1974), which in turn effects attitude change and purchase intentions Oliver (1980).

In the disconfirmation paradigm, satisfaction with a product or service has been conceptualized as a cognitive evaluation of the user's expectation prior to using the product or service and the disconfirmation Oliver (1977).

This view is based on the underlying adaptation level theory that posits that one perceives a stimuli only with respect to a frame of reference Helson (1948). It was posited that individuals make summary comparative judgments apart from and as an input to their feelings of satisfaction. The expectations about a product or service performance serve to form a frame of reference suggested by the adaptation level theory. If the evaluation of the service exceeds the prior expectations, one is positively satisfied. On the other hand, if the disconfirmation falls short of expectations, dissatisfaction results. In the pre-use stage, expectations may be based on personal needs, word-of-mouth communication or past experience. This satisfaction experience influences the revised frame of reference for any further evaluations Oliver (1980). It has been suggested that satisfaction affects attitudes that act as antecedents to purchase intentions. Thus, expectations and disconfirmation were posited as antecedents to satisfaction. Later studies have shown that this relationship did not always hold. A study showed that performance directly impacted satisfaction and not through dissatisfaction Churchill and Surpenant (1982). Other studies found that performance affected satisfaction in two ways - directly and indirectly - through disconfirmation comparison process Bolton and Drew (1991b).

Quality and Satisfaction

There is some confusion in the literature in the conceptualization of the causal relationship between constructs of quality and satisfaction Oliver (1993). A review of the literature suggests that the relationship between quality and satisfaction is not unequivocally interpreted. Distinction is drawn between these two constructs in terms of specificity of judgments and on underlying ideals Oliver (1993). Whereas quality judgments are rather specific, whether they be cues or attributes, satisfaction judgments can result from any dimension, quality related or not. Quality is based on ideals of *excellence* perceptions while a number of non-quality dimensions such as needs, equity, fairness may help form satisfaction perceptions Rust and Oliver (1994). The causation direction between the two constructs is also not clear. Satisfaction was conceptualized as an antecedent to quality Bolton and Drew (1991a). However, in subsequent empirical studies, quality was found to significantly affect satisfaction Cronin and Taylor (1992); Oliver (1993).

The primary difference between satisfaction and perceived quality is that the latter is a form of attitude, a long run evaluation, whereas satisfaction is a transaction-specific measure Cronin and Taylor (1992). Disconfirmation paradigm supports transaction specific conceptualization of satisfaction. Generally, satisfaction is a short term response to consumption. Constructs of satisfaction and quality also differ on experience-dependency Oliver (1997). While satisfaction requires an experience with the product or service, quality judgments can be formed solely based on cues and other information.

Intention

Intention has been defined as a stated likelihood to engage in a behavior Oliver (1997). In the satisfaction literature, satisfaction/dissatisfaction is known to effect purchase intentions either directly or mediated by attitudes Oliver (1980).

THEORETICAL FRAMEWORK AND RESEARCH MODEL

As is evident from the discussion in section , IS product quality and IS service quality are important determinants of IS effectiveness. In this paper, we study the interaction between consequences of product quality and service quality in causing "intentions to use". Furthermore, a review of the literature suggests that satisfaction and quality are related yet distinct constructs. However some confusion exists in the causal direction of the relationship

between the two constructs. In many studies, satisfaction has been conceptualized as an antecedent to quality. In some other studies, quality is conceptualized as a consequence of satisfaction. This relationship has not been explored in an IS context.

In this paper, we conduct a confirmatory study to validate the position suggested by (Boulding 1993, Cronin 1993, Oliver 1997) that quality is an antecedent to satisfaction.

Finally, the literature suggests a strong relationship between satisfaction and user intention Boulding et al. (1993). This relationship is tested for intention towards service, and intention towards products. To summarize, this study seeks to answer the following questions:

RQ 1: How are perceived quality and satisfaction related to one another?

RQ 2: Does service satisfaction affect intention toward the product?

RQ 3: Does product satisfaction affect intention toward the service?

RQ 4: Is the crossover relationship between service (product) satisfaction and intention toward product (service) symmetrical?
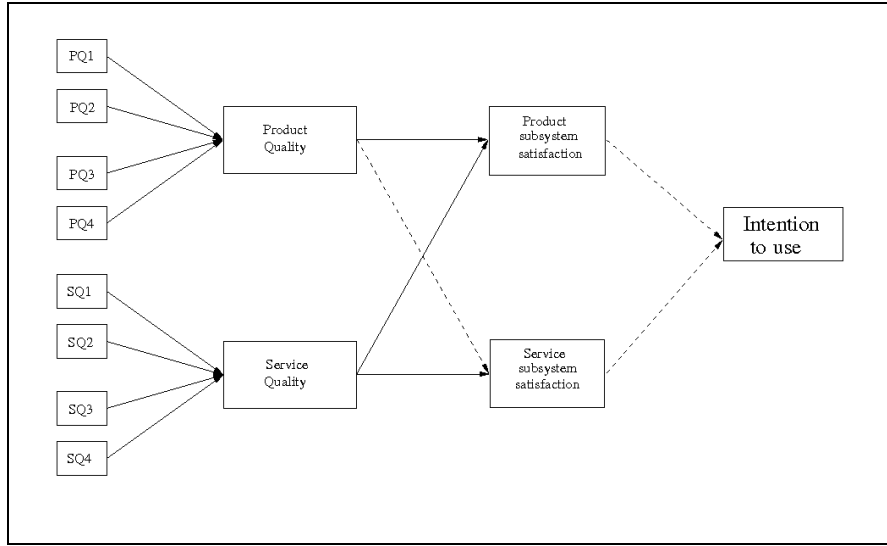
The proposed research model is presented in Figure 1.

Figure 1: Product and Service Subsystems: Research Model

Perceived Quality and Satisfaction

Perceived quality is conceptualized as the perceived performance of the particular attitude. This is based on the *Adequacy-Importance model* Cohen et al. (1972); Mazis et al. (1975) and can be expressed as follows:

$$A_o = \sum_{i=1}^{n} P_i D_i \tag{1}$$

where,
A_o = an individual's attitude towards an object

P_i = importance of attribute (dimension) i for the person
D_i = his evaluation of the object with respect to the attribute dimension i
n = number of attribute dimensions

The relationship between quality and satisfaction is modeled on the basis of expectancy disconfirmation theory Oliver (1980), which is in turn based on adaptation level theory. The latter posits that one perceives a stimulus only with respect to a frame of reference Helson (1948). Oliver (1980) suggests that attitude (A) is initially a function of expectations (E) $[A_{t1} = f(E)]$ and subsequently a function of satisfaction (S) with a product or service $[A_{t2} = f(A_{t1}, S_{t2})]$. Purchase intentions (I) are then considered initially to be a function of an individual's attitude toward a product or service $[P_{t1} = f(A_{t1})]$, but subject to modification due to the mediating effect on prior attitude of the satisfaction inherent in subsequent usages $P_{t2} = f(A_{t2}) = f(A_{t1}, S_{t2})$. Thus, if quality is considered similar to attitude, then satisfaction mediates the relationship between quality and intentions. Previous studies have shown a stronger relationship between satisfaction and intentions than between perceived quality and intention Cronin and Taylor (1992); Boulding et al. (1993).

Link between Satisfaction and Intentions

Dissonance theory Festinger (1957) and consistency theory Heider (1958) explain the effect of satisfaction on intentions. These theories posit that people are predisposed to maintain cognitive and attitudinal consistency. To reduce dissonance or maintain a balance in mental representations of ideas, people selectively process information that enhances consistency. Thus, if a person is satisfied with a certain product, his subsequent intentions are such that they are consistent with the initial judgment.

Crossover Link between Satisfaction and Intentions

The motivation for modeling the product and service subsystems is drawn from the consumption system approach Mittal et al. (1999). A consumption system consists of goods and services that are consumed over time in multiple consumption episodes Mittal et al. (1999). The underlying theoretical basis for this approach is provided by "General Living Systems Theory" which says that a complex phenomena can be modeled as a system comprising of interconnected subsystems Reidenbach and Oliva (1981). The research model comprises of perceived quality, perceived satisfaction and behavioral intentions as elements of the consumption system. It can be predicted that negative intentions caused by dissatisfaction with a product is likely to be attenuated by positive intentions caused by satisfaction with the service system. For instance, negative intentions caused by dissatisfaction resulting from a difficult-to-use product, offered by a provider may be countered by providing better technical support. Thus, satisfaction in one subsystem has a significant effect on the behavioral intentions in the other subsystem. Furthermore, the study seeks to empirically test the relationship between constructs of *quality* and *satisfaction* in an IS setting.

The following hypothesized relationships will be empirically confirmed in this paper:

H1a: *Perceived product quality* has a positive impact on *perceived product subsystem satisfaction.*
H1b: *Perceived service quality* has a positive impact on *perceived service subsystem satisfaction.*

H2a: *Perceived product subsystem satisfaction* has a positive impact on *intention toward products.*
H2b: *Perceived service subsystem satisfaction* has a positive impact on *intention toward service.*

H3a: *Perceived product subsystem satisfaction* has a positive impact on *intention to use.*

H3b: *Perceived service subsystem satisfaction* has a positive impact on *intention to use.*

METHODOLOGY

A field study will be conducted to test the research model. A large sized organization in which employees use a mix of IS products and services in performance of their functions is an appropriate source of data for this study. Conducting the study with a homogeneous sample is appropriate for theory testing objectives Calder et al. (1981).

We are in the process of conducting a field study to collect the data to test the hypotheses. Our sampling frame consists of users of an ERP system. A list of users of the ERP system has been provided by the IT department of the organization. The user list also contains the profile of users categorized as "heavy," "moderate," and "light" users of the system. In addition, the users will also be asked to provide their role in using the system.

We hope to be able to conduct multiple waves of data collection in order to maximize the response rate. The survey will be hosted on the web in the first wave and, depending on the response rate, a combination of web/paper data collection strategy will be employed. In the event of inadequate response rate after the first mailing, second or third wave of reminder mailings will be sent to increase the response rate.

Construct Operationalization and Scale Development

Measures of perceived quality, satisfaction and intention used in previous studies have been adapted for this study. Table 2 provides various measures and their reliability statistics used in previous studies in which they were used previously. These measures were adapted for this paper so that the wording of the items are unambiguous and conveys the intended meaning. The revised instrument was further pre-tested by obtaining responses from a sub-sample of 15 respondents out of the targeted sample Straub (1989). The sample instrument is attached.

Construct	Cronbach's alpha	Reference
Perceived quality	> 0.8	Cronin and Taylor (1992)
Satisfaction	0.8	Susarla et al. (2003)
Behavioral Intention	0.9	Karahanna and Straub (1999)

Table 2: Construct scales

Analysis

We are currently in the process of data collection and hope to be able to present preliminary results and analysis at the conference. We expect to gather an acceptable number of respondents for a rigorous empirical testing of the hypotheses. The analysis will be done either by multiple hierarchical regression or by Structural Equation Modeling (SEM). SEM and multiple hierarchical regression are recommended methods of analysis for theory testing Rigdon (1998); Gefen et al. (2000); Cohen et al. (1983).

CONCLUSION

In this paper, we expect to reveal relationships between the constructs of perceived quality, satisfaction and behavioral intentions in the "service subsystem" and the "product subsystem". Moreover, the study will also

provide evidence to the extent of interaction between the two subsystems. We are conducting a field survey in an organization which has recently implemented a major ERP system project.

From practitioners' standpoint, it is important for IT service providers to understand the needs of their customers. From a firm's perspective, satisfied users are likely to continue using its products and services, and are also likely to spread positive information through word-of-mouth channels Oliver (1997). It has been found that satisfaction results in long term loyalty and profits for the firm. Therefore, it is important to understand the satisfaction decision process of users/ customers of products and services. Furthermore, "satisfaction" has been widely studied. But most studies have considered satisfaction either from a service perspective, or from a product perspective. This study should provide confirmation to the proposition that the product quality and service quality both can influence the users' intention to use/repurchase.

This research could lead to some useful follow-up studies. It will be interesting to find out how these relationships change over time. Consequently, a longitudinal study could reveal the patterns of changes in the relationships. The nature of relationship between the satisfaction and intentions between the two subsystems may be asymmetric and dynamic. Understanding the processes and variables that cause shifts in the relationships will be an interesting research problem.

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