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The influence of technology readiness on satisfaction and behavioral intentions toward self-service technologies

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Abstract

Today's competitive world is increasingly characterized by technology-assisted services and transactions. Self-service technologies (SSTs) continue to be a critical component of customer–firm interactions but not all customers like to use SSTs or are ready to use them. In this study, we examine the role of customer's technology readiness (TR) and assess the influence of TR on both satisfaction and behavioral intentions toward SSTs. We first review the relevant literature on technology readiness, satisfaction and behavioral intentions, then explore their relationships, and present our research framework and hypotheses. This model was tested with a sample of 413 consumers. The hypothesized model was statistically significantly supported, indicating that TR does influence customer satisfaction and behavioral intention with SSTs. Implications of the results are then discussed.

Keywords: Technology readiness; Self-service technology; Satisfaction; Behavioral intention

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1. Introduction

High labor costs are causing service firms to examine delivery options that allow customers to perform services for themselves (Dabholkar, 1996). The development of new technologies revolutionizes the service landscape with companies using technology to improve service operations, increase service efficiency, and provide functional benefits for customers. Many service providers and retailers have begun to use a wide range of technologies allowing customers to enjoy services electronically without direct contact with service employees. That is to say, customers can interact with technology to create service outcomes instead of interacting with the firm's service employees.

Companies' use of new technologies to serve customers is growing at a rapid pace. As technological innovations continue to be a critical component of customer–firm interactions, self-service technologies (SSTs), i.e. technological interfaces that enable customers to produce a service independent of direct service-employee involvement (Meuter, Ostrom, Roundtree, & Bitner, 2000), change the way customers interact with firms to create service outcomes. These modes of interaction are expected to become key criteria for long-term business success. The wide range of SST alternatives available to service firms, such as interactive kiosks, ATMs, internet and interactive phone/voice systems, can be utilized to improve service and gain competitive advantage. Accordingly, the role of technology in customer service has brought about major changes for both companies and customers.

Due to the rapid infusion of technology into the process through which services are purchased and consumed, the traditional triangle model of service marketing proposed by Kotler (1994), which emphasizes the interactions between company, employees and customers, cannot completely capture the present complexities of service marketing (Parasuraman, 2000). To address the significance of technological shifts in the nature of customer–company interactions, Parasuraman (1996) proposed a "pyramid model" of service marketing that incorporates technology as a new dimension into the two-dimensional triangle model and features three new links that need to be managed well to maximize marketing effectiveness: company–technology, technology–employee, and technology–customer. As such, the nature of customer service and company-customer interactions is undergoing fundamental changes.

From the customers' perspective, SSTs enable them to enjoy the services they require with a more flexible choice of time and space, and in more ways, e.g. telephone, internet and kiosks (Meuter et al., 2000). This not only increases the efficiency and effectiveness of service providers, but also gives customers a higher degree of satisfaction (Bitner, Brown, & Meuter, 2000; van der Wal, Pampallis, & Bond, 2002). On the other hand, customers are dealing with services that are becoming increasingly sophisticated from a technological point of view. As Meuter, Ostrom, Bitner, and Roundtree (2003) stated, even when customers can see the benefits of using SSTs, they may avoid it if they are not comfortable with and/or ready to use the technology. There is also evidence of increasing customer frustration in dealing with technology-based systems (Parasuraman, 2000). This indicates that customers' adoption

of technology will vary according to characteristics of individuals. When customers face technology, different psychological reactions will occur, depending on the individual's feelings towards the technology-based system. Parasuraman (2000) suggests that technology readiness (TR) should also be taken into consideration when SSTs are being developed, in order to predict the behavior of customers more accurately. Therefore, one of the major issues of the injection of technology into service business is customers' readiness and willingness to use technology-based systems as well as influence of such systems on service results.

In studies reported to date, there is very limited empirical research regarding self-service technologies (Dabholkar, 1996; Meuter et al., 2000), and very little is known about factors influencing consumers' usage and evaluation of SSTs. Furthermore, there has been even less research examining consumers' readiness to use technology-based systems and its consequent influences on behavior. The absence of a technology focus in service encounter research is also highlighted by Bitner et al. (2000) and Parasuraman (2000). Our study attempts to review and integrate literature related to technology readiness, in order to further discuss the influence of TR on satisfaction and behavioral intentions when customers use SSTs.

The main focus of this study is on the influence of technology readiness on both SST satisfaction and SST behavioral intentions. In the sections which follow, we first review the relevant literature on technology readiness, satisfaction and behavioral intention and explore their relationships. We then present our conceptual framework and hypotheses, summarize the research methodology, and report our results. Finally, we elaborate on the major findings, discuss the implications of our research, clarify the limitations of the study and suggest further research directions.

2. Conceptual background

2.1. Self-service technologies

Self-service technologies are technological interfaces that enable customers to use a service independent of direct service-employee involvement (Meuter et al., 2000). Examples of SSTs include automated teller machines (ATMs), voice processing and voice mail systems, automated ticketing/check-in machines, telephone banking and internet services. The benefits of choice of SSTs are quite evident in terms of productivity and cost-saving for firms (Dabholkar, 1996). Yet, scholars have only recently started to investigate the role of technology in service delivery (e.g. Dabholkar, 1996; Meuter et al., 2000; Meuter et al., 2003; Parasuraman, 1996, 2000). Areas of SST research include the elaboration of profiles for the distinct SST users based on demographic characteristics (e.g. Dabholkar, 1992; Meuter et al., 2003), classification schemes for new technologies (Dabholkar, 1994; Meuter et al., 2003), the role of technology in enhancing service quality (Dabholkar, 1996), and the developing attitudes toward technology (Taylor & Todd, 1995). There is still very little known about factors influencing customers' evaluation and usage of SSTs, and much to be learned about how customers use SSTs.

2.2. Technology readiness

The research of Meuter et al. (2003) shows that 55% of Americans suffer from some degree of technophobia, while prior studies contend that millions of American workers (Craig, 1994) and one-third of college students (DeLoughry, 1993) suffer from computer-related anxiety. In other words, many people avoid technology if they are not comfortable with, and not ready to use, the technology. Therefore, as new technologies are developed, it is important to explore customers' readiness to use them.

The recently coined term "technology readiness" (TR) refers to people's propensity to embrace and use new technologies for accomplishing goals in home life and at work (Parasuraman, 2000). Related to TR are the technology acceptance model (TAM), technology paradoxes, computer anxiety, and technology anxiety. Davis, Bagozzi, and Warshaw (1989) developed the technology acceptance model that reflects general facets of potential drivers and inhibitors of technology acceptance. Mick and Fournier (1998), using extensive qualitative research on people's reactions to technology, identified eight technology paradoxes with which consumers have to cope: (1) control/chaos, (2) freedom/enslavement, (3) new/obsolete, (4) competence/incompetence, (5) efficiency/inefficiency, (6) fulfills/creates needs, (7) assimilation/isolation and (8) engaging/disengaging. As these paradoxes infer, technology may trigger both positive and negative feelings about it. This emotional conflict creates anxiety in an individual. Related to this anxiety are computer anxiety, the fear, apprehension and expectations people feel when considering possible or actual use of computer technology (Igbaria & Parasuraman, 1989; Kay, 1993), and technology anxiety, i.e. a user's negative state of mind about technology tools (Meuter et al., 2003). Other relative studies have also identified specific consumer beliefs and motivations that may enhance (e.g., perceived ease of use, fun) or inhibit (e.g., perceived risk) adoption of new technologies (e.g., Dabholkar, 1994; Davis et al., 1989).

The TR construct can be viewed as an overall state of mind resulting from a gestalt of mental enablers and inhibitors that collectively determine a person's predisposition to use new technologies (Parasuraman, 2000). A 36-item scale was developed based on four dimensions: Optimism (a positive view of technology and a belief that it offers people increased control, flexibility and efficiency in their lives); Innovativeness (a tendency to be a technologically pioneering and thought leader); Discomfort (a perceived lack of control over technology and a feeling of being overwhelmed by it) and Insecurity (distrust of technology and skepticism about its ability to work properly). Of these, optimism and innovativeness are the positive drivers of TR; they encourage customers to use technological products/services, and to hold a positive attitude towards technology. Discomfort and insecurity are the negative attitudes, i.e. inhibitors; they make customers reluctant to use technology. So far, very little academic research has been done on the impact of TR on consumer behavior. Parasuraman (2000) also calls for studies to assess the generalizability of the TR scale and its further application.

2.3. Technology readiness and customer satisfaction with SSTs

Customer satisfaction has been the subject of much attention in the literature (e.g. Bitner & Hubbert, 1994; Oliver, 1977, 1980, 1981; Rust & Oliver, 1994). Satisfaction with a service provider is perceived as being both an evaluation- and emotion-based response to a service encounter (Oliver, 1997). Satisfaction is described as "an evaluation of an emotion", suggesting that it reflects the degree to which a consumer believes that the possession and/or use of a service evokes positive feelings (Cronin, Joseph, Brady, & Hult, 2000; Rust & Oliver, 1994). Satisfaction is also the consumer's fulfillment response. It is a judgment that a product or service feature, or the product or service itself, provides a pleasurable level of consumption-related fulfillment, including levels of under- or over-fulfillment (Oliver, 1997).

Meuter et al. (2003) suggested that technology anxiety is related to consumers' satisfaction with SSTs. Butcher, Sparks, and O'Callaghan (2001) also stated that social comfort (a customer's feeling of anxiety or relaxation arising from the interaction with a service employee) will influence customer's service encounter satisfaction. Accordingly, we may surmise that when customers use SSTs, the anxiety or relaxation (i.e. negative or positive feeling) they feel will also influence their satisfaction with the encounter. Therefore, we infer that the technology readiness of consumers will influence their satisfaction when using SSTs.

Hypothesis 1. Technology readiness (TR) has a positive influence on satisfaction with self-service technologies (SST-SAT).

2.4. Technology readiness and behavioral intentions toward SSTs

Behavioral intentions are indicators that show whether customers have remained with or deserted an organization (Alexandris, Dimitriadis, & Markata, 2002; Zeithaml, Berry, & Parasuraman, 1996). Specifically, Zeithaml et al. (1996) suggests that favorable behavioral intentions are associated with a service provider's ability to get its customers to: (1) say positive things about them (Boulding, Kalra, Staelin, & Zeithaml, 1993), (2) recommend them to other consumers (Parasuraman, Berry, & Zeithaml, 1991; Parasuraman, Zeithaml, & Berry, 1988), (3) remain loyal to them (Rust & Zahorik, 1993), (4) spend more with the company and (5) pay price premiums. Other scholars explored similar concepts of behavioral intentions in their research (e.g. Babakus & Boller, 1992; Cronin, Joseph, & Taylor, 1992; Cronin et al., 2000).

Using analysis of variance, Parasuraman (2000) found that customers' perceived desirability of technology-based services differed significantly in the predicted positive directions across three TR segments for all the services. In other words, consumers are more willing to engage in self-service if they perceive it as more convenient, efficient, or enjoyable (Dabholkar, 1996). Meuter et al. (2003) found that consumers' technology anxiety is significantly related to key SST encounter outcomes such as word of mouth intentions and repeat usage intentions. In addition, Zeithaml,

Parasuraman, and Malhotra (2002) Zeithaml, Bhatnagar, and Lurie (2002) further proposed that customers' TR has a positive impact on their e-shopping behavior. From the studies above, we may theorize that the consumers' technology readiness will influence their behavioral intentions toward SSTs.

Hypothesis 2. Technology readiness (TR) has a positive influence on behavioral intentions toward self-service technologies (SST-BI).

2.5. Customer satisfaction and behavioral intentions toward SSTs

Evidence for the significant impact of satisfaction on behavioral intentions comes from a wide variety of service research. Service-related research that was based mainly on interpersonal interaction points out that customer satisfaction has a positive influence on behavioral intentions (Anderson & Sullivan, 1990, 1993; Bearden & Teel, 1983; Bitner, 1990; Bolton & Drew, 1991; Boulding et al., 1993; Cronin et al., 1992, 2000; Dabholkar & Thorpe, 1994; Dick & Basu, 1994; Fornell, 1992; Howard & Sheth, 1969; Howard, 1997; Labarbera & Mazursky, 1983; Lee, 1998; McDougall & Levesque, 2000; Patterson, 1995; Selnes, 1993; Woodside, Frey, & Daly, 1989; Zeithaml et al., 1996). In addition, related research in e-commerce/e-service (Taylor, Celuch, & Goodwin, 2002) found that customer satisfaction can increase the technology/internet behavioral intentions of customers. MacDonald and Smith (2004) also found a significant correlation between buyers' satisfaction with a seller's use of technology-mediated communication and their future intentions. Based on the service-related research above, we can similarly theorize that customers' satisfaction with SSTs will influence their behavioral intentions toward SST.

Hypothesis 3. Satisfaction with self-service technologies (SST-SAT) has a positive influence on behavioral intentions toward self-service technologies (SST-BI).

The conceptual framework which shows the hypothetical relationships (Hypotheses 1–3) appears in Fig. 1. The relationships among the constructs depicted in this model were empirically tested as follows:

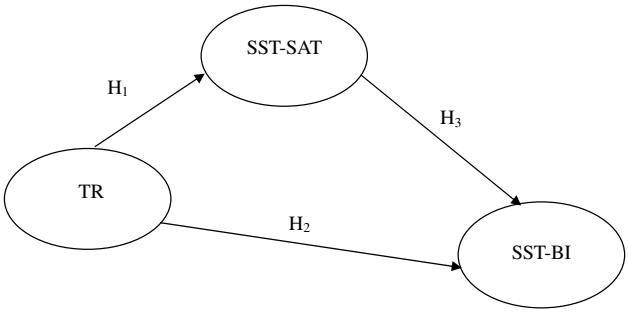

Fig. 1. Conceptual framework.

3. Data collection

Questionnaires were distributed to a sample of 500 adult consumers in Taiwan. A team of 20 research assistants requested personal participation of these respondents in this self-administered survey with a small prize to encourage responses.

The definition and classification of SSTs used in this survey was based on the typology of Meuter et al. (2000), which is one of the few comprehensive and empirically based SST classification schemes. Respondents were asked to measure their own technology readiness and evaluate their experiences with the firm's SSTs that they had used most frequently as well as their resulting satisfaction and behavioral intentions.

The questionnaire used to collect the data was pre-tested three times to ensure that questions were understood as intended and to assess the feasibility of the survey approach. The final survey produced 413 usable responses, after accounting for incomplete responses. Respondents' evaluations covered a wide range of SST providers, including banks, railway, airlines, rapid transit systems (subway), stock exchanges and cinemas.

4. Measurement

Scales from prior research provided measurement sources for the present study. For the measurement of consumers' technology readiness, the 36-item technology readiness index (TRI) developed by Parasuraman (2000) was used. Because TRI combines all the research that is related to consumers' technology-readiness it has very good reliability and validity, and is able to describe this construct accurately. Thus it is well suited for this study.

Customer's satisfaction with SST (SST-SAT) was measured with the three-item American Customer Satisfaction Index (ACSI) scale used and discussed in a number of studies including Anderson, Fornell, and Mazvancheryl (2004), Fornell, Johnson, Anderson, Jaesung, and Bryant (1996), Kristensen, Westlund, and Eskildsen (2003), Ryzin, Muzzio, Immerwahr, Gulick, and Martinez (2004), and Wong and Kanji (2001). The three-item ACSI scale was developed using a general index and methodology for measuring customer satisfaction with a broad range of consumer goods and services (Fornell, 1999). It also represents a cumulative evaluation of a firm's market offering, rather than a person's evaluation of a specific transaction, so it is a more accurate indicator of a firm's past, current, and possibly future performance (Fornell et al., 1996).

To measure consumers' behavioral intentions toward SSTs (SST-BI), we used Cronin et al. (2000) three-item scale to measure behavioral intentions that are similar to the domains assessed in the first four of the five behavioral intention outcomes suggested by Zeithaml et al. (1996). These three items are also similar to those reported and used throughout the service-marketing literature (cf. Babakus & Boller, 1992; Cronin et al., 1992).

The measurement scales utilized in the study are included in Appendix A. Survey participants responded to seven-point Likert scales anchored at "strongly

agree'' (7) and ''strongly disagree''(1). For the purpose of this research, these scales were translated into Chinese for their use in Taiwan. As a fundamental cross-cultural validation effort, these scales in Chinese were back translated and compared with the original to ensure the translational equivalence (Mullen, 1995).

5. Results

5.1. Preliminary analysis

We tested our measurement model using LISREL VIII (Jöreskog & Sörbom, 1996) since the model has both latent constructs and multiple indicators. Confirmatory factor analysis (CFA), using maximum likelihood, was employed as the primary data analysis tool to test these expectations. Because TRI consists of four dimensions – Optimism, Innovation, Discomfort and Insecurity – we aggregated the TRI scale to have four indicators by averaging the measurement items in each dimension. Of these, Discomfort and Insecurity, i.e. inhibitors of technology readiness, were reverse-scored. Then, before the subsequent measurement model evaluation and hypothesis testing, a CFA of the three-factor measurement model for the 10 indicators produced an excellent overall tally. In the CFA, the Goodness of Fit Index (GFI), Adjusted Goodness of Fit Index (AGFI), Normed Fit Index (NFI), and Comparative Fit Index (CFI) values were .96, .92, .96 and .97, respectively. A value greater than .80 is desirable for AGFI (Anderson & Gerbing, 1988), and a value greater than .85 is desirable for other indices (Hinkin, 1995). The Root Mean Square Error of Approximation (RMSEA) was .068. Browne and Cudeck (1993) suggest that an RMSEA value of .05 indicates a close fit and that values up to .08 represent reasonable errors of approximation in the population. Accordingly, the model's suitability as indicated by these estimates was deemed satisfactory. The χ^2 test of the hypothetical model was significant ($\chi^2 = 81.98$, df = 28, $p < .01$), but according to Carmines and McIver (1981), a χ^2 value two to three times larger than the degree of freedom is acceptable.

Then we examined the proposed model in three stages. First, the reliability and validity of the constructs for the total measurement model were assessed. Second, the overall fit of the structural model to the data was tested. Third, the structural parameters were examined to determine if the data supported the proposed hypotheses.

5.2. Reliability and validity

Reliability estimates were computed using Cronbach's coefficient alpha (α). As Table 1 shows, the α values for the constructs and subscales are above the desirable minimum of .80, and hence these results surpass the acceptable level of .70 recommended by Nunnally (1978). These measurements, therefore, indicate high internal consistency.

Table 1
Assessment of reliability and convergent validity

Factors/indicators	Standardized loadings	*t*-Value	Cronbach's coefficient alpha	Average variance
TR:			.93	.80
Optimism	.72	11.53	.82	
Innovation	.54	8.34	.92	
Discomfort	.53	9.30	.81	
Insecurity	.35	5.51	.88	
SST-SAT:			.83	.75
SAT1	.93	23.58		
SAT2	.59	12.78		
SAT3	.85	20.74		
SST-BI:			.82	.76
BI1	.66	13.68		
BI2	.86	20.03		
BI3	.76	17.27		

To assess the convergent validity, we first review the *t*-tests for the factor loadings (greater than twice their standard error) (Anderson & Gerbing, 1988). The *t*-tests for each indicator loading are shown in Table 1, and they show that the construct demonstrated a high convergent validity since all factor loadings surpass the recommended level of twice their standard error. In addition, according to Bagozzi and Yi (1991), a trait/construct variance greater than .50 provides strong evidence of convergent validity. The average variances in the indicators accounted for by each of the three constructs were all quite high: .80 for the four-item measure of customer's TR, .75 for the three-item measure of SST-SAT, and .76 for the three-item measure of SST-BI (see Table 1). These figures apparently suggest high levels of convergence among the items measuring their respective construct.

The discriminant validity was checked using the procedure recommended by Anderson and Gerbing (1988). For each pair of constructs on the conceptual model, two different models were conceptualized: The first model allows phi (Φ) to vary, whereas the second model constrains the Φ correlation to unity. The difference between the χ^2 values for the models is itself asymptotically distributed as χ^2. With degrees of χ^2 difference related to degrees of freedom difference for the two models, a χ^2 difference test of customer's TR, SST-SAT, and SST- BI measure was conducted. In this case, the χ^2 for the unconstrained model was found to be significantly lower than the constrained model, which provides evidence of discriminant validity between the constructs in the model (see Table 2).

5.3. Overall model fit

After confirming the measurement model, the structural model shown in Fig. 1 was estimated using LISREL VIII. The LISREL analysis showed a good overall fit for the model. The RMSEA of the hypothetical model was .068, GFI was .96, AGFI was .92, NFI was .96, CFI was .97, and the χ^2 test of the hypothetical model

Table 2
Comparison of constrained and unconstrained models in the assessment of discriminant validity

Models	χ^2	df
TR and SST-SAT		
Constrained model	91.84	12
Unconstrained model	39.95	11
Chi-square difference	51.89	1
TR and SST-BI		
Constrained model	58.31	12
Unconstrained model	29.87	11
Chi-square difference	28.44	1
SST-SAT and SST-BI		
Constrained model	36.90	7
Unconstrained model	18.15	6
Chi-square difference	18.75	1

was significant ($\chi^2 = 81.98$, df = 28, $p < .01$), thus indicating that overall, the data fit the model well (see Table 3).

5.4. Hypotheses tests

The estimated initial model is depicted in Fig. 2 and consists of both a structural equation model based on latent variables corresponding to the theoretical model shown in Fig. 1, and measurement models for the latent variables. According to Fig. 2 and Table 3, these indicated that all relationships hypothesized were significant and in the expected direction. The results provide evidence that the hypothesized positive path between TR and SST-SAT (H1) is supported ($\gamma 11 = .59$, $t = 8.98$, $p < .0001$). Customer's TR was also hypothesized to have a positive influence upon their SST-BI in hypothesis H2. Given the results from the analysis, where

Table 3
Estimated structural parameters of proposed model

Independent latent variable	SST-SAT (η_1)	SST-BI (η_2)
TR (ξ_1)	.59[a] (8.98)[b]	.34 (4.86)
SST-SAT (η_1)	–	.65 (10.03)
SST-BI (η_2)	–	–

Goodness-of-fit measures	
Chi-square = 81.98	RMSEA = .068
df = 28	GFI = .96
$p = .0$	AGFI = .92
Chi-square/df = 2.93	NFI = .96
	CFI = .97

[a] Completely standardized solution.

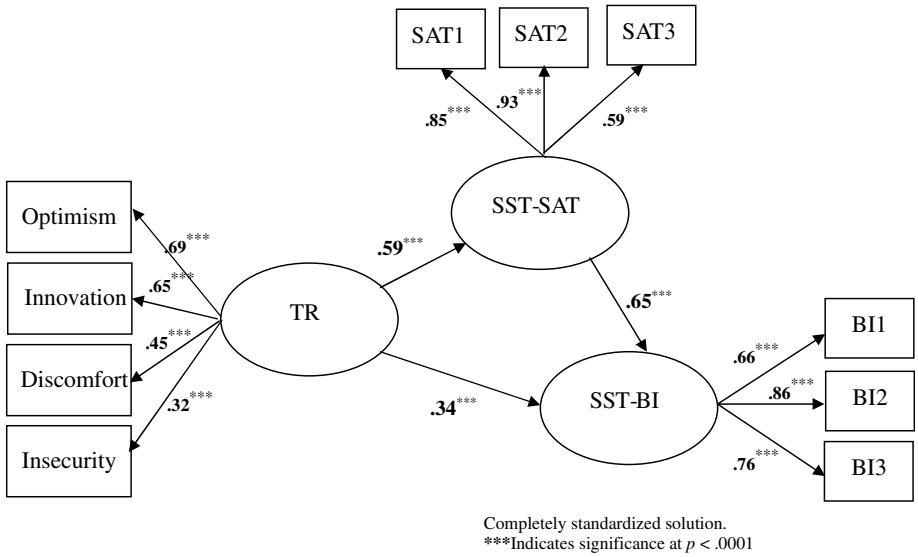

Fig. 2. Estimated model.

$\gamma 21$ was .34 ($t = 4.86$ and $p < .0001$), we find support for H2. Additionally, the sample also yielded results that provide evidence for H3, where the SST-SAT is hypothesized to have a positive influence upon SST-BI. Analysis of the results between the two constructs indicates support for H3 ($\beta 21 = .65$, $t = 10.03$, $p < .0001$).

6. Discussion

Due to the recent rapid growth of self-service technologies, researchers are prompted to gain a further understanding of customer perception and use of these technologies. However, until now there has been a lack of empirical research and application regarding customers' technology readiness. This study reviews relevant literature to discuss the influence of technology readiness on satisfaction and behavioral intentions when customers use self-service technologies. The necessary research framework and hypotheses are developed and empirically tested in order to offer SST providers a reference when designing service interfaces and planning marketing strategy.

Three key results were identified by tests of a hypothetical model. They help to explain the influence that technology readiness has on customers when they use self-service technologies. First, the results show that technology readiness is an important driver of SST-Satisfaction. There is a positive relationship between TR and SST-SAT. That is to say, the higher a customer's technology readiness is, the higher their satisfaction will be when using SSTs. Second, technology readiness also has a significant positive influence on SST-Behavioral Intentions. That is, the higher

a customer's technology readiness is, the more likely it is for them to have favorable behavioral intentions regarding self-service technologies. Lastly, this study confirms that the more satisfaction customers experience when using SSTs, the more likely they are to use it again and recommend it to others. In summary, our model provides guidance as to when customers' technology readiness should be considered and encouraged in self-service technologies as we attempt to increase organizations' marketing outcome.

6.1. Implications

As labor costs rise and information technology spreads, more enterprises are replacing manual labor with technology, providing customers with self-service opportunities. By doing this, businesses hope to reduce labor costs and raise profits. But apart from cost reduction, enterprises also need to consider how to effectively raise customer satisfaction and behavioral intentions. This is where technology readiness plays an important role, and why it should be a key consideration when SST providers design and provide services. Study results also indicate that technology readiness creates a large positive influence on customers when they use SST, and further influences customers to have positive (favorable) behavioral intentions.

Given the importance of technology readiness, it is critical for firms that are currently using, or are considering the use of, SSTs to address the TR of customers. According to our results, the higher the technology readiness of customers, the higher the satisfaction and behavioral intentions that are generated when using self-service technologies. Thus, apart from the conservative way of developing and attracting customers with higher technology readiness, SST providers should attempt to raise the technology readiness of all customers, especially customers with low TR. This will avoid instances of customer dissatisfaction and/or frustration and thus increase overall satisfaction, boost repeat purchases and positive word of mouth recommendations, which, in turn, will increase the number of loyal customers. This means that SST providers can take an aggressive approach to strengthening positive TR drivers and reducing TR inhibitors in order to raise technology readiness of customers as a whole. This will increase satisfaction and behavioral intentions of customers when using SSTs, so companies can reach their goal of satisfying customers.

First, firms offering SSTs can promote better knowledge and attitudes about technology to customers in marketing activities. Customers can be attracted with free trials and price reductions. Positive experiences with the technology will lead to more acceptance and a belief that replacing manual service with technology increases efficiency and customer benefits, ultimately engendering a positive attitude toward SSTs and a willingness to try new technology services.

Next, firms offering SSTs can design SST interfaces that are simple and user-friendly so that customers will accept them more readily. Companies can also provide training so that customers can adapt more quickly to using SSTs. Moreover, SST providers can design more reliable operating systems to lower the frequency

of service failure, take firmer security measures to avoid leaking personal data. Transactions should also be accurately reconfirmed to reduce the fears customers have about SSTs' security and reliability when using SSTs.

To put it briefly, providers must set their strategies in accordance with customers' technology readiness, increase customer adoption to technology, and assist them in overcoming difficulties when using SSTs. Customers should be consulted and involved in the design of SSTs to ensure that SSTs address customers' needs so that customers will be able to accept technology-based service.

Finally, although self-service technologies can be a valuable tool for customers, it is important to provide more choices, as not all customers are technology ready or willing to use SSTs. Besides encouraging customers to use SSTs, firms still need to provide service delivery options for customers with lower TR or unwillingness to try SSTs so that they will be able to interact with the company as suits their needs.

6.2. Limitations and future research

This empirical study has several limitations. First, our research results were obtained from a single study. Thus, caution must be exercised when generalizing the findings. Second, we did not incorporate actual customer behavior in the proposed model. This is not a serious limitation, however, as there is substantial empirical support for the causal link between intention and behavior (Taylor & Todd, 1995; Venkatesh & Davis, 2000; Venkatesh & Morris, 2000).

Moreover, this study is an early effort in applying a technology readiness index (TRI) to a satisfaction-behavioral intention model. However, there are many other attitudinal, behavioral, and psychographic factors (Meuter et al., 2003) that could be explored to provide further insight, such as cost, value, quality and trust (De Ruyter, Moorman, & Lemmick, 2001; Urban, Sultan, & Qualls, 2000; Taylor et al., 2002). Further research should focus on developing a richer model that incorporates additional constructs and their interactions as well as where they fit into the model. The lack of any scale with which to measure SST service-quality demands immediate attention to identify, and possibly develop, customers' service-quality perception toward self-service technologies.

Further research should also investigate the possible influence some situational factors may have on the model. Factors such as time pressures, the presence of other customers and the waiting time (Dabholkar, 1996), should be taken into consideration in future studies. Moreover, because Meuter et al. (2003) points out that demographic characteristics of users will influence their use of SSTs, there is also a need for comparative studies of technology readiness across different situations, individual characteristics, and countries.

Finally, this study mainly discusses the influence of technology readiness on customers' perceptions and behavior. Future research can further explore the TR of service employees who use new technologies in their daily interactions with customers, the influence technology has on employees, and how to raise the efficiency of SSTs by recruiting and training suitable employees.

The evolving applications of self-service technologies present both new opportunities for service firms and new directions for academic research. This paper represents an initial step in exploring the impact of customers' technology readiness on their satisfaction and behavioral intentions as well as building a better understanding of consumer interactions with, and perceptions of, SSTs. Detailed investigation of the areas discussed above will further aid service firms striving to incorporate technology into their service operations for better performance.

Appendix A. The measures

Technology Readiness (scaling from "strongly disagree" to "strongly agree" on a 7-point scale)[a]	
Optimism	
OPT1	Technology gives people more control over their daily lives
OPT2	Products and services that use the newest technologies are much more convenient to use
OPT3	You like the idea of doing business via computers because you are not limited to regular business hours
OPT4	You prefer to use the most advance technology available
OPT5	You like computer programs that allow you to tailor things to fit your own needs
OPT6	Technology makes you more efficient in your occupation
OPT7	You find new technologies to be mentally stimulating
OPT8	Technology gives you more freedom of mobility
OPT9	Learning about technology can be as rewarding as the technology itself
OPT10	You feel confident that machines will follow through with what you instructed them to do
Innovation	
INN1	Other people come to you for advice on new technologies
INN2	It seems your friends are learning more about the newest technologies than you are. (reverse scored)
INN3	In general, you are among the first in your circle of friends to acquire new technology when it appears
INN4	You can usually figure out new high-tech products and services without help from others
INN5	You keep up with the latest technological developments in your areas of interest
INN6	You enjoy the challenge of figuring out high-tech gadgets
INN7	You find you have fewer problems than other people in making technology work for you
Discomfort (reverse scored)	
DIS1	Technical support lines are not helpful because they don't explain things in terms you understand

Appendix A (*continued*)

Technology Readiness (scaling from "strongly disagree" to "strongly agree" on a 7-point scale)[a]	
DIS2	Sometimes, you think that technology systems are not designed for use by ordinary people
DIS3	There is no such thing as a manual for a high-tech product or service that's written in plain language
DIS4	When you get technical support from a provider of a high-tech product or service, you sometimes feel as if you are being taken advantage of by someone who knows more than you do
DIS5	If you buy a high-tech product or service, you prefer to have the basic model over one with a lot of extra features
DIS6	It is embarrassing when you have trouble with a high-tech gadget while people are watching
DIS7	There should be caution in replacing important people-takes with technology because new technology can breakdown or get disconnected
DIS8	Many new technologies have health or safety risks that are not discovered until after people have used them
DIS9	New technology makes it too easy form governments and companies to spy on people
DIS10	Technology always seems to fail at the worst possible time
Insecurity (reverse scored)	
INS1	You do not consider it safe giving out a credit card number over a computer
INS2	You do not consider it safe to do any kind of financial business online
INS3	You worry that information you send over the Internet will be seen by other people
INS4	You do not feel confident doing business with a place that can only be reached online
INS5	Any business transaction you do electronically should be confirmed later with something in writing
INS6	Whenever something gets automated, you need to check carefully that the machine or computer is not making mistakes
INS7	The human touch is very important when doing business with a company
INS8	When you call a business, you prefer to talk to a person rather than a machine
INS9	If you provide information to a machine or over the Internet, you can never be sure it really gets to the right place
SST-Satisfaction (scaling from "strongly disagree" to "strongly agree" on a 7-point scale)	
SAT1	Overall, I am satisfied with the SSTs offered by the firm

(*continued on next page*)

Appendix A (*continued*)

Technology Readiness (scaling from "strongly disagree" to "strongly agree" on a 7-point scale)[a]	
SAT2	The SSTs offered by the firm exceed my expectations
SAT3	The SSTs offered by the firm are close to my ideal SSTs
SST-Behavioral Intention (scaling from "strongly disagree" to "strongly agree" on a 7-point scale)	
BI1	The probability that I will use the SSTs offered by the firm again is
BI2	The likelihood that I would recommend the SSTs offered by the firm to a friend is
BI3	If I had to do it over again, I would still use the SSTs offered by the firm

[a] These questions comprise the technology readiness index which is copyrighted by A. Parasuraman and Rockbridge Associates, Inc., 1999. This scale may be duplicated only with written permission from the authors.

References

Alexandris, K., Dimitriadis, N., & Markata, D. (2002). Can perceptions of service quality predict behavioral intentions? An exploratory study in the hotel section in Greece. *Managing Servcie, 12*(4), 224–232.

Anderson, E. W., Sullivan, M. W. (1990). *Customer satisfaction and retention across firms*. Paper presented at the TIMS College of Marketing Special Interest Conference on Services Marketing, Nashville, TN, (September).

Anderson, E. W., & Sullivan, M. W. (1993). The antecedents and consequences of customer satisfaction for firms. *Marketing Science, 12*(2), 125–144.

Anderson, E. W., Fornell, C., & Mazvancheryl, S. K. (2004). Customer satisfaction and shareholder. *Journal of Marketing, 68*(4), 172–186.

Anderson, J. C., & Gerbing, D. W. (1988). An updated paradigm for scale development incorporating unidimensionality and its assessment. *Journal of Marketing Research, 25*(2), 186–193.

Babakus, E., & Boller, G. W. (1992). An empirical assessment of the SERVQUAL scale. *Journal of Business Research, 24*(3), 253–269.

Bagozzi, R. P., & Yi, Y. (1991). Assessing construct validity in organizational research. *Administrative Science Quarterly, 36*(3), 421–459.

Bearden, W. O., & Teel, J. E. (1983). Selected determinants of consumer satisfaction and complaint reports. *Journal of Marketing Research, 20*(February), 21–28.

Bitner, M. J. (1990). Evaluating service encounters: the effects of physical surroundings and employee responses. *Journal of Marketing, 54*(2), 69–83.

Bitner, M. J., & Hubbert, A. R. (1994). *Encounter satisfaction versus overall satisfaction versus quality: The customer's voice. Service quality: New directions in theory and practice*. Thousand Oaks, CA: Sage.

Bitner, M. J., Brown, S. W., & Meuter, M. L. (2000). Technology infusion in service encounters. *Journal of the Academy of Marketing Science, 28*(1), 138–150.

Bolton, R. N., & Drew, J. H. (1991). A multistage model of customers' assessments of service quality and value. *Journal of Consumer Research, 17*(4), 375–385.

Boulding, W., Kalra, A., Staelin, R., & Zeithaml, V. A. (1993). A dynamic process model of service quality: from expectations to behavioral intentions. *Journal of Marketing Research, 30*(1), 7–28.

Browne, M. W., & Cudeck, R. (1993). *Alternative ways of assessing model fit. Testing structural equation models*. Newbury Park, CA: Sage.

Butcher, K., Sparks, B., & O'Callaghan, F. (2001). Evaluative and relational influences on service loyalty. *International Journal of Service Industry Management, 12*(4), 310–328.

Carmines, E. G., & McIver, J. P. (1981). *Analyzing models with unobserved variables: analysis of covariance structures. Social measurement: Current issues*. Beverly Hills, CA: Sage.

Craig, J. S. (1994). Managing computer-related anxiety and stress within organizations. *Journal of Educational Technology Systems, 22*(4), 309–325.

Cronin, J. J., Joseph, J., & Taylor, S. A. (1992). Measuring service quality: a reexamination and extension. *Journal of Marketing, 56*(3), 55–69.

Cronin, J. J., Joseph, J., Brady, M. K., & Hult, G. T. M. (2000). Assessing the effects of quality, value, and customer satisfaction on consumer behavioral intentions in service environments. *Journal of Retailing, 76*(2), 193–217.

Dabholkar, P. A., & Thorpe, D. I. (1994). Does customer satisfaction predict shopper intentions. *Journal of Consumer Satisfaction, Dissatisfaction and Complaining Behavior, 7*, 161–171.

Dabholkar, P. A. (1992). Role of affect and need for interaction in on-site service encounters. *Advances in Consumer Research, 19*(1), 563–569.

Dabholkar, P. A. (1994). Incorporating choice into an attitudinal framework: analyzing models of mental comparison processes. *Journal of Consumer Research, 21*(1), 100–109.

Dabholkar, P. A. (1996). Consumer evaluations of new technology-based self-options: an investigation of alternative models of service quality. *International Journal of Research in Marketing, 13*(1), 29–52.

Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User acceptance of computer technology: a comparison of two theoretical models. *Management Science, 35*(8), 982–1004.

De Ruyter, K., Moorman, L., & Lemmick, J. (2001). Antecedents of commitment and trust in customer–supplier relationships in high-technology markets. *Industrial Marketing Management, 30*(3), 271–286.

DeLoughry, T. J. (1993). Professors report progress in gaining recognition for their use of technology. *Chronicle of Higher Education, 39*(26), 19–21.

Dick, A. S., & Basu, K. (1994). Customer loyalty: toward an integrated conceptual framework. *Journal of the Academy of Marketing Science, 22*(2), 99–114.

Fornell, C. (1992). A national customer satisfaction barometer: the Swedish experience. *Journal of Marketing, 56*(1), 6–22.

Fornell, C., Johnson, M. D., Anderson, E. W., Jaesung, C., & Bryant, B. E. (1996). The American customer satisfaction index: nature, purpose, and findings. *Journal of Marketing, 60*(4), 7–19.

Fornell, C. (1999, December). ACSI Commentary: Special Report on Government Services. Available from: http://www.theacsi.org/government/govt-key.html.

Kay, R. H. (1993). An exploration of theoretical and practical foundations for assessing attitudes toward computers: the computer attitude measure (CAM). *Computers in Human Behavior, 9*, 371–386.

Hinkin, T. R. (1995). A review of scale development practices in the study of organizations. *Journal of Management, 21*(5), 967–989.

Howard, J. A., & Sheth, J. N. (1969). *The theory of buyer behavior*. New York: Wiley.

Howard, L. (1997). California medical group being ranked on quality. *American Medical News, 40*(45), 5–7.

Igbaria, M., & Parasuraman, S. (1989). A path analytic study of individual characteristics, computer anxiety and attitudes toward microcomputers. *Journal of Management, 15*(3), 373–389.

Jöreskog, K. G., & Sörbom, D. (1996). *LISREL 8*: User's reference guide (2nd ed.). Chicago, IL: Scientific Software International.

Kotler, P. (1994). *Marketing management: analysis, planning, implementation, and control* (8th ed.). Englewood Cliffs, NJ: Prentice-Hall.

Kristensen, K., Westlund, A. H., & Eskildsen, J. (2003). The predictive power of intangibles. *Measuring Business Excellence, 7*(2), 49–55.

Labarbera, P. A., & Mazursky, D. (1983). A longitudinal assessment of consumer satisfaction/dissatisfaction: the dynamic aspect of the cognitive process. *Journal of Marketing Research, 20*(4), 393–405.

Lee, D. Y. (1998). *The effects of product quality and service quality on consumer satisfaction and loyalty – a study of gas station*. Master thesis, National Cheng Chi University, Taiwan.

MacDonald, J. B., & Smith, K. (2004). The effects of technology-mediated communication on industrial buyer behavior. *Industrial Marketing Management, 33*(2), 107–116.

McDougall, G. H. G., & Levesque, T. (2000). Customer satisfaction with service: putting perceived value into the equation. *Journal of Services Marketing, 14*(4/5), 392–410.

Meuter, M. L., Ostrom, A. L., Roundtree, R. I., & Bitner, M. J. (2000). Self-service technologies: understanding customer satisfaction with technology-based service encounters. *Journal of Marketing, 64*(3), 50–65.

Meuter, M. L., Ostrom, A. L., Bitner, M. J., & Roundtree, R. (2003). The influence of technology anxiety on consumer use and experiences with self-service technologies. *Journal of Business Research, 56*(11), 899–907.

Mick, D. G., & Fournier, S. (1998). Paradoxes of technology: consumer cognizance, emotions, and coping strategies. *Journal of Consumer Research, 25*(2), 123–144.

Mullen, M. R. (1995). Diagnosing measurement equivalence in cross-national research. *Journal of International Business Studies, 26*(3), 573–597.

Nunnally, J. C. (1978). *Psychometric theory* (2nd ed.). New York: McGraw Hill.

Oliver, R. L. (1977). Effect of expectation and disconfirmation on postexposure product evaluations – an alternative interpretation. *Journal of Applied Psychology, 62*(4), 480.

Oliver, R. L. (1980). Predicting sales promotion effects: assimilation, attribution, or risk reduction? *Advances in Consumer Research, 7*(1), 314–318.

Oliver, R. L. (1981). Measurement and evaluation of satisfaction processes in retail settings. *Journal of Retailing, 57*(3), 25–49.

Oliver, R. L. (1997). *Satisfaction: A behavioral perspective on the consumer*. New York: McGraw-Hill.

Parasuraman, A. (1996). *Understanding and leveraging the role of customer service in external, interactive, and internal marketing*. Paper presented in Services Conference, Nashville, TN, October 5.

Parasuraman, A. (2000). Technology readiness index (TRI): A multiple-item scale to measure readiness to embrace new technologies. *Journal of Service Research, 2*(4), 307–321.

Parasuraman, A., Berry, L. L., & Zeithaml, V. A. (1991). Refinement and reassessment of the SERVQUAL scale. *Journal of Retailing, 67*(4), 420–451.

Parasuraman, A., Zeithaml, V. A., & Berry, L. L. (1988). SERVQUAL: A multiple-item scale for measuring consumer perceptions of service quality. *Journal of Retailing, 64*(1), 12–40.

Patterson, P. G. (1995). Choice criteria in final selection of a management consultancy service. *Journal of professional Service Marketing, 11*(2), 177–187.

Rust, R. T., & Oliver, R. L. (1994). *Service quality: Insights and managerial implications from the frontier. Service quality: New directions in theory and practice*. Thousand Oaks, CA: Sage.

Rust, R. T., & Zahorik, A. J. (1993). Customer satisfaction, customer retention, and market share. *Journal of Retailing, 69*(2), 193–216.

Ryzin, G. G. Van, Muzzio, D., Immerwahr, S., Gulick, L., & Martinez, E. (2004). Customer satisfaction index model to New York city. *Public Administration Review, 64*(3), 331–342.

Selnes, F. (1993). An examination of the effect of product performance on brand reputation, satisfaction and loyalty. *European Journal of Marketing, 27*(9), 19–36.

Taylor, S., & Todd, P. (1995). Understanding information technology usage: a test of competing models. *Information Systems Research, 6*(2), 144–177.

Taylor, S. A., Celuch, K., & Goodwin, S. (2002). Technology readiness in the E-insurance industry: an exploratory investigation and development of an agent technology E-consumption model. *Journal of Insurance Issues, 25*(2), 142–166.

Urban, G. L., Sultan, F., & Qualls, W. J. (2000). Placing trust at the center of your internet strategy. *MIT Sloan Management Review, 42*(1), 39–49.

Venkatesh, V., & Morris, M. G. (2000). Why don't men ever stop to ask for directions? Gender, social influence, and their role in technology acceptance and usage behavior. *MIS Quarterly, 24*(1), 115–140.

Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: four longitudinal field studies. *Management Science, 46*(2), 186–205.

van der Wal, R. W. E., Pampallis, A., & Bond, C. (2002). Service quality in a cellular telecommunications company: a South African experience. *Managing Service Quality, 12*(5), 323–336.

Wong, Y.-L. W., & Kanji, G. K. (2001). Measuring customer satisfaction: evidence from Hong Kong retail banking industry. *Total Quality Management, 12*(7), 939–949.

Woodside, A. G., Frey, L. L., & Daly, R. T. (1989). Linking service quality, customer satisfaction, and behavioral intention. *Journal of Health Care Marketing, 9*(4), 5–18.

Zeithaml, V. A., Parasuraman, A., & Malhotra, A. (2002). Service quality delivery through web sites: a critical review of extant knowledge. *Journal of the Academy of Marketing Science, 30*(4), 362–376.

Zeithaml, V. A., Bhatnagar, N., & Lurie, N. H. (2002). Reasoning about online and offline service experiences: the role of domain-specificity. *Advances in Consumer Research, 29*(1), 259–261.

Zeithaml, V. A., Berry, L. L., & Parasuraman, A. (1996). The behavioral consequences of service quality. *Journal of Marketing, 60*(2), 31–47.