

# INTERNATIONAL JOURNAL OF ACADEMIC RESEARCH IN PUBLIC POLICY & GOVERNANCE



## Diffusion of Medical Innovation: Predicting Patient Attitudes and Intentions to Use Self-Service Technology in Hospitals: Evidence from Chinese Hospitals

Henry Asante Antwi, Zhou Lulin, Ethel Yiranbon, James Onuche Ayegba, Mary-Ann Yeboah, Emmanuel Osei Bonsu

To Link this Article: <http://dx.doi.org/10.6007/IJARPPG/v1-i1/634>

DOI: 10.6007/IJARPPG/v1-i1/634

Received: 08 Sept 2014, Revised: 13 Oct 2014, Accepted: 16 Nov 2014

Published Online: 28 Dec 2014

In-Text Citation: (Antwi et al., 2014)

To Cite this Article: Antwi, H. A., Lulin, Z., Yiranbon, E., Ayegba, J. O., Yeboah, M.-A., & Bonsu, E. O. (2014).

Diffusion of Medical Innovation: Predicting Patient Attitudes and Intentions to Use Self-Service Technology in Hospitals: Evidence from Chinese Hospitals. *International Journal of Academic Research in Public Policy and Governance*, 1(1), 1–16.

Copyright: © 2014 The Author(s)

Published by Knowledge Words Publications ([www.kwpublications.com](http://www.kwpublications.com))

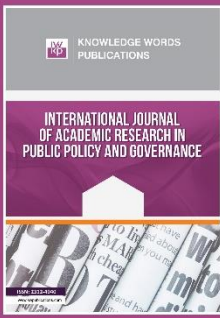
This article is published under the Creative Commons Attribution (CC BY 4.0) license. Anyone may reproduce, distribute, translate and create derivative works of this article (for both commercial and non-commercial purposes), subject to full attribution to the original publication and authors. The full terms of this license may be seen at: <http://creativecommons.org/licenses/by/4.0/legalcode>

Vol. 1, No. 1, 2014, Pg. 1 - 16

<http://kwpublications.com/index.php/pages/detail/IJARPPG>

JOURNAL HOMEPAGE

Full Terms & Conditions of access and use can be found at  
<https://kwpublications.com/pages/detail/publication-ethics>



# Diffusion of Medical Innovation: Predicting Patient Attitudes and Intentions to Use Self-Service Technology in Hospitals: Evidence from Chinese Hospitals

Henry Asante Antwi<sup>1</sup>, Zhou Lulin,<sup>1</sup> Ethel Yiranbon,<sup>1</sup> James Onuche Ayegba<sup>1</sup>, Mary-Ann Yeboah<sup>2</sup>, Emmanuel Osei Bonsu<sup>3</sup>

<sup>1</sup>School of Management, Jiangsu University, 301 Xuefu Road, Zhenjiang 212013, Jiangsu, P.R. China

<sup>2</sup>Department of Computer Science, Faculty of Applied Science, Kumasi Polytechnic, P.O. Box 854, Kumasi, Ghana,<sup>3</sup> School of Business, Ghana Institute of Public Administration, Accra, Ghana

Email: ZLL62@126.com

## Abstract

Self-service technologies have become a part of hospital life in several countries but with some level of difficulty with general acceptability and usage among patients. The study sought to empirically test the validity of the existing conceptual model and hypotheses on adoption and use of Technology in Chinese hospitals, assess different antecedents' influence on patient attitudes towards self-serving technologies at the hospital, investigate if attitudes towards self-serving technologies and predicts patients' intention to use the technology and empirically test the different variables' are moderating effect on the relationship between attitudes and intention to use self-service technology by patients in Chinese hospitals.

A quantitative study based on non-probability sampling and involving the administration of questionnaires to patients in selected hospitals across China. The resulting 384 valid data sets are analyzed through a quantitative procedure, using SPSS software and reveal that perceived ease of use, enjoyment speed and control are all significantly predicting consumers' attitudes towards self-serving hospital technology. Furthermore, there is a strong relationship between attitudes and the intention to use self- self-serving hospital technology which is attenuated by an infrequent use of self-service technologies, yet not by a high need for personal interaction. Results furthermore reveal significant variances between different age groups and respondents with different education levels. Based on the discussion of findings, managerial implications, such as the need to promote self- self-serving hospital technology as "fast lane" and theoretical implications are stated.

**Keywords:** Innovation Diffusion, Medical ICT, Self-Service Technology, Adoption and Use, Hospital Workers, Ghana, China

## Introduction

More and more service industries offer self-service technologies (SSTs) as an alternative service delivery option to the traditional service encounter. SSTs have “revolutionized the typical interface between the customer and service provider” (Meuter and Bitner, 2005, p.63). As a result, the topic area has received an increasing amount of attention during the last decade. The financial service industry has been one of the major sectors that has successfully shifted from a traditional firm production towards customer production by introducing automated-teller-machines (ATMs) (Milligan, 2007).

Due to the financial industry’s role as “pioneer”, the amount of research on the adoption process of online banking, phone banking and ATMs (Cunningham and Young, 2009) is extensive.

Apart from the financial services industry, SSTs in the hotel industry (Bendapuli and Leone, 2003) and travelling industry (Reinders, Dabholkar and Frambach, 2008) have been explored in numerous studies.

Until recently the health care market has been slow to accept self-service technology and currently accounts for less than five percent of the self-service technology market. Not surprisingly, technology providers are trying hard to stoke the healthcare industry’s appetite for these solutions. As Bitner (2000) explains with SSTs, patients may not be snatching the scalpel out of their doctor’s hands and doing their own surgery, but patients are registering on their own – in doctors’ offices, clinics and hospitals – thanks to the advent of healthcare self-service technologies. Taking their cue from airlines, retail stores and banks, healthcare providers are using self-service technologies to speed up the registration process, enter valuable data into the electronic health record and push revenue cycle management capabilities to the front end—all while advancing the concept of patient-directed healthcare.

With increasing pressure on healthcare organizations in Ghana to reduce costs, many are looking to new technologies to cut down on manual administration and maximize the productivity of the medical staff. Whilst initial concern might focus on the fact that SSTs are removing human interaction from the encounter, in reality it is actually freeing up time for the staff and clinicians to talk to the patient. However, it is the contention of Bitner (2000) that SSTs work in the healthcare setting if only they improve the patient experience –including reducing the time spent waiting. Therefore making sure that the technology is easy to use and that where a printer is incorporated that it is robust and requires little intervention is vital.

Even though many hospitals in the world including China are embracing the concept of self-service technology, it is the contention of Bitner (2000) that the rate of its adoption and use is far from expected, requiring extensive studies to understand the dynamics of adoption as far as patients are concerned.

In the existing literature, the concept of diffusion, adoption and use of technology in any area has come with different constraints. These have been conceptualized into theories and hypothesis some of which have been tested, validated or rejected in different socio-cultural context. For example while some researchers consider personality factors as influencing the interest, and rate of technology adoption, others think that immediate environmental factors has bigger influence while others also look at distant external factors as the key to technology adoption and use (Kierkegaard, 2011). Hofstede (2001) contends that people in cultures with high uncertainty avoidance orientation are more likely to have higher rate of adoption and use of technology compared with individuals in countries with low uncertainty avoidance cultural orientation.

The other common factors that influences technology adoption and use are conceptualised in theories such as Theory of Reasoned Action (TRA), Technology Acceptance Model (TAM), Technology Acceptance Model 2 (TAM2), Motivational Model (MM), Theory of Planned Behaviour (TPB), Combined TAM and TPB (C-TAM-TPB), Model of PC Utilization (MPCU), Innovation Diffusion Theory (IDT), Social Cognitive Theory (SCT), Unified Theory of Acceptance and Use of Technology Model (UTAUT) etc and these have given different constructs of technology adoption and use (Venkatesh, Morris, Davis, Davis, 2003). Further some researchers have tested the relationships between the effect of age and attitudes towards SSTs (Dean, 2008) and between the experienced level of service quality and related retail patronage intentions (Lee and Fairhurst, 2009).

Furthermore, differences in service recovery in self-service and traditional service situations have been compared (Forbes, 2008) and SST classifications have been proposed (Cunningham and Young, 2009). The only study, exclusively focusing on the influence of antecedent variables on attitudes and the intention to use self-serving technology, has been conducted by Weijters and Falk (2006).

Our research is a cross-theoretical study that integrates each of the major elements proposed to affect user acceptance of technology from the models above to predict user acceptance, adoption and use of Self-Service Technology in Chinese Hospitals. The following are the objectives of the research:

- a. To empirically test the validity of the existing conceptual model and hypotheses on adoption and use of Technology in Chinese hospitals.
- b. To assess different antecedents' influence on patient attitudes towards self- serving technologies at the hospital.
- c. To investigate if attitudes towards self-serving technologies and predicts patients' intention to use the technology.
- d. To empirically test the different variables' are moderating effect on the relationship between attitudes and intention to use self-service technology by patients in Chinese hospitals.

### **Self-service**

Self-service refers to the reorganization of the labor process, transferring work processes and responsibility from employees to consumers (patients), therefore substituting paid labor (Andrews, 2009). There are several different kinds of self-services. They can, but must not be facilitated by technology, and they can be executed either in or out of home (Bobbitt & Dabholkar, 2001). While Andrews (2009) labels the increasing use of self-service as a "novel twist on the contemporary trend of outsourcing" (p.38), the development dates back several decades. For example Andrews (2009) reports that some hospital industry induced the shift towards self-service in 1926, when products became individually priced and customers started collecting items themselves instead of placing orders with the store clerk (Andrews, 2009). The process continued with customers carrying products through the stores and to their cars, instead of having the groceries delivered to their home (Andrews, 2009). While these processes are examples of self-service, Ritzer (1999) highlights the increasing role played by technology.

Meuter (2000) defines an SST as a "technological interface that allows customers to produce and consume services without direct assistance from employees" (p.50). This definition has been approved and reinforced through several studies (Makarem and Mudambi, 2009). Numerous SSTs across industries have become self-evident and integral to consumers' everyday lives as online purchases of books and airline tickets, withdrawal of money via ATMs, online education, online

banking, library check-out systems and self-serving in hospitals show (Andrews, 2009). Despite SSTs being widely accepted and implemented across service industries (Meuter, 2000, 2005), companies need to fully understand the beneficial and detrimental aspects that either convince or stop consumers from using the technology (Curran and Meuter, 2007), due to the substantial investment that is required (Marzocchi and Zammit, 2006). Secondary sources reveal that there are multiple aspects that on the one hand encourage usage, and on the other hand inhibit consumers from using SSTs.

### **Benefits and Drawbacks of SSTs**

While early studies rather concentrate on how service providers benefit from SSTs (Lovelock and Young, 1979; Mills, 1983; Kelley, 1990), the focus of more contemporary studies shifts towards the disadvantages and advantages from a consumer's perspective. The risks and disadvantages of SSTs as perceived by customers include a limited possibility of service recovery (Walker and Craig-Lees, 2000; Bitner, 2001), lacking financial benefits (Andrews, 2009), computer glitches (Bitner, 2001; Andrews, 2009), human-based errors which delay transactions (Bitner, 2001; Andrews, 2009), complexity (Curran, 2003; Edison and Geissler, 2003) and depersonalisation (Curran, 2003; Dabholkar, 2003). All of these aspects are likely to negatively affect the attitudes towards a broad variety of SSTs.

While Andrews' (2009) claims that SSTs' advantages for consumers remain rather unclear, there are benefits that are commonly included in studies and promoted by service providers, including convenience, control, independence, enjoyment and speed for example. Speed is without a doubt the most controversial benefit derived from SSTs. While stores propose that self-serving machines reduce the queuing time and therefore allow faster shopping (Walker, 2002; Anitsal and Schuhmann, 2007), Andrews (2009) argues that differences in experience and skills do not allow the proposition that self-serving is actually a faster checkout method under all circumstances.

The researcher rather concludes that while the actual waiting time is not reduced, people might merely perceive the process as faster, since they are actively participating instead of passively waiting (Andrews, 2009). Although their degrees of significance differ across studies, speed (Walker, 2002), control (Marzocchi and Zammit, 2006), independence (Andrews, 2009) and enjoyment (Gillberg and Gummerus, 2006) are four further benefits that are commonly included in studies and supported as benefits that consumers derive from SSTs.

### **Technology Adoption**

As indicated in earlier sections, factors that influences technology adoption and use are conceptualized in theories such as Theory of Reasoned Action (TRA), Technology Acceptance Model (TAM), Technology Acceptance Model 2 (TAM2), Motivational Model (MM), Theory of Planned Behavior (TPB), Combined TAM and TPB (C-TAM-TPB), Model of PC Utilization (MPCU), Innovation Diffusion Theory (IDT), Social Cognitive Theory (SCT), Unified Theory of Acceptance and Use of Technology Model (UTAUT) etc. Based on the formulated research objectives, the review of journal articles and research-based evidence, the following conceptual framework (Figure 2), consisting of seven hypotheses, is proposed. The core model is based on the TAM and further influenced by the conceptual models used in studies by Dabholkar (1996) and Dabholkar and Bagozzi (2002). Figure 1 shows the conceptual model of self-service technology adoption for this research

The perceived ease of using SSTs, enjoyment derived from using SSTs, perceived speed and control

of SSTs are proposed as independent variables, positively affecting the attitude towards self-serving, which in turn affects the dependent variable intention to use self-serving technology. This relationship is attenuated by the moderator variables need for interaction an infrequent SST use. Additionally, demographic information, the level of computer self-efficacy and the most commonly visited hospital are recorded as control variables. The basis of these hypotheses is reviewed next. The attitude towards self-serving is at the core of the model. Attitudes are defined as psychological tendencies that are “expressed by evaluating a particular entity with some degree of favour or disfavour” (Edison and Geissler, 2003, p.140). According to the widely acknowledged TAM, perceived ease of use is a key influence on attitudes towards technology (Davis, 1989). Additionally, studies have found significant relationships between attitude formations and further constructs, including enjoyment, speed and control as argued in the following paragraphs.

### **Perceived Ease of Use**

Perceived ease of use is defined as the “extent to which a person believes that using a technology is free of effort” (Venkatesh, 2000, p.344) and is one of the key constructs in the TAM (Davis, 1989). The construct has found strong support as antecedent of attitudes towards technology throughout numerous studies that prove a significant relationship between high levels of perceived ease of use and positive attitudes towards technology (Lee and Fairhurst, 2009). Due to the strong evidence, it can be hypothesised that:

*H1: The perceived ease of using SSTs has a significant, positive effect on the attitude towards self-serving technology in hospitals.*

### **Perceived Enjoyment**

Attitude formation is based on cognitive and affective influences (Schiffmann and Kanuk, 2009). The importance of affect is rooted in consumer behavior theory which states that people might decide to accept or reject things for non-cognitive reasons (; Batra and Ahtola, 1991). Research found that these non-cognitive reasons include enjoyment, since patients tend to be more willing to use technology if it is perceived as enjoyable (Malone, 1981; Lee and Fairhurst, 2009). Numerous studies support enjoyment as determinant of attitudes towards technology (Curran and Meuter, 2007). Thus it can be hypothesised that:

*H2: The perceived enjoyment derived from using SSTs has a significant, positive effect on the attitude towards self-serving technology in hospitals.*

### **Perceived Speed**

The influence of speed on the preference for self-service is identified in an early study (Bateson, 1985) and finds support through numerous researchers, who determine it as being of particular importance for the adoption of SSTs (Dabholkar 1994, 1996; Alreck and Settle, 2002; Lee and Fairhurst, 2009). Burke (2002) explains that respondents in his study considered technology as most satisfying when it saved time which is confirmed by Dabholkar and Lee (2003) in a later study that singled out speed as most important reason for patients using SSTs. Therefore, it can be hypothesised that:

*H3: The perceived speed of SSTs has a significant, positive effect on the attitude towards*

*self-serving technology in hospitals.*

### **Perceived Control**

Early studies in the field of social psychology establish the degree of perceived control as variable determining behaviour (Gecas, 1989; Ajzen, 1991; Rozell and Turner, 1994) and the level of satisfaction (Bateson, 1985). Hui and Bateson (1991) show in their study, that any characteristic causing an increase of perceived control positively affects patients' response and therefore behaviour in a service encounter. Anselmsson (2001) shows in his study that this impact of perceived control also applies for SSTs, since the sense of control which is derived through different system attributes, impacts the perceived service quality positively. Since numerous contemporary studies (Curran and Meuter, 2007) support the impact of perceived control on patients' responses towards SSTs, it can be hypothesised that:

*H4: The perceived control derived from using SSTs has a significant, positive effect on the attitude towards self-serving in hospitals.*

### **Attitude Towards Self-Serving**

Numerous attitudinal studies strongly support the link between attitudes and behavioural intentions (Bobbitt and Dabholkar, 2001). This relationship has also been determined as significant in the context of technology adoption, establishing attitudes towards technology as strong predictor for behavioural intentions (Childers, 2011). Thus, it can be hypothesised that:

*H5: The attitude towards self-serving in hospitals has a significant, positive effect on the intention to use self-serving technology in hospitals.*

### **Moderating Effect of Need for Interaction**

Psychographic factors and consumer traits, such as the need for social interaction are key influences on attitude formation and behaviour (Curran and Meuter, 2005). Despite the benefits that SSTs offer, some consumers assign a lot of value to interaction as it provides social benefits (Beatson, Coote and Rudd, 2006) and are therefore reluctant to eliminate yet another point of social interaction in their lives (Andrews, 2009). Studies support the notion that the need for interaction has an adverse effect on attitudes towards self-service (Curran and Meuter, 2005), thus it can be hypothesised that.

*H6: The need for interaction attenuates the positive relationship between attitudes towards self-serving and the intention to use self-serving technology in hospitals.*

### **Moderating Effect of Infrequent SST Use**

After researchers (Gefen, 2003; Curran and Meuter, 2005) concluded that the TAM is insufficient for fully explaining technology acceptance, Bolton, Grewal and Levy (2007) specifically indicated the role of experience as an aspect for future research. The relationship between previous experience and use of new technology has already been found as significant in early studies (Korgaonkar and Moschis, 1987), and is supported by more recent research, acknowledging the positive influence of frequent use of technology on technology adoption (Andrews, 2009). Inferred from this relationship, it can be hypothesised that:

H7: *An infrequent SST use attenuates the positive relationship between attitudes towards self-serving and the intention to use self-serving technology.*

### Material and Methods

We adapted but modified items or indicators of technology adoption based on the TAM model as our key measurement in our questionnaire. The reason is that it is a comprehensive model incorporating as many as 8 different models of technology adoption. The following calculation of the sample size is based on the accessible population

$n$  = required sample size

$N$  = population size (46,184,800)

$Z$  = number of standard errors (1.96 for 95% confidence level)

$$n = \frac{2,500 \times N \times Z^2 [25(N-1)] + [2,500 \times Z^2]}{2,500 \times Z^2}$$

$$n = \frac{2,500 \times (46,184,800) \times 1.96^2}{2,500 \times 1.96^2} = 384,157 = 384$$

We measured all construct items on a seven-point likert-type scale (1-disagree strongly, 7-agree strongly). The questionnaire also collected data about the demographic information of the respondents and computer self-efficacy. We tested for validity of content of the questionnaires by rigorously pre-testing on appropriate sample (within the population but outside the final sample) to refine the wordings.

We self-administered the final 384 questionnaires to patients at Shandong Provincial Hospital, the People's Liberation Army Central Hospital, Shaanxi Provincial People's Hospital, Inner Mongolia Chifeng Hospital, Shandong the Yidu Central Hospital all of which have fixed IBM Multi-Channel Self-Service Solutions for Hospitals or Silver Medical technology or other self-service solutions for Check-in/Registration, Wayfinding, Hospital Kiosks over a period of 3 months.

### Analysis of Data

We performed a two staged statistical analysis to obtain the results. Firstly, we performed factor analysis to investigate the dimensions of self-service technology adoption after which we formulated a linear regression model to examine the effect of the identified variables on adoption of self-service technology. We thoroughly verified the basic assumptions i.e. the constant variance and normality and these did not affect the results.

We determined the appropriateness of the data for factor analysis by employing Kaiser–Meyer–Olkin measure of sampling adequacy (KMO-MSA) and Bartlett's Test of Sphericity. We recorded a KMO value of more than 0.60 and a significant value for the Bartlett's Test of Sphericity. We performed Varimax rotation and principle components analysis for factor analysis. We eliminated all the factors that had factor loadings lower than 0.50 after which we conducted the Cronbach's alpha reliability analysis. We ensured that all measure of sampling adequacy exceeded the Cronbach's alpha reliability value threshold level of 0.60 and large and significant Bartlett's Test of Sphericity. We eliminated all items that had a factor loading lower than 0.50. The exploratory factor analysis and



reliability statistics measures of the accepted variables are shown as appendix

Descriptive statistics were used to draw up a respondent profile, by comparing mean scores, analysing mean differences and defining the extent to which mean scores either fall below or exceed the Likert scale's midpoint, one-sample t-tests are conducted. To test hypotheses H1-H5, bivariate linear regression analyses was carried out using the following model.

$$Y = \alpha + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \beta_7X_7 + e$$

- $\alpha$  = origin of regression line or the intercept
- $B$  = the coefficient of regression
- $Y$  = Attitude to use and intention to use self-serving technology
- $X_{1...}$  Predictor Variables

This dependence test measures the relationship between a predictor and a criterion variable and indicates the extent to which the prior variable influences the latter. To test hypotheses H6 and H7, split group regression analyses are carried out. This test allows determining whether the proposed moderator variables attenuate the relationship between attitudes and behavioural intentions. To H6, a split group analysis between respondents with a high (referred to as high group) and low need for interaction (referred to as low group) is conducted. The high group includes respondents, scoring a mean of  $\geq 4$  for the variable "need for interaction", while the low group includes all respondents scoring a mean of  $\leq 3$ . To test H7, again, a split group analysis between respondents using SSTs frequently (mean score of  $\geq 4$ ) and respondents using SSTs less frequently (mean score of  $\leq 3$ ) is carried out. ANOVA tests are executed to test whether significant differences between groups, such as different age groups, education or income levels exist. To test if the ANOVA results indicate significant differences, Post Hoc tests, based on the Scheffe procedure, are conducted to see where the significance lies.

## Results and Analysis

Table 1.1 Regression Results for Hypothesis 1-5

Predictor Variable	R <sup>2</sup>	Beta	P	Significance Level
Perceived Ease of Use	0.326	0.571	0	P<0.001
Perceived enjoyment	0.448	0.669	0	P<0.001
Perceived Speed	0.348	0.59	0	P<0.001
Perceived Control	0.424	0.651	0	P<0.001
Attitude towards self-serving	0.539	0.734	0	P<0.001

Table 1.1 shows the bivariate regression analysis results for dimensions of Perceived Ease of Use, Perceived enjoyment, Perceived Speed, Perceived Control and their effect on Attitude towards self-serving technology in the hospitals. Further the fifth hypothesis further shows the extent to which these attitude towards using self-serving machines in the hospitals impact on intention to use the technologies. All the analyzed results as shown in table 1.1 indicate a strong, positive correlation between the predictor variables "Perceived Ease of Use, Perceived enjoyment, Perceived Speed, Perceived Control" and the criterion variable "attitude towards self-serving". It further demonstrates

a strong, positive correlation between attitude towards self-serving and intention to use self-serving technology. In all instance the “P” value is 0 suggesting high significance. The  $R^2$  values in each case shows that reveals that in each case more than 30% of the deviation from the criterion variable’s mean can be explained by the predictor variables. Following the claims of Pallant (2011), it is observed that the Beta values are more than 0.5 in each case and that supports a positive correlation, predicting that the higher the predictor values, the better the attitude towards and intention to use self-serving technology in hospitals.

In respect of H6 table 1.2 shows that the test results support the hypothesis at  $p < .01$  level for both groups. The significant scores of 0.000 for both groups match the results of the regression analysis for H5. This data shows that the need for interaction does not moderate on the relationship between the predictor and criterion variable, therefore neglecting the hypothesis.

On the other hand with respect to H7, table 1.3 the underlying hypothesis was previously supported at  $p < .01$  level, yet now, the significance level for the low group decreases to  $p < .05$  level. These results show that a low frequency of SST usage negatively affects the relationship between the attitude towards self-serving and the intention to use self-serving. For the high group, the hypothesis is still supported at  $p < .01$  level, therefore not weakening the causal effect between the predictor and criterion variable. Consequently, the hypothesis, that the positive relationship between the attitude towards and the intention to use self-serving in hospitals is weakened by an infrequent use of SSTs is supported.

In terms of gender the mean score of the variable “perceived ease of use” for male respondents (5.455) is higher than the mean for female respondents (5.148) and the difference is significant. In the same way the ANOVA test results indicate differences between age groups, affecting all eight constructs at significant levels. The difference lies between younger respondents (15-34) and older respondents (60+), suggesting that younger patients perceive SSTs as being easier to use, more enjoyable, speedier and offering more control than older patients. In terms of level of education, the ANOVA analysis shows respondents with a postgraduate (5.079) and undergraduate education (5.298) use SSTs more often than respondents with a secondary school (4.036) or college education (4.495).

Finally with computer self-efficacy, the ANOVA test results show that there is no significant difference between male and female respondents’ levels of self-efficacy. Yet, the self-efficacy scores differ significantly between age groups ( $p < .01$ ) and education levels ( $p < .01$ ). Respondents aged 15-24 and 25-34 score significantly higher (6.034; 6.046) in contrast to respondents aged 60 and older (4.598), supporting findings from Dean (2008), who causally links self-efficacy and age and level of education.

Respondents with an undergraduate (mean=5.947) or postgraduate (mean=5.883) degree score higher than respondents who are educated at secondary school (mean=5.000) or college (mean=5.382) level.

### **Conclusions and Implications**

The first managerial implication resulting from this study is that self-serving in hospitals should not be offered as the only checkout option. Despite the fact that people are experienced in using SSTs and consider self-serving in hospitals as a fair alternative to the traditional checkout, people do not enjoy the use of self-serving technology and are unlikely to permanently prefer self-serving to the traditional checkout. This implies that hospitals which already offer self-serving technology should leave the decision, whether to check out service offerings traditionally or via

self-serving, to the patients and not remove the traditional checkout completely.

Secondly, self-serving in hospitals should be promoted as “fast lane”. The results show that speed is the characteristic of SSTs that is valued most strongly by respondents. Previous studies show that some patients do not see the value of self-serving, since they do not benefit financially from taking on work that previously has been done for them. This implies that hospitals should promote self-serving as fast lane. Highlighting the technology’s potential to reduce the time that patients spend queuing would therefore be communicated as a nonfinancial benefit to customers.

Thirdly, results support the suggestion that the amount of self-serving machines in hospital branches should relate to the demographic characteristics of residents in the catchment area. Considering the significant differences between age groups, hospital chains should take the demographic characteristics of residents in the catchment area of different branches into consideration when deciding on the number of self-serving machines. Self-serving is more likely to be used by younger, educated people. This implies that hospital branches in student neighbourhoods should include a higher number of self-serving machines than a branch in an area where the average age is significantly higher and the education level lower.

Previous studies, exploring attitudes towards SSTs and antecedents of SST use in the healthcare sector have mainly been conducted in Europe. Cultural differences likely affect patient behaviour, such as attitudes and perception (de Mooij, 2011) Comparing the results with those studied in Europe and other parts of the world from previous studies and this study which has taken place in China, it is possible to conclude that SSTs can be globally adopted.

Despite the fact that several studies did not find a significant influence of demographics (Rogers, 1995; Dabholkar and Bagozzi, 2002; Meuter, Bitner and Ostrom, 2003; Reinders, Dabholkar and Frambach, 2008), concluding that age and gender for example are no important contributors towards understanding the behaviour of patients, this study proves the opposite. The results imply that there are significant differences between patients from different age and education groups. These findings are especially valuable, since it could have been argued that the increasing access to and acceptance of technology in various service settings reduced or erased these differences.

### **Limitations**

The major limitation of this study is the sampling. Although patients from various parts of the US participated, the different cities are not represented to an equal extent. Secondly, it needs to be considered that self-serving technology may change and improve over time, as Weijters and Falk’s study (2006) illustrates, the results of this study are consequently time-context dependent and might not allow generalizations to future technology. A third limitation lies in the scales used in the questionnaire. Despite being sourced from previous studies, the construct “perceived enjoyment” is measured by merely three, very similar items. This might limit respondents’ associations and affect responses, whereas a scenario-based questionnaire might have achieved more precise results.

**References**

- Ajzen, I. (1991). The theory of planned behavior. *Organizational behavior and human decision processes*. 50(1), pp.179-211.
- Anitsal, I., And Schuhmann, D. W. (2007). Toward a conceptualization of customer productivity: the customer's perspective on transforming customer labor into customer outcomes using technology-based self-service options. *Journal of Marketing Theory and Practice*. 15(4), pp.349-363.
- Bateson, J. E. G. (1985). Self-service consumer: an exploratory study. *Journal of Retailing*. 61(3), pp.49-76.
- Beatson, A., L. Coote, and Rudd, J. (2006). Determining consumer satisfaction and commitment through self-service technology and personal service usage. *Journal of Marketing Management*. 22(1), pp.853-882.
- Beatson, A., N. Lee, and Coote, L. V. (2007). Self-service technology and the service encounter. *The Service Industries Journal*. 27(1), pp.75-89. 46
- Bendapudi, N., And Leone, R. P. (2003). Psychological implications of customer participation in co-production. *Journal of Marketing*. 67(1), pp.14-28.
- Bitner, M. (2001). Self-service technologies: what do customers expect? *Marketing Management*. 10(1), pp.10-11.
- Bitner, M., Brown, S. W., and Meuter, M. (2000). Technology infusion in service encounters. *Journal of the Academy of Marketing Science*. 28(1), pp.138-149.
- Bitner, M., Ostrom, A., and Meuter, M. (2002). Implementing successful self-service technologies. *The Academy of Management Executive*. 16(4), pp.96-109.
- Bobbitt, L. M., and Dabholkar, P. A. (2001). Integrating attitudinal theories to understand and predict use of technology-based self-service: the internet as an illustration. *International Journal of Service Industry Management*. 12(5), pp.423-450.
- Burke, R. R. (2002). Technology and the customer interface: what consumers want in the physical and virtual store. *Journal of the Academy of Marketing Science*. 30(4), pp.411-432. 47
- Childers, T. L. (2001). Hedonic and utilitarian motivations for online retail shopping behaviour. *Journal of Retailing*. 77(4), pp.511-535.
- Curran, J., Meuter, M., and Surprenant, C. F. (2003). Intentions to use self-service technologies: a confluence of multiple attitudes. *Journal of Service Research*. 5(3), pp.209-224.
- Curran, J., and Meuter, M. (2005). Self-service technology adoption: comparing three technologies. *The Journal of Services Marketing*. 19(2), pp.103-113. 48
- Curran, J., and Meuter, M. (2007). Encouraging existing customers to switch to self-service technologies: put a little fun in their lives. *Journal of Marketing Theory and Practice*. 15(4), pp.283-298.
- Czepiel, J. A. (1990). Service encounters and service relationship: implications for research. *Journal of Business Research*. 20(1), pp.13-21.
- Dabholkar, P. A. (1992). Role of affect and need for interaction in on-site service encounters. *Advances in Consumer Research*. 19(1), pp.563-569.
- Dabholkar, P. A. (1994). Technology-based self-service delivery: a classification scheme for developing marketing strategies. *Advances in Services Marketing and Management*. 30(3), pp.241-271.

- Dabholkar, P. (1996). Consumer evaluations of new technology-based self-service options: An investigation of alternative models of service delivery. *International Journal of Research in Marketing*. 13(1), pp.29-51.
- Dabholkar, P. and Bagozzi, R. (2002). An attitudinal model of technology-based self-service: moderating effects of consumer traits and situational factors. *Journal of the Academy of Marketing Science*. 30(3), pp.184-201.
- Dabholkar, P., and Lee, E. (2003). Understanding consumer motivation and behavior related to self-scanning in retail. *Journal of Service Management*. 14(1), pp.59-95.
- Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*. 13(3), pp.319-339.
- Davis, F. D., Bagozzi, P., and Warshaw, P. R. (1989). User acceptance of computer technology: a comparison of two theoretical models. *Management Science*. 35(8), pp.982-1003. 49
- Davis, F. D., Bagozzi, P., and Warshaw, P. R. (1993). Extrinsic and intrinsic motivation to use computers in the workplace. *Journal of Applied Social Psychology*. 22(14), pp.1109-1130.
- DEAN, D. H. (2008). Shopper age and the use of self-service technology. *Managing Service Quality*. 18(3), pp.225-238.
- Edison, S. W., and Geissler, G. L. (2003). Measuring attitudes towards general technology: antecedents, hypotheses and scale development. *Journal of Targeting, Measurement and Analysis for Marketing*. 12(2), pp.137-156.
- Forbes, L. (2008). When something goes wrong and no one is around: non-internet self-service technology failure and recovery. *Journal of Services Marketing*. 22(4), pp.316-327.
- Forman, A. M., and Ven, S. (1991). The depersonalization of retailing: its impact on the 'lonely' consumer. *Journal of Retailing*. 67(2), pp.226-243.
- Garcia, R., and Calantone, R. (2002). A critical look at technological innovation typology and innovativeness terminology: a literature review. *The Journal of Product Innovation Management*. 19(2), pp.110-132. GECAS, V. 1982. The self-concept. *Annual Review of Sociology*. 8(1), pp.1-33.
- Gecas, V. (1989). The Social Psychology of Self-Efficacy. *Annual Review of Sociology*. 15(1), pp.291-316.
- Gefen, D., Karahanna, E., and Straub, D. W. (2003). Trust and TAM in online shopping: an integrated model. *MIS Quarterly*. 27(1), pp.51-90.
- Igbaria, M., and Parasuraman, S. (1989). A path analytic study of individual characteristics, computer anxiety and attitudes towards microcomputers. *Journal of Management*. 15(3), pp.373-355.
- Kelley, S. W. (1990). Customer participation in service production and delivery. *Journal of Retailing*. 66(3), pp.315-336.
- Kirca, A. H., Jayachandran, S. and Bearden, W. O. (2005). Market orientation: a meta-analytic review and assessment of its antecedents and impact on performance. *Journal of Marketing*. 69(2), pp.24-41.
- LEE, H., and Fairhurst, A. E. (2009). The importance of self-service kiosks in developing consumers' retail patronage intentions. *Managing Service Quality*. 19(6), pp.687-701.
- Lovelock, C. H., and Young, R. A. (1979). Look to consumers to increase productivity. *Harvard Business Review*. 57(3), pp.77-89.
- LU, H., and SU, Y. (2009). Factors affecting purchase intention on mobile shopping web sites. *Internet Research*. 19(4), pp.442-458.

- Makarem, S. C., Mudambi, S. M., and Podoshen, J. S. (2009). Satisfaction in technology-enabled service encounters. *Journal of Services Marketing*. 23(3), pp.134-144.
- Malone, T. W. (1981). Toward a theory of intrinsically motivation instruction. *Cognitive Science*. 5(4), pp.333-369.
- Marr, N. E., and Prendergast, G. P. (1991). Strategies for retailing technologies at maturity: a retail banking study. *Journal of International Consumer Marketing*. 3(3), pp.99-125.
- Marr, N. E., and Prendergast, G. P. (1993). Consumer adoption of self-service technologies in retail banking: is expert opinion supported by consumer research? *International Journal of Bank Marketing*. 11(1), pp.3-10.
- Marzocchi, G. L., and Zammit, A. (2006). Self-scanning technologies in retail: determinants of adoption. *The Service Industries Journal*. 26(6), pp.651-669. 54
- Meuter, M., Bitner, M., and Ostrom, A. (2000). Self-service technologies: understanding customer satisfaction with technology-based service encounters. *Journal of Marketing*. 64(6), pp.50-64.
- Meuter, M., Bitner, M., and Ostrom, A. (2003). The influence of technology anxiety on consumer use and experiences with self-service technologies. *Journal of Business Research*. 56(11), pp.899-906.
- Meuter, M., Bitner, M., and Ostrom, A. (2005). Choosing among alternative service delivery modes: an investigation of customer trial of self-service technologies. *Journal of Marketing*. 69(1), pp.61-83.
- Meuter, M., Ostrom, A., and Roundtree, R. (2000). Self-service technologies: understanding customer satisfaction with technology based service encounters. *Journal of Marketing*. 64(3), pp.50-64.
- Mills, P. K. (1983). Motivating the client/ employee system as a service production strategy. *The Academy of Management Review*. 11(4), pp.726-635.
- Mills, P. K., Chase, R. B., and Margulies, N. (1983). Motivating the client/ employee system as a service production strategy. *Academy of Management Review*. 8(2), pp.301-310.
- Reinders, M. J., Dabholkar, P. A., and Frambach, R. T. (2008). Consequences of forcing consumers to use technology-based self-service. *Journal of Service Research*. 11(2), pp.107-123.
- Shimp, T. A., and Kavas, A. (1984). The theory of reasoned action applied to coupon usage. *Journal of Consumer Research*. 11(3), pp.795-809.
- Simon, F. and Usunier, J. (2007). Cognitive, demographic, and situational determinants of service customer preference for personnel-in-contact over self-service technology. *International Journal of Research in Marketing*. 24(1), pp.163-173.
- Smith, A. K., and Bolton, R. N. (1998). An experimental investigation of customer reactions to service failure and recovery encounters. *Journal of Service Research*. 1(1), pp.65-81.
- Venkatesh, V. (2000). A theoretical extension of the technology acceptance model: four longitudinal field studies. *Management Science*. 46(2), pp.186-204. 57
- Venkatesh, V., and Davis, F. (1996). A model of the antecedents of perceived ease of use: development and test. *Decision Sciences*. 27(3), pp.451-482.
- Venkatesh, V., Morris, M. G., and Davis, G. B. (2003). User acceptance of information technology: toward a unified view. *MIS Quarterly*. 27(3), pp.425-478.
- Venkatesh, V., and Morris, M. G. (2000). Why don't men ever stop to ask for directions? Gender, social influence, and their role in technology acceptance and user behaviour. *MIS Quarterly*. 24(1), pp.115-139.

- Walker, R. H. (2002). Technology-enabled service delivery: an investigation of reason affecting customer adoption and rejection. *International Journal of Service Industry Management*. 13(1), pp.91-107.
- Webster, J., and Martocchio, J. J. (1992). Microcomputer playfulness: development of a measure with workplace implications. *MIS Quarterly*. 16(2), pp.201-226.
- Weijters, B., and Falk, T. (2007). Determinants and outcomes of customers' use of self-service technology in a retail setting. *Journal of Service Research*. 10(1), pp.3-21.
- Wolfenbarger, M., and Gilly, M. C. (2003). Etailq: dimensionalizing, measuring and predicting etail quality. *Journal of Retailing*. 79(3), pp.183-198.
- Yen, H. R. (2005). An attribute-based model of quality satisfaction for internet self-service technology. *The Service Industries Journal*. 25(5), pp.641-659.
- Yoo, B., and Donthu, N. (2001). Developing and validating a multidimensional consumer-based brand equity scale. *Journal of Business Research*. 52(1), pp.1-14.
- Zeithaml, V. A., and Gilly, M. C. (1987). Characteristics affecting the acceptance of retailing technologies: a comparison of elderly and nonelderly consumers. *Journal of Retailing*. 63(1), pp.49-68.
- Zeithaml, V. A. (2004). Return on marketing: using customer equity to focus marketing strategy. *Journal of Marketing*. 68(1), pp.109-127. 58
- Ziefle, M., and Bay, S. (2005). How older adults meet complexity: aging effects on the usability of different mobile phones. *Behaviour and Information Technology*. 24(5), pp.375-389.

Table 1.1 Regression Results for Hypothesis 1-5

Predictor Variable	R <sup>2</sup>	Beta	P	Significance Level
Perceived Ease of Use	0.326	0.571	0	P<0.001
Perceived enjoyment	0.448	0.669	0	P<0.001
Perceived Speed	0.348	0.59	0	P<0.001
Perceived Control	0.424	0.651	0	P<0.001
Attitude towards self-serving	0.539	0.734	0	P<0.001

Table 1.2 Regression Results for Hypothesis 6

Moderator Variable	Group	R <sup>2</sup>	Beta	P	Significance Level
Need for interaction	High group	.494	.703	0.000	P<0.001
Need for interaction	Low group	.668	.817	0.000	P<0.001

Table 1.6 Regression Results for Hypothesis 7

Moderator Variable	Group	RSquare	Beta	P	Significance Level
Frequency of SST usage	High group	.666	.816	0.000	P<0.001
Frequency of SST usage	Low group	.214	.463	0.013	P<0.05

Table 17: Summarized data output H7