The Influence of User's Trait on Public e-Service Usage: A Self-Service Technology Perspective

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Received: January 23, 2011 Accepted: February 23, 2011 doi:10.5539/ass.v7n7p3

Abstract

This article intends to explore the critical traits of citizens in terms of public e-service usage based on the perspective of self-service technologies (SSTs) as well as the perception towards the e-service quality. A well-designed survey was conducted in Tokyo, a leading e-city, to understand the profile of the user. The result shows that user's traits in terms of "perceived risk" and "need for interaction with public servant" have significant impact on the perception of e-service quality. Towards the end, this article will give several meaningful contributions and practicable suggestions academically and managerially to the policy makers, as well as government CIOs.

Keywords: Public e-service, Self-service technology, User's traits, GCIO

1. Introduction

Public e-service is a tool for governments to connect with their citizens via the virtual channel. The channel presented by public sector can be accessed anytime anywhere by anyone. According to "Service Triangle[1]", the key players within a service are *company*, *employee* and *customer*. Within each player, different types of marketing approach existed. For example, between *customer* and *employee* there is interactive marketing, which referred to the decisive moment of interaction between the front-office employees and customers. This step is of utmost importance, because if the *employee* falters at this level, all prior efforts made towards establishing a relationship with the *customer* would be wasted. In order to capture the complexities resulting from the growing infusion of technology into serving customers, Parasuraman (1996) added *technology* influence into the triangle and named it as "Service Pyramid". "Service pyramid" focuses its attention on the transformation of technology toward each player in the service triangle. Particularly, the process with *technology* in which the *customer experience* will be totally different from traditional human contact, even though the outcome for the *customer* is usually the same.

The main task or responsibility of government CIO is to take the enterprise leadership role in information and IT management and to provide provision to support future projects for competitive value, as well as the management of daily delivery of required I/IT services[2]. From this point of view, government CIO has to draw up a clear roadmap for I/IT strategy and make sure that projects will be delivered to the right persons at right places without any delay.

Moreover, from the perspective of policy marketing, in spite of the limited ability in terms of locking target customers (Snavely, 1991), government agencies, government CIO in particular, still need to know who and where they are. In Snavely's policy marketing model, the core is to target customer along with other facilitators such as service, policy analysis, human resource and so on, which points to the existence of the concept of target customer, but so far no one could suggest a way to identify them for a specific service or policy.

In this study, Self-Services Technology (SSTs) related literatures would be employed as a comprehensive discussion had been done (Parasuraman, 1996; Betson, 1985; Dabholkar, 1996; Meuter et al., 2000; Kolter, 2001). Additionally, concept of service quality will be introduced in order to form a measurement model to test the user's perception on public e-service.

2. Theoretical Framework

In this section, the definition and concept of self-service technologies are first discussed in order to extract major elements which might have the same effect in public e-service context. Then it will be followed by the discussion on the e-service quality as perceived by user, where a framework was established and used as the measurement for later empirical experimentation.

2.1 Self-Service Technologies

Self-Service Technologies (SSTs) refers to "technological interfaces that enable customers to produce a service independent of direct service employee involvement" (Meuter et al., 2000). During the process of using SSTs, user will finish the service by himself/herself with technical interface facilities (Hoffman and Betson, 2001). Therefore, the difference between traditional service and self-service are the level of "interface" and "personal interaction". There are many kinds of self services, and one of them is interactive kiosks such as vending machine, automatic tailor machine (ATM), ticket machine, information kiosk, and car auto-washing. The other kind is online service or e-service like online ticket purchasing system, e-ticket system for airline check-in, online hospital registry, railway e-ticket and so on.

Regarding the advantages of adopting SSTs, so far there is no consensus. Globalization and internationalization force enterprises to keep their cost down, so that if the process can be designed in such a way that customer is able to serve himself/herself, the cost can be kept down so that the company can be profitable (Lovelock and Young, 1979). Moreover, to view customer as the employee, it would not only save cost but also increase the service quality (Bowen, 1986). Fenili (1985) argued that a well-designed service system must integrate self-service and full-service, so that the system can increase organization's overall service performance. If a company can have an effective self-service system, it helps to increase productivity (Dabholkar, 1996). In addition, Parasuraman (1996) enhanced the original service marketing triangle by adding *technology* factor, and it was called service marketing pyramid. Service encounter can be seen as a dynamic interaction among *employee*, *company* and *customer*. Once technology is implemented in service delivery process, not only service employee (internal customer) can utilize self-service to make their jobs more efficient, but customers are able to finish much more services by themselves too.

2.2 Three Determinants of SSTs Usage

Even though there are many factors which might influence the usage of SSTs, this study will only emphasize on three of them which are "technology anxiety", "perceived risk" and "need for interaction with service employee".

"Computer anxiety" is defined as "the fear, apprehension and hope people feel when considering use or actually using computer technology (Meuter et al., 2003). The *technology anxiety* was extended from computer anxiety by Meuter et al. (2003). Comparing with former concept, *technology anxiety* focused on a user's state of mind about general technology tools whereas computer anxiety is more narrowly focused on anxiety related to personal computer usage. Moreover, *technology anxiety* also demonstrated the mental status specifically in terms of people's willingness as derived from the competency to use technology-based tool. Prior research shows that *technology anxiety* has a negative effect on customer satisfaction and behavioral intention to reuse SSTs (Meuter et al., 2003).

Perceived risk referred to the feeling of uncertainty regarding possible negative consequences of using a product or service (Featherman and Pavlou, 2003). It was considered traditionally as a combination of uncertainty plus seriousness of outcome involved and the expectation of losses in terms of purchase and acted as an inhibitor to purchase or using behavior (Featherman and Pavlou, 2003). Perceived risk has been thought as one of the most important factors which might affect consumer behavior in marketing related literature. Many discussions in terms of e-services or SSTs converged their efforts on the psycho-social and performance risk, as well as introducing new items such as privacy (Featherman and Pavlou, 2003). In addition, social risk was adopted in order to explain the concept of "self-consciousness[3]" as using technology-based self-service (Dabholkar and Bagozzi, 2002). Their research told an interesting fact that people with greater self-consciousness will hesitate to use SSTs. In this case, social risk is an influential factor, making a person reluctant to use the technology-based services.

"Service encounter", a key element affecting a customer's perceived quality within a service has been taken into consideration and was referred by many people as "the moment of truth". It is defined broadly as a period of time during which a consumer directly interacts with a service, which includes the interaction between customer and service delivery system comprising service employees, facilities, and other tangible factors. Dabholkar

(1996) used the term, "need for interaction with a service employee", to illustrate the phenomenon where people have the need to be served during the process of service, and this interaction within a service delivery process is quite critical to some consumers (Betson, 1985). In addition, in the context of self-service technology, users with need for interaction with service employees will avoid using self-service technology like ATM, and vice versa. Similar concept and finding was proposed by Meuter et al. (2000) as well.

2.3 Perceived e-Service Quality

In Technology Acceptance Model, most studies employed the "intention to use" as the dependent variable to assess the influence made by system variables such as perceived ease of use and perceived usefulness. However, between "intention to use" and those system variables, the factor called "attitude toward use" is often discussed. Here this article employs the term "perceived service quality" to represent user's attitude toward use from the service marketing perspective.

Service quality has been shown to promote user satisfaction in the literature of the IS field (Collier and Bienstock, 2006) and customer satisfaction and loyalty in the marketing field (Santos, 2003). More recently, interest in service quality has shifted to reflect current developments in e-commerce which emphasize the role of service quality. E-service quality can be described as overall customer evaluations and judgments regarding the excellence and the quality of e-service delivery in the virtual marketplace (Bitner et al., 2002). Online transaction is a complex process that can be divided into various sub-processes such as navigation, information searching, negotiation, online payment, delivery, and after-sales services. Thus, e-service quality contains multiple-components, which reflects two attributes in its measurement, namely *system attribute* and *service attribute*. *System attribute* stresses technological elements, such as efficiency, speed, and security, while service attribute has been addressed in many service quality literature. On the other hand, e-service quality is not solely an evaluative outcome of a system, and the essence of service quality is customer service such as order delivery and after-sales service.

Obviously, e-service is different from traditional service in terms of character and nature. Traditional service industry makes contact with customer by setting a service site to provide face to face service delivery. However, e-service creates occurrences of a human to machine interaction instead of the typical human to human interaction. Users do not know who/what is serving them, nor can they see/feel the attitude of the service personnel serving them, making its measurement context vastly different from those of traditional service..In this case, the connotation of e-service quality cannot be covered by using traditional service quality model completely. Furthermore, there are some differences in user's viewpoint between traditional service quality and e-service too.

Since the business model of e-service is quite different from traditional service industry, the dimensions of e-service quality need to be restructured by reviewing the business model of e-service, and those used in real environment should not be applied blindly within the virtual world. For example, there are huge differences between online store and real brick-and-mortar store, even though both are part of the retail industry. In this case, the retail service quality scale cannot be applied to online retail store due to the differences in nature (Dabholkar, 1996). Additionally, within those dimensions, different service quality dimension has different influence on consumer's perceived service quality. In other words, only few of them are able to fulfill and achieve consumer's service quality requirement. SERVQUAL scale developed by Parasuraman et al. (1988) and related models have established a perfect benchmark in terms of service quality measurement. However, as the speedy development of emerging technology and the pervasion of SSTs, e-service continues to face new challenges in terms of individualization and Self-service (Nunnally and Bernstein, 1994).

3. Methodology

3.1 Hypothesis and Questionnaire Design

Based on above discussion, this study established a conceptual framework in order to illustrate the relationship between public e-service user's traits and his/her perception to it. Assuming in the context of a public e-service, when users display the willingness to use e-service, it means that these users had executed the behavior in terms of system usage. The public e-service is defined as an Internet-based self-service technology. User is able to interact with the government through its website and completes these public services online. Within this context, this study proposed that user's characteristics will, significantly, affect his or her perception on public e-service quality. "Technology anxiety", "perceived risk" and "need for interaction with service employee" are selected to be the user's traits, while "security", "reliablilty", "customization", "responsiveness" and "interface" represent factor(s) of perceived e-service quality (Van Riel et al., 2003).

A survey was conducted to test this hypothesis, and a seven-point Likert scale was employed. Most of the related studies were conducted using the same scale as ambiguity of respondents can be avoided with better discriminability. The scale was measured from 1, as "strongly disagree," to 7, as "strongly agree". In addition, content validity (also known as logical validity) refers to the extent to which a measure represents all facets of a given social construct. In this study, all measurements are derived from previous researches which give this study adequate content validity. . The construct and its source are shown as below.

3.2 Sampling

This study has selected Tokyo as its research target, Tokyo has initiated an ICT based project called e-City for its 3.3 million citizens in 2001. This project contained three major parts which are infrastructure, application and government. In terms of government, Tokyo government created a sub-project called e-capital promotion project, and focused on four initiatives, both internally and externally. One of them is to increase user's perception on e-service for both its inhabitants and enterprises, and it has already obtained a great success. Moreover, the citizens in Tokyo are considered to have high technology readiness, thus they are highly capable of using technology-based services or products. Therefore, this study had chosen the "e-city project of Tokyo" as the target, and sent its questionnaire to those users who had previously used the e-service offered by Tokyo government.

Samples of this survey were extracted from the database of Goo research[4] a nationwide research company monitoring more than 4 million samples around Japan. In order to meet the requirement of the sampling, a pre-test, which contained 3,700 questionnaires, was sent to these potential respondents in this database and 1333 replied. Among the respondents, 301 who had previously used the e-service of Tokyo were willing to proceed with the survey. Finally, 105 samples were obtained to continue the following analysis with a response rate of 34.8%.

Regarding the analytical method, Partial Least Square (PLS) method was adopted. Partial Least Squares (PLS) method (Chin & Newsted, 1999) is a useful alternative to Covariance-based SEM. PLS can be a powerful method of analysis because of the minimal demands on measurement scales, sample size, and residual distributions (Chin & Newsted, 1999), hence, this method is usually termed "soft modeling". PLS models can be specified by an arrow scheme and each latent variable (LV) is indirectly observed by a block of manifest variables (MVs). LS (Least Squares) estimation is distribution-free, except for predictor specification, and does not require independence of observations. Predictor specification can be summarized as a linear conditional expectation relationship between dependent and independent variables, and LS modeling based upon predictor specification is prediction-oriented (Wold, 1985). That is, the variance-based approach of PLS shifts the orientation from casual model/theory testing to component-based predictive modeling (Chin & Newsted 1999). In some situations, there are many variables but not necessarily as many samples and observations. PLS is considered especially useful for constructing prediction equations in such situations (Garthwaite, 1994), and the sample range of minimal recommendations is from 30 to 100 cases (Chin & Newsted, 1999). Due to the limitation of field survey, in which a total of 105 cases were obtained in Tokyo, PLS method was adopted to analyze the data.

This study utilized *SmartPLS* software developed by Ringle, Wende, and Will (2005) at University of Hamburg, and it has been adopted in most of academic researches. *SmartPLS* is Java-based which is independent from the user's operating system and only raw data can be analyzed. The model is specified by drawing the structural model for the latent variables and by assigning the indicators to the latent variables via "drag and drop". The output is provided in HTML, Excel or Latex format, as well as a parameterized path model. Bootstrapping and blindfolding are the resampling methods available. As for the resampling method, Bootstrap is adopted in this study. The bootstrap samples are built by resampling with replacement from the original sample. The procedure produces samples consisting of the same number of units as in the original sample. The number of resamples has to be specified. The default is 100 but a higher number (such as 200) may lead to more reasonable standard error estimates. In this study, the number of "300" is used to resample the cases.

4. Analysis and Findings

4.1 Factor Analysis

A factor analysis was conducted first to eliminate and filter inadequate variables in order to move into the next stage. 26 variables have remained with relative high factor loading from 0.72 to 1 which means these MVs were highly correlated on measuring a single LV than on other LVs. Again, the correlation matrix (Table 4) revealed that the correlations between the MVs intended to measure the same factor were significantly higher than between those designed for different factors.

4.2 Reliability and Validity

As shown in Table 3, AVE of each LV is from 0.638 to 0.8043 and composite reliability of each LV is from 0.8397 to 0.9208. All values are above the required thresholds, so the measurement models are considered to possess both high reliability and convergent validity.

Regarding discriminant validity, Fornell and Larcker's (1981) criterion shows positive result for all constructs, and AVE is larger than the correlations between the LV and other LVs which means the discriminant validity is adequate. In table 4, all AVEs (the italicized numbers on the diagonal) were larger than the inter-construct correlations (the numbers off the diagonal). Thus, the revealed LV structure (convergent validity) can be deemed as being able to explain sufficiently the model and this structure includes all unique MVs (discriminant validity).

The coefficient of determination (R^2) describes the share of the variance of an endogenous construct explained by the relationship in the model. The R^2 of perceived e-service quality is reasonable, however, the model still need to be improved by adding other parameters to get a better explanation power.

4.3 Path Analysis

Perceived risk has a significant negative relationship (path coefficient = -0.3579, $p<0.01$) with perceived e-service quality. User with high risk tendency will avoid using technology based service, and perceive it as being of low ease of use. Consequently, he/she will perceive a lower quality as using e-service. Featherman and Pavlou (2003) integrated the factor of perceived risk into TAM, and it was found to exert a strong inhibiting influence on TAM's criterion variables.

"Need for interaction with service employees" is also a significant factor toward perceived e-service quality (path coefficient = 0.4142, $p<0.01$). It means the factor, "need for interaction with service employee", will positively influenced user's perceived quality towards e-service. However, the direction is opposite to the proposition from SSTs literature (Dabholkar, 1996). User who needs to interact with service employee during service encounter in public e-service context will have a positive image toward e-service.

"Technology anxiety" has an insignificant relationship with perceived service quality (path coefficient = -0.0117). The higher the technology anxiety, the more the user will refuse to use technology based service. Moreover, those who have higher technology anxiety will be of lower self-efficacy as well, therefore they will hardly perceived ease of use during the service encounter.

5. Conclusions and Further Research

This article focuses on the determinants of e-services usage from SST perspective. Based on prior researches, the user's characteristics - technology anxiety, need for interaction with service employee and perceived risk - are proposed to be the key factors in influencing their usage on SSTs. The results partially support the proposed research model in the context of public e-service.

First of all, the two factors, "need for interaction with service employee" and "perceived risk", are found to affect user's perception on e-service quality significantly, while "technology anxiety" does not show the significant relationship at the same time. Based on the results, it's clear that service encounters are very important to customer, whether it is human (service employee) or machine (technologies) contact. .However it is difficult to control the service delivery process, within the context of self-service, as service employee is not able to interact with customer directly.

Moreover, technology anxiety is shown as an insignificant factor toward perceived quality of e-service in this study. It is telling that the effect of technology anxiety is still ambiguous. Until now, there is no clear evidence to show that the technology based characteristics such technology anxiety or technology readiness are related to country or race, culture factor seemed to have some relations to that. According to Elliott et al. (2008), their research was to assess differences in American and Chinese students with respect to their level of "technology readiness", and the findings showed that Chinese students exhibited a lower propensity to embrace and use new technology than do American students. Similarly, the effect of technology anxiety might be different due to cultural factor. However, the research didn't include it since it focused on the relationship between user's traits and the perception on e-service quality in a specific context. Nevertheless, the importance of cultural can't be ignored, and could be suggested as a point of further research.

Regarding the managerial meaning might be related to government's internal administration, as two factors, "need for interaction with service employee" and "perceived risk", are confirmed to be related to perceived quality. For government, when designing its e-service architecture, it is of utmost importance that it eliminates or reduces system risk as perceived by users. Evidently, this differs slightly from commercial service, as users do

not trust public e-service, probably due to privacy concerns. Meanwhile, the more interaction the users have with employee, the more they are able to understand and accept e-service. Thus, government agencies should educate or provide necessary help to users before or while they are using the system.

While most e-government or e-services researches focus on system or internal efficiency improvement, this study tries to raise another important topic regarding user's traits and their perception on quality as well as examining the causality under a self-service technology context. The findings contributed to our knowledge of theoretical development regarding e-governance, service marketing and policy marketing.

Despite all the care given to this study, there are several limitations in the present study that should be noted and addressed in any future research. First of all, this research empirically tested the e-services usage of Tokyo, and it did not select any specific e-service from it. As there are great variety and diversity in e-services, the characteristics of each e-service might have a possibility of influencing the results in ways unknown. Future empirical study should select a particular e-service to eliminate any possible variance.

Another issue is the sample size. For this study, the sample size is just over 100, and it is accepted by PLS definitely. However, PLS is used to discriminate the relationship between variables, but has nothing to do with cluster analysis and so on. The users in this study should be able to be grouped according to their traits which will then be meaningful to describe the behavior of each group academically and practically.

Acknowledgement

The author gratefully acknowledges the assistance of Phaik-Imm Goh.

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Notes

Note 1. Kolter mentioned this concept firstly in his book, "Marketing Management: Analysis, Planning, Implementation and Control", in 1994, and it serves for a general service industry.

Note 2. Model CIO Study, US DOD, December 2002.

Note 3. Self-consciousness referred to a person's view of himself/herself as a social object, with an acute awareness of other people's perspectives about him/her.

Note 4. Goo research is a NTT-based company whose main business is Internet-based research and database maintenance.

Table 1. Questionnaire design

Construct	Operational definition	Item and number		Source
Technology Anxiety	The fear, anxious and aspire as people are using or going to use technology-based services.		5	Meuter et al. (2003)
Need for Interaction	People would like to interact with service employee rather than using technology-based service anytime and anywhere.	Need interaction with service employee	3	Dabholkar (1996)
Perceived Risk	The risk or insecurity that people perceived as they use technology-based service.		3	Featherman and Pavlou (2003)
Perceived e-Service Quality	People's evaluation toward e-service in terms of responsiveness, reliability, customization, security, user interface and overall aspect.	Responsiveness	3	Van Riel et al. (2003)
		Reliability	3	
		Customization	3	
		Security	3	
		User Interface	3	

Table 2. Result of Factor Analysis

Construct	Initial Items	Final Items	MV	Factor Loadings
Technology Anxiety	5	3	TA2	0.9018
			TA4	0.7229
			TA5	0.7604
Need for Interaction	3	2	NISP1	0.8791
			NISP2	0.9143
Perceived Risk	3	3	PR1	0.8191
			PR2	0.8974
			PR3	0.806
e-Service Quality	16	5*	OVERALL	0.8552
			CUS	0.8788
			REL	0.8133

*After data reduction (factor analysis)

Table 3. Reliability and validity

	Convergent Validity			Discriminant Validity	
Construct	Factor Loadings	Composite Reliability	AVE	Fornell/Lacker	R^2
Criterion		>0.7	>0.5	<AVE	
Technology Anxiety	0.9018	0.8397	0.638	0.4167	
	0.7229				
	0.7604				
Need for Interaction	0.8791	0.8915	0.8043	0.2449	
	0.9143				
Perceived Risk	0.8191	0.8792	0.7086	0.1769	
	0.8974				
	0.806				
e-Service Quality	0.8552	0.9208	0.6995	0.6492	0.3784
	0.8788				
	0.8133				
	0.7913				
	0.8403				

Table 4. LV correlation

	ESQ	Interaction	PR	TA
ESQ	***0.8364***			
Interaction	0.4949	***0.896827743***		
PR	-0.4206	-0.1835	***0.8418***	
TA	-0.1311	-0.0744	0.3321	***0.7987***

Note: The italicized numbers on the diagonal are AVEs.

Table 5. Path coefficient and its t-statistic

Constructs	ESQ
TA	-0.0117 (0.1044)
Interaction	0.4142*** (3.9809)
PR	-0.3579*** (3.9858)

Note: Values in parentheses are t values, *P<0.1, **P<0.05, ***P<0.01

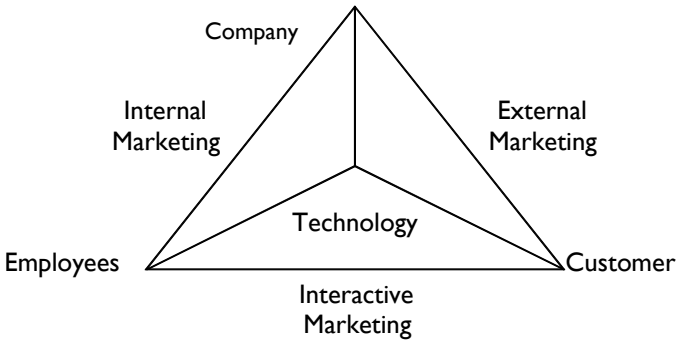

Figure 1. Services Marketing Pyramid

Source: Kotler (1994), Parasuraman (1996)

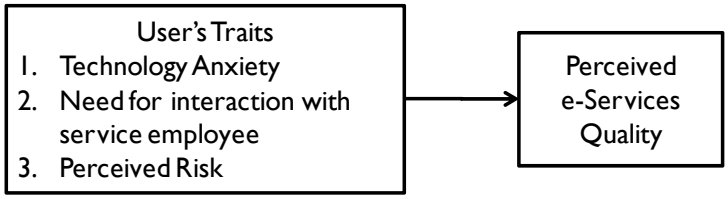

Figure 2. Research structure