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Information Systems Success in the Context of Internet Banking: Scale Development

SENTHILARASU BALASUBRAMANIAN, Ph.D

Associate Professor, Department of Management Studies, National Institute of Technology, Tiruchirappalli, Tamil Nadu, India

Postal Address: National Institute of Technology, Tiruchirappalli-620015, India

Authors Personal/Organizational Website:

<http://www.nitt.edu/home/academics/departments/management/faculty/asstprof/drbsenthil/>

Email: arasu@nitt.edu

Dr. Senthil Arasu Balasubramanian is the Associate Professor of Management studies department, at the National Institute of Technology, Tiruchirappalli, India. His current research interests are on Indian Capital Market, International Trade Finance and Documentation, and Merchant Banking and Financial Services.

VEERARAGHAVAN JAGANNATHAN, M.E

Research Scholar, Department of Management Studies, National Institute of Technology, Tiruchirappalli, Tamil Nadu, India.

Postal Address: National Institute of Technology, Tiruchirappalli-620015, India

Email: vjveeraraghavan@gmail.com

Veeraraghavan Jagannathan is a Full time Research Scholar of the Management Studies department at the National Institute of Technology, Tiruchirappalli, India. His research areas are Information Systems, Technology adoption, information retrieval, data mining, and big data and machine learning.

THAMARAISELVAN NATARAJAN, Ph.D

Associate Professor, Department of Management Studies, National Institute of Technology, Tiruchirappalli, Tamil Nadu, India

Postal Address: National Institute of Technology, Tiruchirappalli-620015, India

Authors Personal/Organizational Website

<http://www.nitt.edu/home/academics/departments/management/faculty/associate>

professors/drthamarai/

Email: selvan@nitt.edu

Dr. Thamaraiselvan Natarajan is the Associate Professor, of Management studies department, at the National Institute of Technology, Tiruchirappalli, India. His current focus research areas include Services marketing, Branding strategies, retail marketing, e-marketing, buying behavior and Social marketing.

Abstract

The Internet has revolutionized services across institutions. The Banking sector has registered significant change in the quality of service owing to the bandwidth of information flow ensuring greater customer-satisfaction. This has also brought into perspective the security environment within which information flow takes place. This paper initiates a few viable steps through scale development for Information System success with respect to Internet Banking. It attempts to fine tune the design efficiency of the measuring tool, at an individual level, for IS success. Towards this end, the study takes the empirical route for, qualitatively and quantitatively, testing and validating the outcomes for enhanced perceived security in select Indian nationalized banks. The present study examines the user satisfaction; individual impact; information, system and which impact IS success. It revisits the methods by which these variables are, hitherto, measured. It proceeds towards a scale development after examining the responses from 520 samples. The findings are based on the development of a six-factor scale. While the study has particular relevance for individual users of net-banking, it has promise for wider application at the organizational level as well.

Keywords: Banking; Information system success; e-banking; internet banking; net banking, Scale development-net banking; internet banking success; research study; India

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INTRODUCTION

The Internet is the nervous system of the 21st century. The World Wide Web has integrated people and systems like never before. Every organization, today, is harnessing the benefits of the Internet's neural network; and, the banking sector is no exception. The banking sector has always been in the vanguard of technology in order to add value to its products, services and efficiency. The Internet has galvanized business by increasing customer base, reducing transaction costs, and enabling sale of products globally. However, the Internet's Achilles' heel is the security architecture. Investing in a new information system or updating the current one is not cost effective for any

organization. Technology investment results from careful consideration based on evaluation and analysis of the pay offs for future success. This research paper is concerned with Information Systems (IS) success in internet banking and its security concerns at the individual level of analysis.

THEORETICAL BACKGROUND

Delone and McLean (1992) in their landmark paper proposed a causal model for IS success by factoring success as an integration of system quality, information quality, user satisfaction, use, individual impact and organizational impact.

According to this model the system quality and information quality affect user satisfaction and use.

The model also posits use and user satisfaction as interdependent factors in a reciprocal compact. Moreover, it presumes that the interdependent factors are direct antecedents of individual impact which, in turn, affects organizational impact. Empirical investigation was carried out on the model, fully and partially, in various settings and contexts. The model was further developed with the inputs of Pitt, Watson and Kavan (1995) and Seddon and Kiew (1994). Recommendations of Pitt et al. (1995) resulted in the incorporation of service quality as a new dimension. The model underwent fine-tuning with the comments of Seddon and Kiew (1994) resulted in grouping of individual and organizational impact into one variable as net benefits and also the use variable now has two meanings, depending upon its volitional or mandatory use. For Volitional use one "use" may be used as the construct in the whereas for mandatory use one may use "intentions to use" as the construct. We shall briefly discuss the IS success constructs and measures in the forthcoming sections.

System Quality

Delone and McLean (1992) characterize system quality as desired characteristics of the information system itself. They incorporate four instruments: convenience of access, flexibility of the system, integration of the system and response drawing from (Bailey & Pearson, 1983). The other measures include: realization of user expectations (Barki & Huff, 1985); response time (Srinivasan, 1985); reliability, response time, ease of use, ease of learning (Belardo & Karwan, 1982); perceived usefulness of IS (Franz & Robey, 1986); resource utilization, investment utilization (Kriebel&Raviv, 1980); IS sophistication, use of new technology (Lehman, 1986); flexibility of system (Mahmood, 1987); system reliability, system accessibility (Srinivasan, 1985); perceived ease of use based on Technology Acceptance Model (TAM) (Davis, Bagozzi, & Warshaw, 1989); ease of navigation, privacy, security, and customization (Molla & Licker, 2001, Palmer, 2002); access (Gable, 2008); customization, ease of learning, sophistication, system features (Gable, 2008, Sedera, 2004); data accuracy, efficiency (Gable, Sedera & Chan, 2008).

Information Quality

Information quality refers to the quality of the information or the output that the system produces. The operational potential of information quality (Bailey & Pearson, 1983) depends on factors like accuracy, precision, currency, timeliness, reliability, completeness, conciseness, relevance, and the preferred format. The other measures include sufficiency, understandability, freedom from bias, timeliness, reliability, relevance

to decisions, comparability, quantitiveness (King & Epstein, 1983); completeness of information, accuracy of information (Miller & Doyle, 1987); ease of navigation, privacy, and security (Molla & Licker, 2001, Palmer, 2002) as well as customization which are some of the system quality measures discussed by Delone and McLean (2003) in the extended model

Service Quality

A very popular measure for service quality in IS is developed by Pitt et al. (1995). The dimensions of the instrument include tangibles: reliability, responsiveness, assurance, and empathy.

Delone and McLean (2003) found that the importance of the relationship by the user is predominantly increasing in the IT departments, hence, they emphasized on developing a construct measurement on service quality in order to update their model.

Intentions to use/Use

Delone and McLean (1992) posit system use as a success measure in many IS conceptual models and empirical studies. The measurement construct includes actual use (King & Rodrigues, 1978; Lucas, 1973; Lucas Jr., 1978; Swanson, 1974), as opposed to reported use (Fuerst & Cheney, 1982; Maish, 1979). The other measures include frequency of use (Culnan, 1983), frequency of general use, frequency of specific use (Fuerst & Cheney 1982), motivation to use (DeSanctis, 1982), use in support of cost reduction, management, strategy planning, and competitive thrust (Zmud, 1987). Some of the use constructs identified in the updated model include number of site visits, navigation patterns, nature of use and number of transactions used (Delone, 2004).

User Satisfaction

The research by Seddon (1997), measured the user satisfaction based on the study of (DeLone, 1992), utilizing the measures of system quality and information quality separately to measure the overall user satisfaction. These variables have been extensively studied by various authors in a variety of contexts. In the beginning, studies limited themselves to a single item to measure user satisfaction (Ginzberg, 1981, Lucas Jr, 1981). Later studies extensively used the scale as a multiple item measurement (e.g., Bailey & Pearson, 1983, Ives, Olson & Baroudi, 1983; Kriebel & Raviv, 1980; Swanson, 1974). Other measures include user information satisfaction (Barki & Huff, 1985, Baroudi, Olson & Ives, 1986); user satisfaction (Doll & Ahmed, 1985); overall satisfaction (Ginzberg 1981; Mahmood 1987); overall user satisfaction (Rushinek & Rushinek, 1985 & 1986)); overall satisfaction and decision making satisfaction (Sanders & Courtney, 1984 & 1985). However, these instruments also contain items related to system, information, and service quality, besides measuring user satisfaction. Accordingly, other items have also been developed to exclusively measure user satisfaction with an IS. Some of the exclusive measures include, but not limited to adequacy, effectiveness, efficiency, overall satisfaction (Almutairi & Subramanian, 2005, Seddon & Kiew, 1994); enjoyment, system satisfaction (Gable et al., 2008).

Net Benefits

The review of literature points to the limitations of a system to accurately target a single measure of net benefits. In the E-commerce environment, the task is not any easier. Different researchers have employed different measures to operationalize the net benefits construct. However, these measures tend to cluster into three major areas:

financial outcomes, efficiency outcomes, and customer relationship outcomes. This paper aims to assess the net benefits at the individual level. Some measures identified at the individual level (DeLone, 1992), include, individual learning (Lucas Jr, 1980); understanding of a problem and test scores related to the problem (Lucas Jr 1981); information recall (Watson & Driver, 1983); decision effectiveness in terms of average time (Benbasat & Schroeder, 1977, Benbasat & Dexter, 1979); confidence on the Productivity improvement and user productivity (Rivard & Huff, 1985, Hughes, 1987). The aforementioned measures do not have appreciable compatibility in the e-commerce environment.

E-Commerce Success

In their follow up to the updated model in 2004, DeLone and McLean (2004) discuss how the model can be adapted to E-Commerce. They explain that Volitional use sets E-Commerce System apart from other Information systems. The present authors who propose the extended model to the one proposed by DeLone and McLean (1992, 2003). The measures related to e-commerce success are pooled from literature includes, ease of navigation, privacy, and security (Molla & Licker, 2001, Palmer, 2002) to examine e-commerce success. The E-commerce environment's information quality has been enriched through information personalization and dynamic content (Barua & Whinston, 2000; Parsons, Zeisser, & Waitman 1998), thereby making it a key factor for user satisfaction in the studies (McKinney, Yoon & Zahedi, 2002; Livari, 2005 & Gable et al., 2008).

Service quality in the E-commerce environment reflects the organizational support given to the customer (the E-commerce system user) before, during, and after the exchange cycle. Measures of responsiveness, assurance, and empathy with the customer have been used to operationalize service quality (Liu & Arnet, 2000). Use construct has measures like: number of site visits; navigation patterns; nature of use and the number of transactions used (Delone & Mclean, 2004). Net benefits have cost savings, expanded markets, incremental additional sales, reduced costs, reduced search times (Gable et al., 2008; livari, 2005; McKinney et al., 2002) for organizations and reduced cost, time, accessing of account without geographical limits, diffabled friendly (Angelakopoulos & Mihiotis, 2011) for in an e-commerce success model. Overall, Delone Mclean (2004) claim that the same model can be effectively adapted to e-commerce paradigm also, and invited researchers to validate it across a variety of contexts.

Perceived Security: a measure of net banking success

Despite several technical advancements in Internet security such as cryptography, digital signatures, certificates, authentication, consumers are still anxiety-ridden about the security of monetary transactions over the internet (Yoon, 2010). According to (Chellappa & Pavlou, 2002), perceived information security is defined as the subjective probability with which consumers believe that their personal information will not be viewed, stored or manipulated during transit or compromised by inappropriate parties in a manner consistent with their confident expectations. They also claim that the customer perceptions of information security is influenced by encryption, protection, verification and authentication. The details of the mechanisms and the corresponding technology used in order to implement encryption, protection, verification and authentication is given in Table 1 adapted from (Chellappa & Pavlou, 2002) . The key empirical finding of their research is that Perceived security strongly influences customer trust than financial

liability of the customer. Also antecedents of Perceived security like encryption, protection, and authentication have been supported, while verification is least supported in their study (Chellappa & Pavlou, 2002) as customers are aware of domain names or they use portals like Google to verify the name. In this scenario, privacy of information, protection and encryption are known to have moderate support in their (Chellappa & Pavlou, 2002) study.

Table 1: Technology used to implement Encryption, protection, verification and authentication

Mechanism	Explanation	Technology used
Encryption	Translation of information from its original form (Plain text) into an encoded incomprehensible (Cypher text) form	Secure Socket Layer(SSL)
Protection	Personal information is not compromised	Firewall
Verification	Verifying that the domain name is correct (eg. Citybank.com Vs Citibank.com)	Portal like yahoo or Google
Authentication	Internet retailer’s identity is established through trusted third party	Digital Certificate with Encryption

Kim, Tao, Shin, & Kim (2010) classify security perceptions of customers during e-payment systems into 3 categories viz. security statements; transaction procedures; and technical protections. They claim that Security statements are important to enable trust in the customer with respect to e-payment systems. They found positive association between users’ perceived security and their use of e-payment systems. Yoon (2010) found that security in online banking strongly influences customer satisfaction. The importance of security and privacy for the acceptance of online banking has been noted in many banking studies (Hernandez and Mazzon, 2007; Chen and Barnes, 2007). Security is one of the key factors which strongly influences customer satisfaction (Yoon, 2010), with low or high experience. In a study on Tunisian customers, adoption of internet banking, Ansari (2011) found that perceived security and prior internet knowledge have significant effects on behavioral intention during online banking. The study by Yoon & Steige (2013) provides support for previous research showing that perceived security concern negatively affects Internet banking use. They Yoon & Steige (2013) argue that, in order to build a stronger theoretical framework on Internet banking use, an empirical investigation is necessary and which includes the factors that can positively alleviate customers’ security concern.

The Research Gap and the scale development

It is hard to find a study in the literature which studies IS success in the context of

internet banking. Also there is no scale to exclusively measure IS Success in the context of internet banking with security as a bottleneck which prevents bank customers from using net banking. But security figures under information quality in the updated Delone & Mclean model (2003) and it was measured with a single measure (Molla & Licker, 2001). This is insufficient to measure a very important construct in the context of internet banking because of these studies (Chen and Barnes, 2007; Hernandez & Mazzon, 2007), which found security as the bottleneck in the adoption of internet banking. Hence, this research induces the new dimension on perceived security to the model based on the support of the above discussed literature.

The purpose of this research is to phenomenologically investigate the success of information system in the context of internet banking.

This research takes cues from the (Delone, 2003) model and retains all the dimensions except the dimension of service quality based on the study by Petter, Delone and Mclean (2008). Hence the justification for developing a novel scale to measure information system success in the context of internet banking with constructs perceived security, system quality, information quality, use, user satisfaction and net benefits.

QUALITATIVE INQUIRY

The domain areas for the research related to information success was broadly identified from the previous studies. The identified domain areas are system quality, information quality, and perceived security, intension to use, net benefits and user satisfaction. The first step of the instrument development process begins with pooling of items or measurement scale from previous studies. It has generated 62 items all together, To clearly state, 16 items on system quality, 10 items on information quality, 16 items on perceived security, 6 items on intension to use, 5 items on user satisfaction and 9 items on net benefits. The measurement scale was developed in seven point Likert scale with anchoring range from strongly agree (7) to strongly disagree (1).

These scale items were pretested with a group of experts on the subject which includes one research methodologist, one psychologist, two executives from banks, two academics and one statistician. They evaluated the fitness of each item to the specific domain area. During this process, an interesting issue related to internet banking emerged. The subject experts decided to include two more items in the domain area of system quality. They are: 1. automated refund of money for failed transaction and 2. Automated communication (emails or SMS). The Q-sort procedure was adopted to validate the items that belong to each domain area. All the 64 items were typed in a card and the subjects were asked to sort the items into the categorized domain area. Subject experts have classified the items into 6 major domain areas. In the iteration process, 12 items were misclassified and those items were summarily eliminated from the scale.

Further, all the 52 items were evaluated on how they understand the wording of each of the items in the questionnaire, how they interact and respond to the content of the items, the structure of the question, the ease of answering and the time taken to complete the questionnaire were, collectively, taken into consideration. Suggestions through feedback regarding the format and content of the questionnaire were considered and changes were made to the questionnaire to reflect the respondents' recommendations. During this process, the items were rephrased. The scale was further furnished with personal

characteristics like age, gender, occupation, income, education, internet use. In this manner, the experts assessed content and face validity.

Data Collection

Data were collected from 520 respondents who are customers of a largest public sector Nationalized Bank in India. The responses were collected by visiting the branches in a metropolitan city (Chennai) in South India. The criteria for participating in the survey are minimum 6 months of experience in internet banking.

Purification

The correlation score of each inter item was estimated for each factor and the score which was less than 0.5 was deleted. The inter correlation items pertaining to service quality were less than .5 and all items were deleted. The retained items in system quality are 4, information quality are 5, perceived security are 5, intention to use are 4, user satisfaction are 4 and net benefits are 4. Finally, 26 items were selected for further analysis. The scale purification is performed using Exploratory Factor Analysis (EFA) and further substantiated by Confirmatory Factor Analysis. Exploratory Factor Analysis was performed with principal component method of factoring with Varimax rotation with the 6-factor loading to be extracted in using IBM SPSS - 21. A 6-factor model was estimated.

The factor solution accounted for 80.456% of the total variance, and exhibited a KMO measure of sampling adequacy of 0.798. All communalities ranged from 0.759 to 0.953. Table 2 illustrates the 26 item factor structure. Discriminant validity is justified as indicated by high loading on own factor and low loading on other factors. The scale purification procedure relies on an iteration of confirmatory factor analysis, with the goal to improve the congeneric measurement properties of the scale. A 26 item, six dimension confirmatory factor model was estimated using LISREL 8.72 and the model

was converged with the $\chi^2_{(284)} = 890.74$, (p-value < 0.05). The GFI = 0.88, AGFI = 0.86, CFI = 0.95, NNFI = 0.94, SRMR = 0.027, RMSEA = 0.064. Convergent validity can be assessed from the measurement model by determining whether each indicator's estimated maximum likelihood loading on the underlying constructs is significant. As in the Table 2, all confirmatory factor loading exceed 0.66, and all are significant with t value above 1.96. Therefore, the scale is proved with the evidence of convergent validity. The measurement properties are provided in Table 2 and the final instrument is given at the end of this article.

DISCUSSION AND IMPLICATIONS

IS Success scale captures a wide variety of variables that influence the success of internet banking and it has broad spectrum of applications in internet banking research. In addition to this, the scale can also be applied to other related domains like mobile banking and online shopping, e-ticketing and e-governance. Moreover, the scale can also be used to measure the adoption and acceptance of net banking and other kindred areas discussed above. This new instrument can be used by professionals in the banking sector to measure the success of the internet banking system to attract new customers and to get the customer's job done efficiently. The instrument also helps to manage the resources effectively.

They can now use our new scale to obtain new and reliable insights about their customers by administering it to people belonging to various geographical locations. The measure can also be used to evaluate the bank’s website

Table 2: Measurement properties

Items	EFA Item loadings	CFA Item loadings	t- value	Error variance	R ²	α
IQ1	.84	.76	19.95	.25	.57	
IQ2	.87	.86	24.20	.11	.74	
IQ3	.90	.92	27.04	.08	.85	.923
IQ4	.90	.88	25.25	.12	.78	
IQ5	.85	.78	20.89	.20	.61	
SQ1	.95	.95	29.33	.05	.91	
SQ2	.95	.98	30.60	.03	.95	.958
SQ3	.95	.92	27.44	.09	.85	
SQ4	.90	.82	22.80	.18	.67	
PSC1	.86	.83	23.26	.17	.69	
PSC2	.94	.95	28.81	.06	.90	
PSC3	.95	.97	30.13	.04	.94	.932
PSC4	.89	.87	24.79	.14	.75	
PSC5	.75	.67	17.08	.33	.45	
NB1	.89	.83	22.97	.21	0.69	
NB2	.91	.87	24.95	.16	.76	.939
NB3	.94	.94	28.29	.07	.89	
NB4	.93	.92	27.25	.10	.85	
USE1	.84	.79	20.54	.20	.63	
USE2	.86	.83	21.84	.16	.68	.872
USE3	.86	.81	21.10	.17	.65	
USE4	.82	.75	19.04	.23	.56	
US1	.86	.79	21.35	.21	.63	.922

US2	.91	.90	25.87	.12	.80
US3	.94	.96	28.93	.05	.91
US4	.86	.82	22.36	.19	.67

against competitors' sites. This helps them to update their website accordingly to better their services. Also, it is important for banks to educate the customers about the benefits of transacting online like: 24 X 7 availability, better time management, lesser queue-time. Also there should be an assurance about security of transaction and privacy of customer-information which ought not to be compromised at any cost. As all the dimensions carry very important impacts on overall customer-satisfaction and benefits to customers, periodical administration of the instrument is highly desired to ensure the overall success of net banking operations.

LIMITATIONS AND FUTURE RESEARCH

As with any study, this one also has limitations. However, it has greater relevance if one considers the scope for further research. The authors have emphasized, in this study, the factors which influence the success of internet banking from the perspective of the individual customer. The same instrument may prove its versatility as it finds acceptance among practitioners of banking as well as policy makers to assess the effectiveness from the organizational perspective. Also this study was carried out on only one bank. The same instrument may be used for customers of different public and private banks. Moreover, a comparative study may be done between public and private sector banks on how their customers feel about their net banking operations. It may be observed that this study has not brought under its empirical ambit other online transactions relating to debit and credit cards as they form a big chunk of customer-bank interactions. Future research may include these instruments in their study. Also one should consider using the instrument with advanced techniques like Structural Equation modelling, PLS and Multiple Linear Regression to test the scale in a way that best informs existing literature.

CONCLUSION

The present study has covered appreciable ground in the field of IS success by satisfying expectations with respect to aim, approach, and applicability. It has made a definite contribution to IS success by, qualitatively and quantitatively, fine-tuning a measurement tool with improved design efficiency. The study finds application in the investigation of the relationship among existing measures like system quality, information quality, user satisfaction, use, individual impact as well as organizational impact. The most noteworthy aspect about the study is the promise it holds for managers in decision-making relating to IS success in the banking sector.

The final instrument

SQ1: The net banking website is easy to use

SQ2: The net banking web site provides high-speed information access

SQ3: The banking system provides automated refund of failure transactions

SQ4: The net banking website has attractive user interface

Information Quality

IQ1: The website provides precise information

IQ2: The website provide Account Statements in different formats

IQ3: The website provides accurate information

IQ4: The information in the website is clearly presented

IQ5: The website provide up to date information

Perceived Security (Technology to implement provided in brackets)

PS1: I fear that privacy and integrity of my personal information is compromised (firewall)

PS2: There is no way to verify that I am transacting with whom I intend to (digital certificates)

PS3: I fear the information sent over the internet is not protected (encryption)

PS4: I fear hacker threats of my bank website (Intrusion detection System)

PS5: I fear data loss because of viruses and other malware at the bankers end.(Antivirus)

Use

USE1: I use net banking more often than other form of banking

USE2: I believe net banking use will increase

USE3: My use of Net banking is voluntary

USE4: I log on to my account at least one time a day

User Satisfaction

USE1: The net banking system is efficient

USE2: I strongly recommend net banking to others

USE3: I think I made the correct decision to use net banking

USE4: I am satisfied with the way net banking has carried out my transactions

Net benefits

NB1: I can access my account irrespective of geographical limits

NB2: It provides convenience of access as it is available 24 X 7

NB3: Use of Net banking saves cost and time

NB4: Net banking effortless accessibility for differently abled people

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