Internet Banking Acceptance, Self efficacy and Perceived Security - An Extended Technology Acceptance Model

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Abstract

There are various models to predict factors that influence the adoption of a technology. This study uses the Technology Acceptance Model (TAM). According to this Model (TAM), Perceived ease of use and Perceived Usefulness constructs are believed to be fundamental in determining the acceptance and usage of various IT. These beliefs, however, may not fully explain the user's behavior towards a newly emerging IT such as internet banking. It is proposed to extend this Model (TAM) by incorporating 'Perceived Security' as a new factor that reflects the user's security and privacy concerns in the acceptance of internet banking ,and its influence on an individual's intention to adopt internet banking. Based on a sample of 655 bank customers, the results strongly support the extended TAM in predicting the intention of users to adopt internet banking. It also demonstrates the significance of Computer Self-efficacy on behavioral intention through Perceived ease of use, perceived usefulness and perceived security. It is expected that this study will provide more specific factors that influence consumers' intention to use internet banking.

Key words: Internet banking acceptance, TAM, Perceived Security, Computer Self efficacy

1. Introduction:

Banks have been developing new instruments and services and improving processes, both to reduce costs of existing services and to offer new services. The pace of innovation has increased dramatically particularly with the advances in information processing and communications technologies. Consequently, internet banking has changed the nature of consumer interactions with banks, reducing the importance of physical branch locations which involve face –to-face interactions. Many services are available now through the internet. Internet banking provides a convenient, low-cost alternative to the traditional bank visit.

Internet banking in this study is defined as an internet portal, through which customers can use different kinds of banking services ranging from providing information and bill payment to making investments. Indian banks and their customers enjoy an array of benefits through adoption of internet banking. The Internet and Mobile Association of India report (IAMAI 2006) reveals that the costs

of banking service through the Internet amount to a fraction of the costs through conventional methods. Industry estimates assume teller cost at Re 1/- per transaction, ATM transaction costs at Re 0.45, phone banking at Re 0.35, debit cards at Re 0.20 and Internet banking at Re 0.10 per transaction.

On the whole, one can easily conclude that Internet banking increases operational efficiencies and reduces costs, besides giving a platform for offering value added services to the customer, thereby fulfilling all the essential prerequisites for a flourishing banking industry. In anticipation of efficiency in operating costs, banks seek the diffusion of internet banking. However, banks cannot expect instant returns, unless the Internet population itself reaches a critical mass.

On the customers' side also there are many advantages. First, there is twenty four hour access. And second, banks can be accessed from anywhere in the world at one's own convenience. Additionally there is time savings, convenience, increased access to information on their bank accounts and effective management of personal finances.

Although the advantages of internet banking seem to pull consumers towards its usage, the evidence for consumers' reluctance to use internet banking calls for a scholarly inquiry into the underlying factors influencing individual consumers' decision to adopt internet banking. Human beings, being creatures of habit will probably view anything that is new with caution and suspicion. The same applies to internet banking. People are cautious and often reluctant to depart from traditional ways of banking to internet banking. Crores of rupees have been spent on building Internet banking systems in India but reports show that potential users may not use the systems in spite of their availability.

This, points out the need for research to identify the factors that determine acceptance of Internet banking by the users. In India, comparatively less number of studies have been conducted on the current status of internet banking and internet banking adoption compared to other countries. Thus, there is a lot of scope for the research to present new ideas concerning internet banking in India which may be useful to the Indian banking industry.

2. Theoretical Underpinnings

There is a growing body of research focussing on examining the determinants of computer technology acceptance and utilization among users (Moore and Benbasat, 1991; Saleh, 2003; Randolph, 2001). Several competing theoretical approaches have been used to investigate the determinants of acceptance and use of information technology (Venkatesh et al, 2003).Important lines of study in this area focus on the determinants of individual acceptance of new technologies by using actual behaviour itself (Davis, 1989; Taylor and Todd, 1995). These various theories explain technology acceptance and adoption. In acceptance studies, researchers focus on the attitudinal explanations of the use of a specific technology or service. The studies rely largely on the following five concepts: perceived user friendliness, perceived usefulness, attitudes towards use, intention to use and actual use.

Adoption research is grounded in three models from social psychology, namely, the Theory of Reasoned Action (TRA) (Ajzen and Fishbein, 1980), the Theory of

Planned Behaviour (TPB) (Ajzen, 1991) and Technology Acceptance Model (TAM). Of the three theories, TAM has emerged as the most powerful and parsimonious theory to represent the antecedents of technology usage through belief in two factors that is, perceived usefulness and perceived ease of use of an information system (Davis, 1989). TAM has received empirical support in information technology research from many research studies regardless of the country concerned (Guriting and Nelson, 2006; Wang et al.2003; Ramayah and Ling, 2002; and Venkatesh and Morris, 2000). Given below is a brief description of the Technology Acceptance Model.
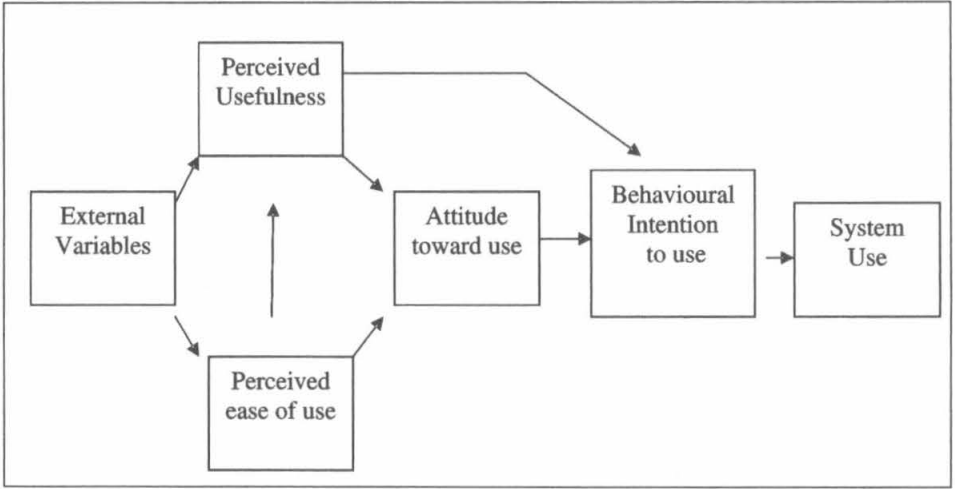
2.1 The Technology Acceptance Model

The TAM is an adaptation of Theory of Reasoned Action (TRA) specifically tailored for modelling user acceptance of new information technology (software information systems within organizations) (Davis, 1989). While TRA suggests that social behaviour is motivated by an individual's attitude towards carrying out that behaviour, it does not specify what specific beliefs would be important in a particular situation. TAM posits that the actual usage of technology can be predicted by user's behavioural intention and his/her attitude towards use, which in turn are influenced by the technology's perceived ease of use and perceived usefulness. TAM adopts the well-established causal chain as follows:

Beliefs >   Attitude   >   Intention>   Behaviour

Davis (1989) used the Theory of Reasoned Action (TRA) and developed the Technology Acceptance Model (TAM). Based on certain beliefs, a person forms an attitude about certain objects, on the basis of which he forms an intention as to how he should behave with respect to that object. The intention to behave is the sole determinant of actual behaviour. Davis adapted the TRA by developing two key beliefs , perceived ease of use (PEOU) and perceived usefulness (PU) to determine individual's acceptance of a technology, more specifically information system usage. The first of these beliefs perceived usefulness is defined as the 'degree to which a person believes that using a particular system would be beneficial or enhance his/her job performance' (Davis, 1989). The second, perceived ease of use is defined as 'the degree to which a person believes that using a particular system would be free of effort' (Davis, 1989). A diagram of the model is presented in Figure one.

**Figure I: The Technology Acceptance Model**

3. The Research Framework

Considering the uniqueness of internet banking and its users, and the simplicity of the Technology Acceptance Model, an extended TAM is used as a theoretical framework to examine the effects of Computer self-efficacy on users' acceptance of internet banking through attitude towards internet banking, where attitude is influenced by three beliefs namely, Perceived usefulness, Perceived ease of use and Perceived security.

The research model tested is shown in Figure two. It includes the individual difference variable 'Computer self-efficacy' and three belief variables (Perceived usefulness, Perceived ease of use and Perceived security)

Figure II: The research model and hypotheses
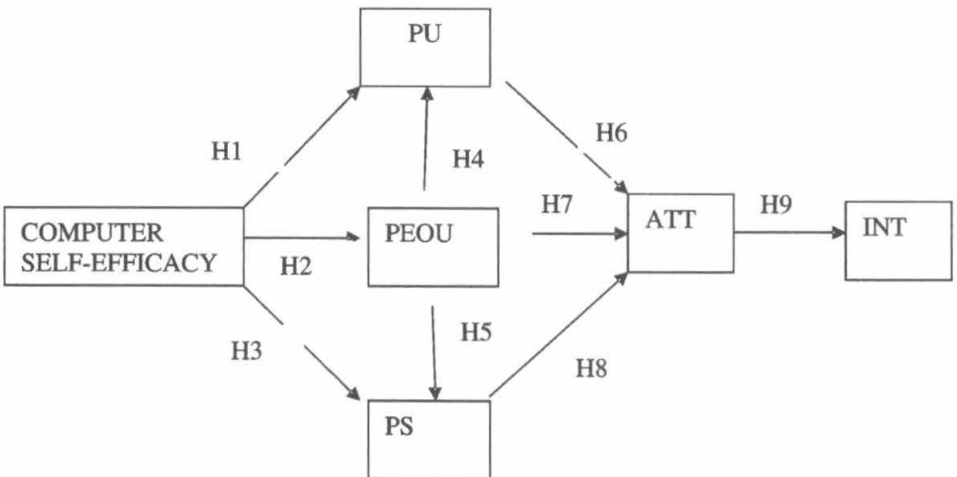
3.1 Computer Self-efficacy

One important factor that influences the adoption of internet banking is the computer and internet proficiency of the consumer. Consumers need to be familiar with computers in general, and should be, to some extent, proficient in the use of web browsers, to engage in computer-mediated communications and transactions. Having proficiency in these areas will increase a consumer's likelihood of adopting internet banking. Self-efficacy has been examined by many researchers (Compeau and Higgins, 1995; Compeau et al, 1999; Hong et al, 2001; Agarwal et al, 2000; Johnson and Marakas, 2000; Chau, 2001). Prior research has suggested a positive relationship between experience with computing technology and a variety of outcomes such as an affect towards computers and computer usage (Levin and Gordon, 1989; Harrison and Rainer, 1992; Agarwal and Prasad, 1999). This confirms the critical role that computer self-efficacy plays in understanding individual responses to information technology. Self-efficacy, in this study has been further extended to the use of internet and is measured as a skill level of consumers in using computers and internet.

3.2 Perceived Usefulness (PU)

Davis (1989) asserts that the decision to use new technology is determined by the extent to which a person believes that it is cost-effective in providing goods or services compared to the current method. PU is defined as the degree to which a person believes that using a particular technology will enhance his performance. The PU is also an important variable from TAM (Araujo and Araujo, 2003; Noteberg et al.2003; Gefen at al., 2003; Matheison, 1991; Malhotra and Galleta, 1999). PU has been confirmed as an important variable that influences user technology acceptance and therefore has received a great deal of attention from previous researchers.

3.3 Perceived Ease of Use

Perceived ease of use refers to the degree to which a person believes that using a particular system would be free of effort. According to TAM, the PEOU is one of the main variables influencing the use of technology. Extensive research over the past years provides evidence of the significant effect of perceived ease of use on usage, either directly or indirectly through its effect on perceived usefulness (Agarwal and Prasad, 1999; Davis et al, 1989; Hu et al, 1999; Jackson et al, 1997; Venkatesh, 1999, 2000; Venkatesh and Davis, 1996, 2000; Venkatesh and Morris, 2000). IT's that are easy to use will be less threatening to the individual (Moon and Kim, 2001). This implies that perceived ease of use is expected to have a positive influence on users in their interaction with internet banking systems.

Therefore the more the consumer perceives internet banking as easy to use, the more he or she is likely to adopt it.

3.4 Perceived Security:

Perceived security is a major reservation consumers have about internet banking. Concerns about cyber crime, transaction security and errors in transactions can limit adoption of electronic technologies (Gingrade, 1998; Simms, 1999). Security is the state of being free from dangers like theft or losing money and information

(Gefen et al, 2003). Consumer concerns about security and privacy have been noted by many experts (Miyazaki and Fernandez, 2001; Gefen et al., 2003; Nissenbaum, 2004). One particular survey by Chung and Paynter (2002) identified consumer fear regarding transaction security as an inhibitor to the adoption of internet banking. Security has also been identified as a key consumer concern in other internet banking adoption studies (Black et al., 2002; Siu and Mou, 2005). Hain et al (2003) observed that non-internet banking consumers were more concerned about security and privacy issues than internet banking consumers.

Security has been identified as one of the biggest barriers for the uptake of internet banking (Sathye, 1999). Cooper (1997) and Daniel (1999) identified that an important factor affecting the acceptance and adoption of an innovation is the level of security and risk associated with it. Even in countries where internet banking has long been established, one of the most important factors slowing its progress is the consumers' concern for security of financial transactions over the internet. Security failure at a particular bank could not only cause large losses for that bank, but could spawn a general lack of reliability in internet banking transactions.

Awamleh and Fernandes (2005) revealed that security of internet banking transactions has a significant impact on customer satisfaction in internet banking. Security of internet banking transactions was significant for those using internet banking for more than two years. O'Connell (1996) and Daniel (1999) discovered that security concern is an important factor which affects acceptance and adoption of a new technology or an innovation.

The hypotheses for the research model are presented in table one.

Table I: Hypotheses for the proposed research model

Hypothesis	Statement
H1	Computer Self-efficacy(CSE) positively influences Perceived Usefulness (PU)
H2	Computer Self-efficacy(CSE) positively influences Perceived Ease of Use (PEOU)
H3	Computer Self-efficacy(CSE) positively influences Perceived Security (PS)
H4	Perceived Ease of Use (PEOU) positively influences Perceived Usefulness (PU)
H5	Perceived Ease of Use (PEOU) positively influences Perceived Security (PS)
H6	Perceived Usefulness (PU) positively influences attitude (ATT)
H7	Perceived Ease of Use (PEOU) positively influences attitude (ATT)
H8	Perceived Security (PS) positively influences attitude (ATT)
H9	Attitude (ATT) positively influences Intention to use internet banking (INT)

4. Research Method

4.1 Research Tool Used

Structural Equation Modelling (SEM) was done using AMOS 18. Structural equation models (SEMs) describe relationships between variables. It is similar to combining multiple regression and factor analysis. SEM offers a more effective way of dealing with Multicollinearity, and has methods for taking into account the unreliability of consumer response data.

4.2 Sample size

The sample size was 655 bank customers. The number of free parameters in this study is twenty four. With regard to sample size while using SEM, McQuitty (2004) suggested that it is important to determine the minimum sample size required in order to achieve a desired level of statistical power with a given model prior to data collection. Schreiber et al (2006) mentioned that although sample size needed is affected by the normality of the data and estimation method that researchers use, the generally agreed-on value is 10 participants for every free parameter estimated. Although there is little consensus on the recommended sample size for SEM (Sivo et al, 2006), Garver and Mentzer (1999), and Hoelter (1983) proposed a 'critical sample size' of 200. In other words, as a rule of thumb, any number above 200 is understood to provide sufficient statistical power for data analysis while using SEM.

4.3 Measures of the Constructs

A questionnaire was used as the instrument for the study. Items selected for the constructs were mainly adopted from prior studies to ensure content validity. Items for Perceived Usefulness (PU), Attitude (ATT) and Intention (INT) were taken from previously validated inventory (Agarwal and Prasad, 1999; Venkatesh and Davis, 1996, Wang et al, 2003) and modified to fit internet banking. Items for Computer Self-efficacy were adapted from Compeau and Higgins (1995). And perceived security was measured by statements specifically developed for this study. Likert scales (1-5) with anchors ranging from "Strongly disagree" to "strongly agree" were used for all questions. The list of items used for this study is presented in table two below

Table II: Measurement items

Measurement items

Computer Self-efficacy (CSE)

- I have sufficient knowledge and ability in using computers and the internet
- I am skilled in using computers and internet
- I would feel comfortable using internet banking on my own
- Given the facilities ,I will be able to use internet banking

Perceived Usefulness ((PU)

- Internet banking enables people to conduct financial transactions more quickly

- Internet banking would improve one's effectiveness in conducting banking transactions

- Internet banking makes it easier to conduct banking transactions

- Internet banking provides convenience since it is available 24 hours, 7 days of the week

- Internet banking saves time compared to traditional banking

Perceived Ease of Use (PEOU)

- It would be easy for me to become skilled in using internet banking

- Learning to use internet banking is easy

- Overall , I believe that internet banking is easy to use

Perceived Security (PS)

- Internet banking systems implement security measures to protect their customers

- Internet banking ensures that transactional information is protected and cannot be altered

- Internet banking systems have adequate safeguard mechanisms to ensure that financial or personal data of customers are not divulged to other parties

- I feel safe about the security and privacy issues connected with internet banking

- Using internet banking is as safe as using other modes of banking.

Attitude (ATT)

- Using internet banking is definitely advantageous

- Using internet banking is a good idea

- Using internet banking is a wise idea

- I would like the idea of using internet banking

Intention (INT)

- I intend to use internet banking in the near future

- Assuming I have access to internet ,I intend to use internet banking

- I intend to increase my use of internet banking in the near future

5. Data Analysis and Results

Data were analyzed using Anderson and Gerbing's (1988) two step approach whereby the confirmatory measurement model was estimated first followed by estimating the structural model. A confirmatory factor analysis (CFA) using AMOS 18 was conducted to test the measurement model.

Reliability of the constructs was assessed by calculating the Cronbach's alpha and for all the constructs the value was greater than the accepted level of 0.7 (Hair et al, 2006). The output showed that each indicator (factor loadings ranging from 0.59 to 0.99) loaded significantly on the constructs ($p<0.001$), which reflects the convergent validity of the constructs (Anderson and Gerbing, 1988). The Average Variance Extracted (AVE) for all the constructs in the model was greater than 0.5, which also supports convergent validity. The AVE values were greater than the inter-construct squared correlation estimates which support discriminant validity of the constructs

as suggested by Fornell and Larcker,(1891).

The chi-square ($\div2$) value was 460.2; degrees of freedom (df) 236; (p <0.001). Common model-fit measures (shown in table three) were used to assess the model's overall goodness of fit : Root Mean Square Residual (RMR), Goodness of Fit Index (GFI), the Adjusted Goodness of Fit Index (AGFI), the Normed fit Index (NFI), Relative Fit Index(RFI), Comparative Fit Index (CFI), Tucker Lewis Index (TLI). The model is found to be an over identified model. The confirmatory factor analysis showed an acceptable overall model fit as shown in table three.

Next the SEM was conducted on the structural model using Amos18 to test the hypotheses formulated in the preceding section. The model fit indices also provide a reasonable model fit for the structural model. Hence it is concluded that the proposed research model fits the data reasonably. The regression weights of the output and result of the hypotheses testing are shown in Table Four. All hypotheses except H5 are accepted.

Table III: Fit indices for the measurement model and structural model

Fit Indices	Measurement Model Values	Structural Model	Recommended Values
Root Mean Square Residual (RMR)	0.01	0.02	<0.05
Goodness of Fit Index (GFI)	0.94	0.93	>0.90
The Adjusted Goodness of Fit Index (AGFI)	0.92	0.92	>0.90
The Normed fit Index (NFI)	0.97	0.97	>0.90
Relative Fit Index(RFI)	0.97	0.96	>0.90
Comparative Fit Index (CFI)	0.98	0.98	>0.90
Incremental Fit Index (IFI)	0.98	0.98	>0.90
Tucker Lewis Index (TLI)	0.98	0.98	>0.90
Root Mean Square error of approximation (RMSEA)	0.03	0.04	<0.05

Table IV : Standardized regression estimates for the hypotheses tested

Hypothesis No.	Hypothesized paths	Path coefficients	Supported/ not supported
H1	PU ← CSE	0.24*	Supported
H2	PEOU ← CSE	0.52*	Supported
H3	PS ← CSE	0.64*	Supported
H4	PU ← · PEOU	0.19*	Supported
H5	PS ← PEOU	0.10	Not supported
H6	ATT ← PU	0.20*	Supported
H7	ATT ← PEOU	0.36*	Supported
H8	ATT ← PS	0.35*	Supported
H9	INT ← ATT	0.40*	Supported

* Significant at p<0.01

6. Findings and conclusion

As proved by earlier researchers, attitude (â = 0.40, p < 0.001) was found to have a significant positive effect on the intention to use Internet banking. The result suggests that it is important to form positive attitude in the minds of consumers before the technology can be accepted. The significant effect of perceived Usefulness (â = 0.20, p < 0.001), Perceived Ease of Use (â = 0.36, p < 0.001) and Perceived Security (â = 0.35, p < 0.001) on attitude is also not surprising. Banks can emphasize and publicize these factors to create a positive attitude among customers towards Internet banking. The findings imply that banks need to make Internet banking easy to use, project its usefulness and display themselves as more secure.

The internet bank website should use appropriate technology, indicating that the transactions performed are encrypted and secured. The website may also be certified by a third party agency such as VeriSign indicating that the website is secure. Strategies can also include adopting the best firewall technologies that exist and embracing the best available encryption, working closely with online security firms, and adopting security and privacy policies. Banks should highlight their assurances to keep private information and transactions safe and secure by a security endorsement from third party agencies such as VeriSign.

While Perceived Ease of Use has a significant effect on Perceived Usefulness (â = 0.19, p < 0.001), it does not have a significant influence on Perceived Security. The results of this study support the hypothesis that Computer Self-Efficacy significantly affects Perceived Usefulness (â = 0.24, p < 0.001), Perceived Ease of Use (â = 0.52, p < 0.001) and Perceived Security (â = 0.64, p < 0.001). This suggests that individuals are likely to engage in Internet banking when they believe that they have the efficacy to use the technology, find it easy to use and also find it secure. This implies that efficacy or confidence to use Internet banking may affect an individual's attitude and thereby his intention to use internet banking.

6. Implications and Contributions to Academic Research

The information systems knowledge base has been greatly benefited from this study. First, the results of this study show that Computer Self-Efficacy influences Perceived Usefulness, Perceived Ease of Use, and Perceived Security, and that these have significant effect on behavioural intention to use Internet banking through attitude towards internet banking.

Second, this study has shown that perceived security is one of the important determinants of individual acceptance of Internet banking. This suggests the call for incorporating security and building trust on internet banking systems as one of the determinants of behavioural intention to use Internet banking as appropriate. Perceived security can also be incorporated in other electronic business models as they also share similar characteristics with Internet banking. The earlier research in the field of social psychology is found to be well-grounded and proved in the information systems adoption field also.

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