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# Enabling internet banking adoption

## An empirical examination with an augmented technology acceptance model (TAM)

Enabling  
internet  
banking  
adoption

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### Abstract

**Purpose** – The integration of relevant antecedents into TAM would lead to better understanding of the decision factors which act as enablers for the adoption of internet banking. The purpose of the paper is to determine the influence of the antecedents subjective norm, image, banks initiative, internet banking self-efficacy, internet usage efficacy, trust, perceived risk, trialability and government support on the existing constructs of the technology acceptance model (TAM) and to test measurement invariance and the moderating effect of the demographic variables on the relationship between the latent constructs used in this augmented TAM.

**Design/methodology/approach** – A survey questionnaire was administered on internet banking users and a total of 300 responses were collected. A two-step approach suggested by Hair *et al.* (2006) and Schumacker and Lomax (2004) was used in this study. The proposed model was assessed using the confirmatory factor analysis approach. The structural model was then tested in order to establish nomological validity. The data based on four demographic dimensions gender, age, income, education were divided into two groups for each of these demographic dimensions. The invariance test was first performed on the measurement model and then on the structural model. The measurement model and structural model were subjected to tests of equivalence of parameters across groups.

**Findings** – To a large extent the results of the study supports the proposed model and thereby contributes to understand the influence of subjective norm, image, banks initiative, internet banking self-efficacy, internet usage efficacy, trust, perceived risk and government support on internet banking adoption. The predictor variables in the augmented TAM were able to explain 29.9 per cent of the variance in the actual usage of internet banking as compared to the TAM which was able to explain only 26.5 per cent variance in the actual usage of internet banking. A significant difference in the relationship between the different constructs of the model was observed when the model was subjected to multi-group invariance testing.

**Research limitations/implications** – The study suffers from the same limitations as most other studies involving TAM. In this study self-reported measures about the usage were taken as the actual usage. The findings of the study can be of use to marketers for target-specific marketing by customizing the marketing campaign focussing on the factors that were found to be strong influencers leading to the usage of internet banking for each target audience.

**Originality/value** – The main challenge in this study was to develop the conceptual model for the internet banking adoption by extending the TAM and to get a robust theoretical support from the extant literature for the relevant factors along with their relationship to uncover new insights about factors responsible for the internet banking adoption. The augmented model had an improved predictive capability and explanatory utility.

**Keywords** India, Internet banking, Technology acceptance model (TAM),

Structural equation modelling (SEM)

**Paper type** Research paper



### 1. Introduction

Internet banking is an alternative channel of service delivery that offers banks several advantages which includes cost reduction, market differentiation, stream lining of work processes, increased sales, increased reach, increased loyalty and the opportunity to attract

new customers. Internet banking channel of service delivery for the customer is a help yourself model which offers any time anywhere access to a broad range of banking products and services. The internet banking channel was introduced in India in the year 1996. Statistics on the channel usage reveal that the internet banking channel is highly underutilized with just over 7 per cent of transactions occurring via this channel even after more than ten years of its introduction. Banks in India have already invested heavily to facilitate and promote this new channel of banking. It has, therefore, become imperative to understand the antecedents of the internet banking usage and the relative influence of these antecedents on the internet banking adoption.

Sukkar and Hasan (2005) felt the need to examine information system models which were developed in western countries in a non-western environment. They argued that the circumstances and conditions that exist in the less-developed countries are not similar to the developed nations where these models have been developed. Bagozzi and Yi (1988) were also of the view that to extend the body of knowledge in the context of consumer behaviour it is essential to validate the models developed in a country in other countries.

The technology acceptance model (TAM) was a parsimonious and robust model which has been generalized and empirically validated for understanding the factors responsible for the adoption of technology (Davis, 1989; Venkatesh *et al.*, 2003; Venkatesh and Bala, 2008; Straub *et al.*, 1995; Szajna, 1996; Adams *et al.*, 1992; Taylor and Todd, 1995; Mathieson, 1991). In view of limited research on the internet banking adoption and to establish external validity of the TAM, the current study was conducted in India using the TAM to address these research issues.

## 2. Literature review

Internet banking adoption studies can be classified as descriptive, relational and comparative. Descriptive studies are concerned with identifying characteristics of the internet banking adopters, the factors that are drivers and inhibitors of internet banking. Relational studies are concerned with explaining the relationship between the factors that lead to the internet banking adoption. Comparative studies are concerned with comparing groups from population, distribution channel and method. Comparative studies may compare the internet banking adoption across countries, distribution channels and studies which compare different models with regard to their explanatory power and predictive value. In this study both relational and comparative methods were employed.

The TAM was proposed by Davis (1986) in his doctoral thesis titled "A technology acceptance model for empirically testing new end-user information systems: theory and results" submitted to the Massachusetts Institute of Technology. The TAM posits that a person's behavioural intention to use a technology is determined by two beliefs: perceived usefulness, defined as the extent to which a person believes that using an IT will enhance his or her job performance and perceived ease of use, defined as the degree to which a person believes that using an IT will be free of efforts (Venkatesh and Bala, 2008). External variables may be system design characteristics, training, documentation and other types of support and decision maker characteristics that might influence usage (Davis, 1989).

The TAM and its extension have been used in varied research studies related to the user acceptance of technology (Rauniar *et al.*, 2014; Pinho and Soares, 2011; Sharif Abbasi *et al.*, 2011; Snowden *et al.*, 2006; Abbasi *et al.*, 2015; Ndubisi and Jantan, 2003; Gangwar *et al.*, 2015; Lee *et al.*, 2015; Elkhani *et al.*, 2014; Lindsay *et al.*, 2011; Lu *et al.*, 2003).

Extant literature shows evidence of plethora of studies which have used the TAM in the context of the internet banking adoption (Bhattacharjee, 2001; Suh and Han, 2002; Chau and Lai, 2003; Ramayah *et al.*, 2003; Pikkarainen *et al.*, 2004; Eriksson *et al.*, 2005; Lai and Li, 2005; Cheng *et al.*, 2006; McKechnie *et al.*, 2006; Shu-Fong *et al.*, 2007; Hernandez and Mazzon, 2007; Ndubisi, 2007; Yiu *et al.*, 2007; Celik, 2008; Gounaris and Koritos, 2008;

Ozdemir *et al.*, 2008; Vatanasombut *et al.*, 2008; Aldás-Manzano *et al.*, 2009; Al-Somali *et al.*, 2009; Hua, 2008; Makris *et al.*, 2009; Polasik and Wisniewski, 2009; Chau and Ngai, 2010; Dimitriadis and Kyrezis, 2010; Featherman *et al.*, 2010; Dimitriadis and Kyrezis, 2011; Gilaninia *et al.*, 2011; Chiou and Shen, 2012; Yousafzai and Yani-de-Soriano, 2012).

Bhattacharjee (2001) was the first to use the TAM for the internet banking adoption. He developed a model for information system use continuance and validated the same using a cross-sectional field survey of online banking users. The proposed model is based on the expectation confirmation theory (ECT) (Oliver, 1980) and other auxiliary theories. The research used the following constructs: information system continuance intention, perceived usefulness, satisfaction and confirmation. The scale for IS continuance intention was borrowed from Mathieson's (1991) behavioural intention scale, perceived usefulness scale was borrowed from Davis (1989), satisfaction scale was borrowed from Spreng and Mackoy (1996), overall satisfaction scale and confirmation scale were their own self-developed scale. The model was empirically tested using the structural equation modelling approach. The results indicate that satisfaction with the information system was the strongest predictor for usage continuance.

Dabholkar and Bagozzi (2002) investigated the moderating effects of consumer traits and situational factors on attitude for the technology-based self-service (TBSS). The TBSS model has many constructs which are similar to the TAM (Davis, 1989). They identified four consumer traits that are directly relevant to the TBSS technology, namely, self-efficacy, inherent novelty seeking, need for interaction with a service employee and self-consciousness. They also identified four situational variables, namely, waiting time, crowding, time pressure and social anxiety. They provided an experimental design using waiting time and social anxiety as a situational treatment. They found that their model had an excellent convergent and construct validity. This study has identified an important consumer trait, self-efficacy. There is limited literature on the role of self-efficacy in the TAM.

Shih and Fang (2004) extended the TAM by combining constructs from the information behaviour model. They studied the use of internet in organizations. They developed a theoretical model which was tested using questionnaires; respondents were Taiwanese office workers. They empirically confirmed their model using multiple regression; findings showed that the information needs strongly influence perceived usefulness, perceived ease of use and user attitudes towards the internet use. They found that the perceived ease of use influences user attitudes more than the perceived usefulness; their findings were not in line with the findings of Davis (1989).

Porter and Donthu (2006) searched for answers on why older, less educated, minority and lower income groups used the internet less than their younger, highly educated, wealthier and white counterparts using an extended TAM. They found that including a construct, perceived access barriers could explain the demographic-based differences in the internet use. They found that exogenous variables such as age affects the perceived ease of use and the perceived usefulness, education affects the perceived ease of use, income and race affects the perceived usefulness and access barrier. Access barrier affects the attitude towards use.

Karjaluoto *et al.* (2002) studied attitude formation towards internet banking using a structural equation modelling approach. The theory of reasoned action (TRA) (Ajzen and Fishbein, 1975) and the TAM (Davis, 1989) are the basis on which they developed their model. The study was funded by Nordea Bank and most of the respondents of the study were customers of the bank and the study segmented the users on the basis of the internet banking usage as non-users, new users and old users (who have been using internet banking for a long time). The study showed that prior experience with computers and technology and attitude towards computers influences the attitude towards internet banking and actual behaviour. They also found that demographic factors such as occupation and household income are significant in the internet banking behaviour.

Typically a young person with a high level of education, a good job and a high income level was an internet banking user.

Pikkarainen *et al.* (2004) proposed an extended version of the TAM for consumer acceptance of online banking. They did focus on group interviews with bank employees, explored TAM literature and other e-banking studies and proposed a model. Their model has six factors: perceived usefulness, perceived ease of use, perceived enjoyment, information on online banking, security and privacy, the quality of internet connection, which they posit to influence acceptance of online banking. They tested their model using a survey on bank customers in Finland and empirical results indicate that perceived usefulness and information on the banks' website are the primary drivers influencing acceptance of online banking. Their model may suffer due to non-inclusion of several factors influencing internet banking, primarily subjective norm, which was included in TAM 2.

Yiu *et al.* (2007) extended the TAM by including two new constructs: personal innovativeness and perceived risk. They found that the perceived usefulness, perceived ease of use, perceived risk and personal innovativeness had a direct relationship with the adoption of internet banking. Their survey finding for identifying accelerators and inhibitors for adoption of internet banking revealed that possibility of performing banking operations anywhere, anytime and reduction in processing time as the most important reasons for use of internet banking, whereas risks and the convenience of using ATM, phone banking and the traditional branch difficulty to use a computer were identified as reasons for not using internet banking. Among several accelerators that drive internet banking adoption incentives offered by the banks was one important driver. This driver, however, has not been included in any of the TAMs.

Alalwan *et al.* (2016) extended the TAM by including perceived risk and self-efficacy to study consumer adoption of mobile banking. They found that intention to use mobile banking was influenced by perceived usefulness, perceived ease of use and perceived risk.

Although perceived risk has been used to extend TAM, limited work has been done on its effect on other variables like trust, perceived usefulness, perceived ease of use and behavioural intention.

Sukkar and Hasan (2005) argued that information-technology models established in developed countries may not be appropriate to less developed countries. They suggested modifications to TAM to make it more relevant to less-developed and developing countries in the context of internet banking. They argued that circumstantial and cultural differences are different across countries. The authors include economics, politics and infrastructure as strong influencers to internet banking adoption. The first stage of their study included a series of unstructured, exploratory interviews to find the factors that affect and influence adoption of internet banking. They found that security and privacy, ease of use and the level of computer literacy, the design of websites, language, lack of access to internet, the indirect cost for usage, lack of government policies, regulations, laws and legislations to protect from internet related fraud, lack of national telecommunication infrastructure, broken and slow internet connections as some prominent factors that influence internet banking adoption. The authors suggested that TAM be extended to include specific issues of culture and trust on the customer side and more basic elements of quality in technology, usability and service on the bank side. In case of internet banking adoption in India we found that there is an alarming variation in rate of adoption among customers of different banks, therefore the role of the bank in promoting internet banking needs investigation.

Scant attention has been paid to internet research in India (Vaithianathan, 2010). There are limited number of studies about internet banking adoption in the Indian context. Kesharwani and Bisht (2012) extended the TAM by including new constructs trust, perceived risk, social influences, website design and perceived behavioural control to examine the impact of these constructs on internet banking adoption. In addition to the

relationship between perceived usefulness, perceived ease of use and behavioural intention found in the original TAM, the authors hypothesized that trust has a negative impact on perceived risk to use internet banking, perceived risk has a negative impact on behavioural intention, perceived ease of use has a positive impact on behavioural intention, social influence has a positive impact on behavioural intention, subjective influence has a positive impact on perceived usefulness, social influence has a negative impact on perceived risk, perceived behavioural control has a positive impact on perceived ease of use, website design has a negative impact on perceived risk and website design has a positive impact on perceived ease of use. Except the relationship between perceived ease of use and behavioural intention all other hypotheses were supported. The authors were not able to conclusively examine the directionality of the causal relationship between trust and perceived risk leaving room for further research to examine this interrelationship between the construct trust and perceived risk.

Literature review indicates that the TAM has been extensively used to investigate the determinants of information technology acceptance and therefore can provide a theoretical basis for further extension for studying internet banking adoption. The gaps in extant the literature on internet banking adoption using the TAM led to the inclusion of several constructs, namely, banks initiative, government support, internet usage efficacy and internet banking self-efficacy.

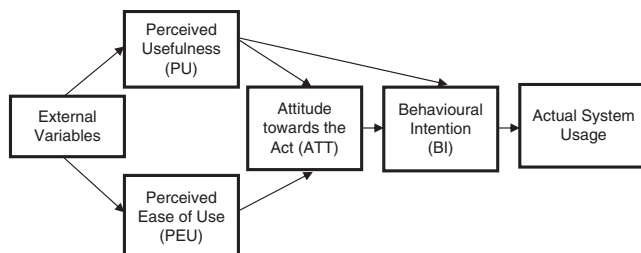
### 3. Theoretical framework

The theoretical background required for this study is derived from the TAM (Davis, 1989) illustrated in Figure 1. The TAM states that a person's behavioural intention to use technology is determined by two beliefs: perceived usefulness, defined as the extent to which a person believes that using IT will enhance his or her job performance and perceived ease of use, defined as the degree to which a person believes that using IT will be free of effort (Venkatesh and Bala, 2008).

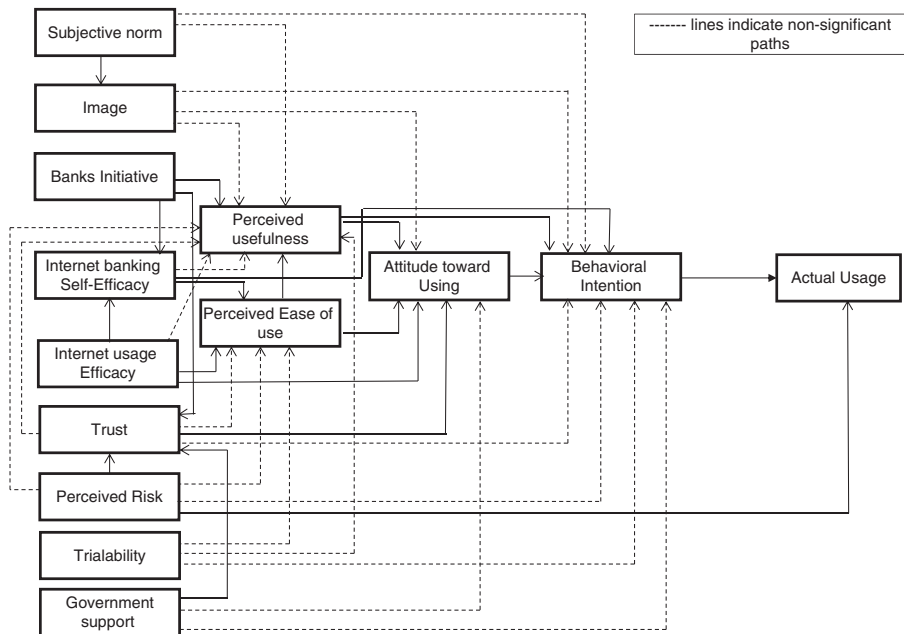
The TAM originated from a renowned model from social psychology, the TRA (Ajzen and Fishbein, 1975). However, the TAM violates the TRA model, as there is a direct path from perceived usefulness to behavioural intention, whereas TRA states that attitude completely mediates belief and intention (Taylor and Todd, 1995).

TAM is a parsimonious model and can be generalized. It has received empirical support in many studies (Adams *et al.*, 1992; Taylor and Todd, 1995; Mathieson, 1991). TAM predicted usage of spreadsheets better than the TPB (Mathieson, 1991).

The proposed model borrows constructs from existing theories and models by adding or deleting certain items to make it relevant to the internet-banking context. This study proposes valid antecedents for perceived usefulness, perceived ease of use, based on Indian conditions and cultural beliefs. An extended TAM was proposed as the research model for this study. Figure 2 shows some of the antecedents, which influence the constructs.



**Figure 1.**  
Technology acceptance model



**Figure 2.**  
The conceptual augmented TAM model

### 3.1 Hypotheses development for the proposed model

**3.1.1 Perceived usefulness.** This construct has been one of the strongest indicators of adoption of internet banking. Information system researchers (Chin and Todd, 1995; Venkatesh and Bala, 2008; Venkatesh and Morris, 2000; Agarwal and Prasad, 1997; Jackson *et al.*, 1997) have extensively used this construct. Adams *et al.* (1992) replicated TAM, which was the work of Fred Davis in his doctoral thesis. They found that perceived usefulness is influenced by many different variables depending on the environment. Taking this into account the items of the construct perceived usefulness were adapted for internet banking usefulness. Lockett and Littler's (1997) study of adoption of internet banking in the UK showed that the most useful feature of internet banking is its 24-hour availability. Moon and Kim (2001) pointed out that TAM's fundamental constructs do not fully reflect the specific influences of technological and usage-context factors that may alter user acceptance. They also found that the factors influencing acceptance of new information technology vary with target audience and context. In this study, the items in the construct perceived usefulness, is therefore, made more relevant to internet banking usefulness:

*H1.* Perceived usefulness has a direct positive effect on the intention to use internet banking.

*H2.* Perceived usefulness has a direct positive effect on attitude to use internet banking.

**3.1.2 Perceived ease of use.** Venkatesh and Davis (2000) found that perceived ease of use is not a strong predictor as compared to perceived usefulness towards the users' attitude towards adoption of technology. However, perceived ease of use became more significant as the length of use increased. Many studies state that perceived ease of use has a positive impact on attitude towards use of technology. Karahanna *et al.* (1999) found a positive link between ease of use and attitude to use Windows 3.1. Taylor and Todd (1995) in their

comparative study of TAM, TPB, DTPB on the use of the computer resource centre, found that paths from perceived ease of use to perceived usefulness and attitude were significant:

- H3. Internet banking perceived ease of use of has a positive influence on perceived usefulness.
- H4. Perceived ease of use will have a direct positive effect on attitude towards using internet banking.

**3.1.3 Trust.** Trust is a cross-disciplinary concept, incorporating ideas from economics, marketing sociology, psychology, organization behaviour, strategy, information systems and decision sciences (Mukherjee and Nath, 2003). Rotter (1967) defines trust as “a generalized expectancy held by an individual that the word of another can be relied on” (McKnight and Chervany, 2002), justify a parsimonious interdisciplinary typology and relate trust constructs to e-commerce consumer actions, defining both conceptual-level and operational-level trust constructs. Conceptual-level constructs consist of disposition to trust (primarily from psychology), institution-based trust (from sociology) and trusting beliefs and trusting intentions (primarily from social psychology). Each construct is decomposed into measurable sub-constructs, and the typology shows how trust constructs relate to already existing internet relationship constructs. Ganesan (1994) showed that trust is related to environmental uncertainty, reputation and satisfaction. Trust is a fundamental prerequisite for any banking activity and unless customers can trust new technology, they will be reluctant to use it (Howcroft *et al.*, 2002). Consumer trust is believed to be the most essential component of, as well as the most formidable barrier to commercialization of the internet (Ambrose and Johnson, 1998). Hussain Chandio *et al.* (2013) used an extended TAM to investigate acceptance of online banking information systems, they found that trust has a significant positive effect on perceived usefulness and behavioural intention. This study propounds that trust will have a significant effect on perceived ease of use, perceived usefulness and attitude:

- H5. Trust in internet banking will have a positive effect on perceived ease of use.
- H6. Trust in internet banking will have a positive effect on perceived usefulness.
- H7. Trust in internet banking will have a positive effect on attitude towards internet banking.
- H8. Trust in internet banking will have a positive effect on behavioural intention towards internet banking.

**3.1.4 Perceived risk.** Previous studies indicate perceived risk as a major factor that negatively influences internet-banking adoption. Cunningham *et al.* (2005) found that there is a risk premium for e-banking services and the risk level is more than the traditional banking channel. Sathye (1999) investigated internet banking adoption by Australian consumers, and found that security concerns and lack of awareness were the main obstacles to adoption. Perceived risk on the use of internet banking may impair customers’ perception of the consequences of adopting internet banking and thus negatively influence the adoption of such technology (Aldás-Manzano *et al.*, 2009). There is a negative impact of perceived risk on customers’ intention to engage in online transaction (Pavlou and Gefen, 2004). Trust and perceived risk are subjective concepts embedded in social behaviour. Featherman and Pavlou (2003) investigated the effect of risk on e-services adoption, and they found that although perceived risk adversely affects adoption, perceived usefulness and perceived ease of use reduce risk perceptions. Lee (2009) found that the dimensions of perceived risk directly and significantly affect perceived usefulness and the intention to adopt internet banking. Loh and Ong (1998) found that user’s concerns about privacy and



security would be one of the key determinants for the adoption of a new system. In another study conducted by Aladwani (2001) on potential customers of internet banking, it was found that they ranked internet security and privacy as the most challenging issue banks would face in the future. Shanmugam *et al.* (2015) based on a qualitative study concluded that security is a primary factor responsible for internet banking adoption in the UK. The extant literature supports the role perceived risk plays in trust formation (Pavlou, 2003; Chen and Dhillon, 2003). However, the directionality of the causal relationship between trust and risk still needs examination (Kesharwani and Bisht, 2012; Kim *et al.*, 2009), and is still inconclusive. This study propounds that perceived risk will negatively influence trust:

*H9.* Perceived risk will negatively influence perceived usefulness.

*H10.* Perceived risk will negatively influence perceived ease of use.

*H11.* Perceived risk will negatively influence intention to use internet banking.

*H12.* Perceived risk will negatively influence trust.

*3.1.5 Internet banking self-efficacy.* Computer self-efficacy has been receiving attention from information system researchers in the recent past. Torkzadeh *et al.* (2006) reported that computer anxiety and attitude towards computers were the main factors effecting computer self-efficacy. They also found that computer training significantly contributed to the development of computer self-efficacy. Igarria and Iivari (1995) found that computer experience had a strong positive effect on self-efficacy. Hussain Chandio *et al.* (2013) found that technological self-efficacy has a significant positive effect on the perceived usefulness and perceived ease of use of online banking information systems. Compeau and Higgins (1995) defined computer self-efficacy as "A judgment of one's ability to use a computer". Internet banking self-efficacy scale is developed by taking items from computer self-efficacy:

*H13.* Internet banking self-efficacy positively influences the behavioural intention towards using internet banking.

*H14.* Internet banking self-efficacy positively influences the perceived ease of use towards using internet banking.

*H15.* Internet banking self-efficacy positively influences the perceived usefulness towards using internet banking.

*3.1.6 Internet usage efficacy.* Bandura (1986) first proposed the theory of self-efficacy. Computer self-efficacy has been recently receiving a lot of attention as an external variable to TAM (see Johnson and Marakas, 2000; Venkatesh and Morris, 2000; Hong *et al.*, 2001). Self-efficacy is a time variant parameter and can change as the individual attains more information and experience. Compeau and Higgins (1995) conducted a survey among Canadian managers to develop and validate a measure for computer self-efficacy. The measures used for computer self-efficacy may not be useful for measuring an individual's internet usage competence. Eastin and LaRose (2000) developed an internet self-efficacy scale, which measured basic knowledge of the internet, the hardware and software. They proposed that future research in this area should focus on the interplay of computer self-efficacy, internet stress and online support. As such, these scales have become obsolete due to fast changing technology. Internet banking self-efficacy, or the belief in one's capabilities to organize and execute courses of internet actions required to produce given attainments is a potentially important factor to explain the consumers' decisions in e-commerce use, such as e-service (Hsu and Chiu, 2004). Previous research studies (Venkatesh and Morris, 2000; Agarwal and Karahanna, 2000; Hong *et al.*, 2001; Venkatesh and Davis, 1996;

Igbaria and Livari, 1995) found significant relationship between computer self-efficacy and perceived ease of use. Fenech (1998) observed that the addition of self-efficacy improved the model fit in determining acceptance of the World Wide Web:

- H16. Internet usage efficacy positively influences the attitude towards using internet banking.
- H17. Internet usage efficacy positively influences the perceived ease of use towards using internet banking.
- H18. Internet usage efficacy positively influences the perceived usefulness towards using internet banking.
- H19. Internet usage efficacy will positively affect internet banking self-efficacy towards internet banking.

*3.1.7 Subjective norm.* Fishbein and Ajzen (1975) define subjective norm as an individual's perception that most people who are important to him think he should or should not perform the behaviour in question. The TAM does not include TRA's subjective norm as a construct to determine behavioural intention. Subjective norm may indirectly affect behavioural intention via attitude. Venkatesh and Davis (2000) found that subjective norm is a predictor of perceived usefulness. They also found that the effect of image on subjective norm was significant. Subjective norm is as important as attitudinal judgments in influencing service acceptance decisions (Bhattacharjee, 2001). Karahanna *et al.* (1999) conducted a study to determine user acceptance of the Windows 3.1 operating system, and they found that subjective norm influences the intention to use the operating system:

- H20. Subjective norm will have a positive influence on perceived usefulness.
- H21. Subjective norm will have a positive influence on image.
- H22. Subjective norm will have a direct positive influence on the intention to use internet banking.

*3.1.8 Government support.* Government support lends credibility as well as feasibility to new electronic commerce applications such as internet banking, thereby making them more likely to be accepted by potential adopters (Tan and Teo, 2000). Tornatzky and Klein (1982) claimed that government support is a major factor which acts as a driving force for internet banking adoption because it assures the user that the internet-banking channel will operate in an orderly and well-managed way. Governments' intention to provide suitable technological infrastructure and internet bandwidth is an enabler for internet banking (Jaruwachirathanakul and Fink, 2005):

- H23. Government support will positively influence the intention to use internet banking.
- H24. Government support will positively influence attitude to use internet banking.
- H25. Government support will positively influence trust.

*3.1.9 Banks initiative.* Polatoglu and Ekin (2001) conducted an exploratory study of consumer acceptance of internet banking in a Turkish bank. They found that marketing effort on the part of the bank is an important driver for adoption of internet banking. Sathye (1999) found that one of the main reasons for non-adoption of internet banking in Australia was lack of awareness. Therefore, it was felt that the banks' initiative like promotion of internet banking by media campaigns will go a long way in eliminating doubts and encouraging customers to use this channel of banking. Akinici *et al.* (2004) found that non-users of internet banking were not aware of all the benefits of internet banking and

believed that it is not possible to do several categories of transactions using the internet and therefore preferred going to the bank branches despite internet access availability. Lichtenstein and Williamson (2006) recommended that lack of awareness of internet banking and its benefits can be tackled by better marketing, informing consumers about the features, benefits, advantages and convenience. They suggested that marketing campaigns, attractive dedicated literature and awareness sessions might prove valuable for creating awareness. These findings suggest that banks' initiative in creating awareness about the different possible transactions using the internet, updating their website with latest information and making their websites user friendly would go a long way in creating internet banking channel acceptability:

*H26.* Banks initiative will positively influence perceived usefulness of internet banking.

*H27.* Banks initiative will positively influence perceived ease of use towards internet banking.

*H28.* Banks initiative will positively influence attitude towards use of internet banking.

*3.1.10 Trialability.* Providing internet banking demonstration at the bank's website increases the likelihood of registration as it reduces customer concerns regarding the complication of I-banking (Chung and Paynter, 2002). Rogers (1995) concluded that allowing users to try the innovation makes them comfortable to use it and aids in adoption of the innovation. In this study, based on previous literature it is felt that trialability will positively affect perceived usefulness, perceived ease of use and the attitude towards usage of internet banking:

*H29.* Trialability will have a direct positive influence on the intention towards using internet banking.

*H30.* Trialability will have a direct positive influence on the perceived ease of use.

*H31.* Trialability will have a direct positive influence on the perceived usefulness.

*3.1.11 Image.* Image was found to be a weak predictor of adoption in a study on the perception of adoption of information technology acceptance (Moore and Benbasat, 1991). IDT suggests that a major factor of adopting a certain innovation is the individual's desire for higher social status. Karahanna *et al.* (1999) also found that one of the reasons for adopting Windows 3.1 was it led to a feeling of higher image amongst their peers:

*H32.* Image will have a direct positive influence on perceived usefulness.

*H33.* Image will have a direct positive influence on attitude towards using internet banking.

*H34.* Image will have a direct positive influence on the intention towards using internet banking.

*3.1.12 Attitude.* An attitude is an individual's disposition to respond favourably or unfavourably to an object, person, institution, or event, or to any other discriminable aspect of the individual's world (Ajzen, 1989). The attitudinal model of the TBSS (Dabholkar and Bagozzi, 2002) suggests that attitude will have a strong, direct and positive effect on intentions. Bobbitt and Dabholkar (2001) in their model for predicting the use of self-service technology suggest a pivotal role of attitude in influencing intentions and behaviour:

*H35.* Attitude towards using internet banking will have a direct positive effect on behavioural intention to use internet banking.

*3.1.13 Behavioural intention.* It is the user's likelihood to engage in banking using the internet. These questions were framed to understand the intent of the respondent in

adopting internet banking in the near future. This construct has a strong correlation with the actual usage of internet banking. Moon and Kim (2001) found that actual usage was directly related to behavioural intention:

*H36.* Behavioural intention towards internet banking will have a direct positive relationship with actual use.

*3.1.14 Actual usage.* Several studies have used self-reported usage (Igarria *et al.*, 1996) and frequency of use, as actual usage. Data about actual usage of internet banking by individual customers would have been a more appropriate measure, but these data were not possible to obtain because of the bank policies on privacy. This study used self-reported usage as the actual usage (Table I).

The theoretical constructs defined in the model were multidimensional and multiple questions were used for measurement of the same construct, thereby increasing the reliability of the measurement. These multidimensional constructs are also called latent variables. The four constructs used for studying internet banking adoption was operationalized using the items shown in Table II.

Research variables	Code name	Conceptual definition	Reference
Perceived usefulness	PU	The degree to which a person believes that using a particular system would enhance his or her job performance	Davis (1989)
Perceived ease of use	PEU	The degree to which a person believes that using a particular system would be free of effort	Davis (1989)
Trust	TR	Customers' trust in e-banking is defined as the willingness of customers to perform on-line banking transactions, expecting that the bank will fulfil its obligations, irrespective of their ability to monitor or control the banks' actions	Yousafzai <i>et al.</i> (2005)
Perceived risk	PR	Perceived risk is the consumers subjective expectation of suffering a loss in pursuit of a desired outcome	Greatorex and Mitchell (1994)
Internet banking self-efficacy	IBSE	The degree to which an individual believes that he or she has the proficiency/capability to perform internet banking	Bandura and Adams (1977), Taylor and Todd (1995)
Internet usage efficacy	IUE	Internet Usage Efficacy (IUE) is the belief in an individual's capability to execute actions using the internet to attain the desired goals	Hsu and Chiu (2004)
Subjective norm	SN	The person's perception that most people who are important to her or him think that he should or should not perform the behaviour in question	Fishbein and Ajzen (1975)
Government support	GS	The efforts of the government to provide infrastructure and legal framework to positively influence internet banking	Tan and Teo (2000)
Banks initiative	BAI	The efforts of the bank to promote and support internet banking	Polatoglu and Ekin (2001)
Trialability	TRI	Trialability is the degree to which an innovation may be experimented with, on a limited basis	Rogers (1995)
Image	IM	The degree to which an individual perceives that use of innovation will enhance his or her status in his or her social system	Moore and Benbasat (1991)
Attitude	ATT	An attitude is an individual's disposition to respond favourably or unfavourably to an object, person, institution, or event, or to any other discriminable aspect of the individual's world	Ajzen (1989)
Behavioural intentions to use	BI	A person's subjective probability that he will perform some behaviour	Fishbein and Ajzen (1975)

**Table I.** Conceptual definition of the constructs in the study

Construct	Items	References	
Perceived usefulness (PU)	Using internet banking enables me to accomplish my banking tasks quickly	Venkatesh <i>et al.</i> (2003)	
	I find internet banking very convenient for managing my finance	Ramsay and Smith (1999)	
	Internet banking enables me to utilize my time effectively by not having to stand in long queues at the bank counter	Walker and Johnson (2005) and Giannakoudi (1999)	
	I find that internet banking is useful in conducting banking transactions	Venkatesh <i>et al.</i> (2003)	
	Internet banking enables me to access banking services at any time	Lockett and Littler (1997)	
	Internet banking is available 24 × 7 and therefore enables me to carry out banking whenever I like	Lockett and Littler (1997)	
	With internet banking, I can access my bank account even on bank holidays	Lockett and Littler (1997)	
	Internet Banking enables me to reduce banking cost, such as reduced bank charges and transportation cost	Ramsay and Smith (1999)	
	Internet banking enables me to get correct information unlike branch banking where I get inappropriate response from bank staff	Moon and Kim (2001)	
	Internet banking eliminates geographic limitation and increases flexibility and mobility	Evans and Wurster (1996)	
	Internet banking is more useful than other existing channels like bank branches, ATMs and phone banking	Thornton and White (2001)	
	Perceived ease of use (PEU)	It is easy to use internet banking	Davis (1989) and Adams <i>et al.</i> (1992)
		It is easy to learn how to use internet banking	Wang <i>et al.</i> (2003) and Adams <i>et al.</i> (1992)
		My interaction with internet banking is clear and understandable	Davis (1989) and Agarwal and Prasad (1997)
It is easy for me to become skilful at using internet banking		Wang <i>et al.</i> (2003)	
Using internet banking does not require a lot of mental effort		Venkatesh and Bala (2008)	
Using internet banking increases the quality of my banking services output with minimal efforts		Venkatesh and Bala (2008)	
Internet banking is flexible to interact with		Venkatesh and Bala (2008)	
Attitude (ATT)	In general, I have a positive opinion about internet banking	Bhattacharjee (2001)	
	I like the idea of using internet banking	Tan and Teo (2000)	
Behavioural intention (BI)	In my opinion, it is desirable to use internet banking	Tan and Teo (2000)	
	If I have the facilities required for using Internet Banking, I intend to use it	Wang <i>et al.</i> (2003) and Wu and Wang (2005)	
	I plan to experiment with or use internet banking regularly in the next six months	Venkatesh <i>et al.</i> (2003) and Webster and Wind (1972)	
	In the future, I intend to continue using internet banking	Karahanna <i>et al.</i> (1999) and Agarwal and Prasad (1997)	
Actual usage (AU) (self-reported)	How long have you been using the internet banking facilities? On a weekly basis, how many times do you use internet banking?	Moon and Kim (2001) Moon and Kim (2001)	
	Trust	I trust that the internet banking systems not to disclose my personal information	Mukherjee and Nath (2003)
I trust the banks to keep customer data securely		Mukherjee and Nath (2003) and Ramsay and Smith (1999)	
I trust the technology of internet banking		McKnight and Chervany (2002)	
	I trust the privacy statement on the bank's web page to guarantee privacy of my personal data	McKnight and Chervany (2002)	

**Table II.**  
Operationalization of the extended TAM constructs

(continued)

Construct	Items	References
Perceived risk (PR)	I am unsure if internet banking performs satisfactorily Overall, I feel internet banking is risky	Cunningham <i>et al.</i> (2005) and Featherman and Pavlou (2003) Ndubisi and Sinti (2006) and Featherman and Pavlou (2003)
Internet usage efficacy (IUE)	I believe that money can easily be stolen while using internet banking I feel confident to open and close the web browser like the internet explorer I feel confident in entering the website address on the address bar of the web browser I feel confident to login to the website using my username and password I feel confident in accessing and uploading information on social networking websites such as Facebook, Orkut, G+, Twitter, etc. I feel confident in using search engines like Google, Bing, etc. to search for information on the web I feel confident chatting with people on messenger I feel comfortable to buy products online using credit/debit cards I feel confident booking airline/train tickets using the internet I feel confident in setting my browser window properties as per my requirement I feel confident searching and comparing products and services using the internet	Ndubisi and Sinti (2006) and Featherman and Pavlou (2003) Torkzadeh <i>et al.</i> (2006), Li <i>et al.</i> (2006) Self-developed for this study Self-developed for this study Self-developed for this study Li <i>et al.</i> (2006) Self-developed for this study Self-developed for this study Self-developed for this study Self-developed for this study Torkzadeh <i>et al.</i> (2006)
Internet banking self-efficacy (IBSE)	I would be confident in using internet banking even if there is no one around to show me how to use it I would be confident about using Internet banking even if I have never used a system like it before I would be confident in using Internet banking even if I have only the online instructions for reference I would be confident in using internet banking, if I had seen someone else using it before trying it out myself	Compeau and Higgins (1995) Compeau and Higgins (1995) Compeau and Higgins (1995) and Wang <i>et al.</i> (2003) Compeau and Higgins (1995)
Subjective norm (SN)	My decision to adopt internet banking is influenced by my friends My decision to adopt internet banking is influenced by my family/relatives My decision to adopt internet banking is influenced by my colleagues/peers	Ajzen (1991), Fishbein and Ajzen (1975), Taylor and Todd (1995) Mathieson (1991) and Ajzen (1991) Taylor and Todd (1995) and Ajzen (1991)
Government support (GS)	Government of India supports and promotes usage of the internet and ecommerce Government of India is active in setting up facilities such as providing adequate telecommunication facilities, which will be an enabler of internet banking Government of India has framed good regulations and laws for Information Technology use	Teo <i>et al.</i> (1997) and Tan and Teo (2000) Teo <i>et al.</i> (1997) and Tan and Teo (2000)
Banks initiative (BAI)	My bank promotes internet banking My bank updates the information on the internet-banking website regularly My bank offers a fully transactional website, which is user friendly My bank updates me regularly about the benefits of using internet banking	Self-developed for the study Self-developed for the study Self-developed for the study Self-developed for the study

(continued)

Table II.

Table II.

Construct	Items	References
Triability (TRI)	Before deciding whether to use internet banking, I can properly try it out	Moore and Benbasat (1991)
	Internet banking is available to me adequately for trial	Moore and Benbasat (1991)
	My bank permits me to use internet banking on a trial basis long enough to see what I can do	Moore and Benbasat (1991)
Image (IM)	If I were to adopt internet banking, It would give me higher status amongst my peers	Karahanna <i>et al.</i> (1999) and Moore and Benbasat (1991)
	People who use internet banking have more prestige than those who do not	Moore and Benbasat (1991)
	Having internet banking is trendy amongst my peers	Moore and Benbasat (1991)

#### 4. Methodology

##### 4.1 Instrument development and data collection

This study used interviews with bank managers, bank employees and bank customers, survey questionnaires, documents pertaining to internet banking. The data source used in this study therefore supports triangulation. The first part of the questionnaire was designed to capture demographic information about the respondents and the second part had questions which were operationalized for the extended TAM model. The pre-test of this instrument was carried out by administering the survey instrument face-to-face to 20 respondents. Respondents were encouraged to point out any adoption of internet banking related factors that they felt was not included in the questionnaire. Even though the respondents did not explicitly mention any new factors that influence adoption of internet banking, one common observation among all respondents was that the questionnaire was very lengthy. The questionnaire was made to look shorter by rearranging the vertical orientation of the scale anchors and by orienting it horizontally. These modifications made the questionnaire look short. A pilot survey is a small-scale survey carried out prior to the final survey to confirm that there are no possible problems (Li *et al.*, 2006). A pilot study was done on individuals who were computer literate, had access to the internet and used internet banking. Some of the item wordings and ordering were changed based on the feedback. This study used a convenience sampling method. Data for this study were collected from internet banking customers of three leading nationalized banks in India through their bank branches in Mumbai. Data were collected using paper-based and electronic survey forms. The choice of the sample size for SEM cannot be too small nor can it be too large. Statistical results from a very small sample size are invalid and a large sample size will result in a poor fit model. Schumacker and Lomax (1996) reported that most of the studies using SEM had a sample size between 200 and 500 subjects. In this study a total of 300 responses were collected.

##### 4.2 Demographic profile of the respondents

Females and males constitute 23.3 and 76.7 per cent of the sample, respectively. India being a male dominated society, there appears to be a male bias even in the current survey. Almost 98 per cent of the respondents were less than the age of 50 indicating that the sample comprised of young or middle aged respondents. Table III illustrates the summary of the respondents' gender, age, education and income.

##### 4.3 Data screening and preparation for analysis

Data screening for out of range values, missing data, outliers, checks for normality and multicollinearity was done prior to proceeding with the statistical analysis. Data from the paper-based questionnaire and online forms were combined and saved as a single file.

Table III.  
Sample demographics

	Frequency	Percentage
<i>Gender</i>		
Female	70	23.3
Male	230	76.7
Total	300	100
<i>Age (years)</i>		
20-30	158	52.7
31-40	97	32.3
41-50	40	13.3
More than 51	5	1.7
<i>Education</i>		
Bachelors	144	48
Masters	151	50.3
PhD or more	2	0.7
<i>Income (lacs)</i>		
< 1.6	12	4
1.6-5	104	34.9
5-8	79	26.5
> 8	103	34.6

A univariate statistics (missing value analysis) revealed that the percentage of missing values for all the variables was less than 1 per cent. The regression imputation method was used in this study for missing data imputation. Multivariate outliers were detected using Mahalanobis  $D^2$ . There were ten outliers with probability of  $D^2$  less than 0.001. Stevens (1984) reported that not all outliers need to be deleted. They found that only outliers with the Cook's distance of greater than one were influential and worthy of further investigation to examine, if they can be deleted. In this study, all the outliers had a Cook's distance less than 1 and therefore none of the outliers were deleted. Skewness effects test of means and kurtosis effects variance and covariance. Non-normality was checked by inspecting the skewness and kurtosis of the univariate distribution and the Mardias multivariate kurtosis value. The univariate skewness and kurtosis statistics are below the cut-off for the data in this study. The correlation between the variables exceed 0.8, the cut-off prescribed by Hair *et al.* (1998), Cooper and Schindler (2003) and Sekaran (2006) in two cases. Each independent variable was regressed against the other independent variables, the tolerance and VIF was calculated. The tolerance values were above 0.2 and VIF values were below 4.

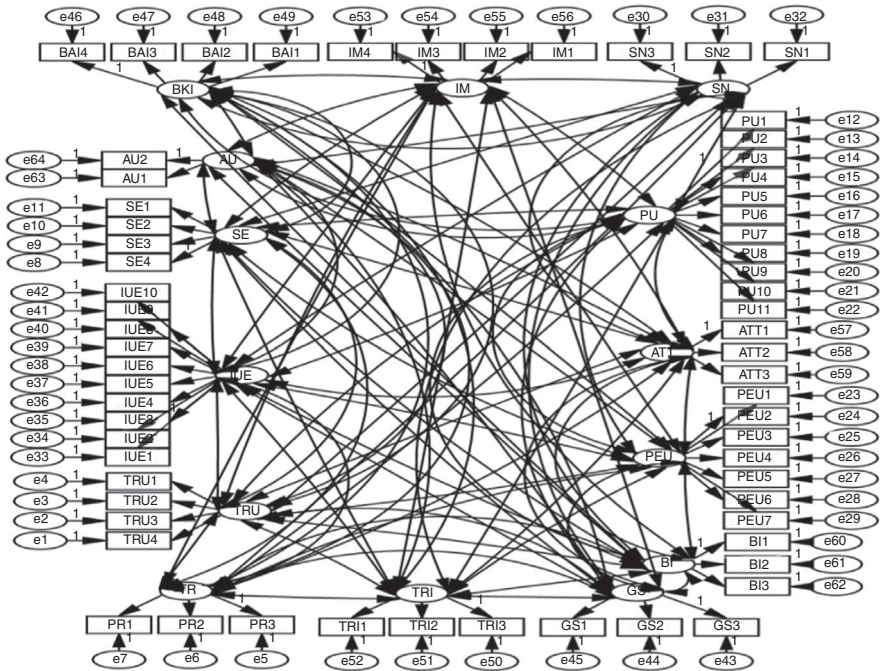
#### 4.4 Measurement model assessment and confirmatory factor analysis (CFA) for the augmented TAM

The two-step approach suggested by Hair *et al.* (2006) and Schumacker and Lomax (2004) was used in this study. The measurement model was examined first, and then the structural model. The measurement model was used to test convergent and discriminant validity and then the structural model was used to test the nomological validity. The measurement model for the augmented TAM is shown in Figure 3.

In the measurement, model shown in Figure 3, the rectangular boxes with labels are the observed or manifest variables also called items, and the latent variables are oval. Double-headed arrows indicate covariance between the latent variables.

**4.4.1 Measurement model fit assessment.** The model was assessed using the CFA approach. The maximum likelihood estimation method for calculating the model parameters was selected from the many other options available in the analysis properties dialog box.





**Figure 3.**  
The measurement model for the augmented TAM

The model  $\chi^2 = 4,746.908$ ,  $df = 1,861$ ,  $p = 0.000$ ,  $\chi^2/df = 2.551$ . The model fit indices for the measurement model showed GFI = 0.658, AGFI = 0.618, NFI = 0.729, RFI = 0.706, IFI = 0.816, TLI = 0.798, CFI = 0.814, standardized RMR = 0.072, RMSEA = 0.072 (LO 90 = 0.069, HI 90 = 0.075) PCLOSE = 0.000.

Most of the goodness of fit measures were less than the recommended values, which indicated that the model can be refined.

**4.4.2 Model refinement.** In this measurement model, the factor loading was at least 0.5 for all manifest (observed) variables. However, items SE4, PU8, PU9, PU11, IUE4, IUE6, IUE7, IUE9, BAI4, BI2, AU1 and AU2 had standardized regression weights less than 0.7.

In this measurement model AU1, AU2, BI2, BAI4, IUE9, IUE7, IUE6, IUE4, PEU7, PU11, PU9, PU8, SE4, PR1, PR3 had SMC's below the cut-off value of 0.5. PR1, PR3, AU1, AU3 were left as there will be only one item left in the perceived risk factor which may lead to potential un-identification.

The items not fulfilling the criteria for factor loading, reliability and having high covariance modification index along with high regression weights in the modification index were deleted.

The trimmed measurement model was again subjected to CFA. The trimmed measurement model had  $\chi^2 = 1,977.401$ ,  $df = 898$ ,  $p = 0.000$ ,  $\chi^2/df = 2.202$ .

The model fit indices for the measurement model showed GFI = 0.786, AGFI = 0.742, NFI = 0.834, RFI = 0.809, IFI = 0.902, TLI = 0.886, CFI = 0.901, standardized RMR = 0.0520, RMSEA = 0.063 (LO 90 = 0.060, HI 90 = 0.067) PCLOSE = 0.000.

The model fit improved, and the trimmed model was found to fit the data adequately. Although the fit was not excellent, it was decided to construct the structural model. For a model having sample size greater than 250, number of variables greater than 30 having CFI or TLI greater than 0.90, SRMR less than 0.08, RMSEA less than 0.07 with CFI of 0.90 or

higher is considered to have a good fit (Hair *et al.*, 2006). Many researchers interpret goodness of fit measures in the 0.80-0.89 range as representing reasonable fit; scores of 0.90 or higher are considered evidence of good fit (Doll *et al.*, 1994).

In the trimmed measurement model the correlations between the latent factors was less than 0.8 as recommended by Kline (2005) and many others. Fit measures being in the range that was recommended in previous literature, further adjustments were not deemed necessary.

*4.4.3 Reliability and validity of the instrument.* Reliability and validity of the instrument was established and confirmed for the trimmed measurement model. Table IV shows composite reliability and average variance extracted (AVE) for the constructs in the study.

As recommended by Byrne (2001) and Fornell and Larcker (1981), the AVE was greater than 0.5 and the construct reliability was greater than 0.7 for almost all the constructs in the trimmed measurement except actual usage. Actual usage being a two-item construct and the inability to remove any items due to the threat of model un-identification was one of the reasons for these observations. All the above evidences support convergent validity for all the constructs in the measurement model except the construct actual usage.

All the above evidences support convergent validity for all the constructs in the measurement model except for where the construct actual usage. Construct validity is concerned with finding whether the instrument is measuring what it actually intended to measure (Churchill, 1995). The measure of validity refers to developing correct and adequate operational measures for the concept being tested (Malhotra, 1996). In this part of the study, construct validity was examined by finding convergent and discriminant validity.

*4.4.3.1 Convergent validity.* Convergent validity was examined to determine whether the items of the same construct are correlated and discriminant validity was used for conclude whether the items of a construct do not correlate on other constructs. Convergent validity of the trimmed measurement model was established by using three criteria:

- (1) factor loading;
- (2) AVE; and
- (3) Construct reliability/composite reliability.

Standardized factor loading of all the items were greater than the recommended value of 0.5 (Byrne, 2001)

Construct	AVE	CR
TRU	0.7542	0.901
PR	0.558	0.789
IBSE	0.721	0.886
PU	0.713	0.925
PEU	0.661	0.921
SN	0.721	0.885
IUE	0.605	0.859
GS	0.782	0.915
BKI	0.738	0.894
IM	0.770	0.931
ATT	0.828	0.935
BI	0.741	0.851
AU	0.411	0.582
TRI	0.715	0.882

**Table IV.**  
Summary of  
the reliability and  
validity measures

4.4.3.2 Discriminant validity. Discriminant validity is established if the AVE from the construct is greater than the variance shared between the construct and other constructs in the model (Chin, 1998). Discriminant validity of the trimmed measurement model was established by using the criteria that the AVE estimates for the construct should be larger than the square of the inter-construct correlation estimates. In this part of the study, there are in all five constructs.

In Table V, the diagonal elements are the AVE (shown in green). The values below the diagonal are the implied correlation of the constructs (shown in red) and the values above the diagonal are the square of the correlations between the constructs (shown in blue). Hair *et al.* (2006) state that if the AVE is higher than the squared inter-scale correlation of the constructs, then discriminant validity is supported. In this model, the AVE is greater than the square of the inter-construct correlation in all cases, and hence discriminant validity was established.

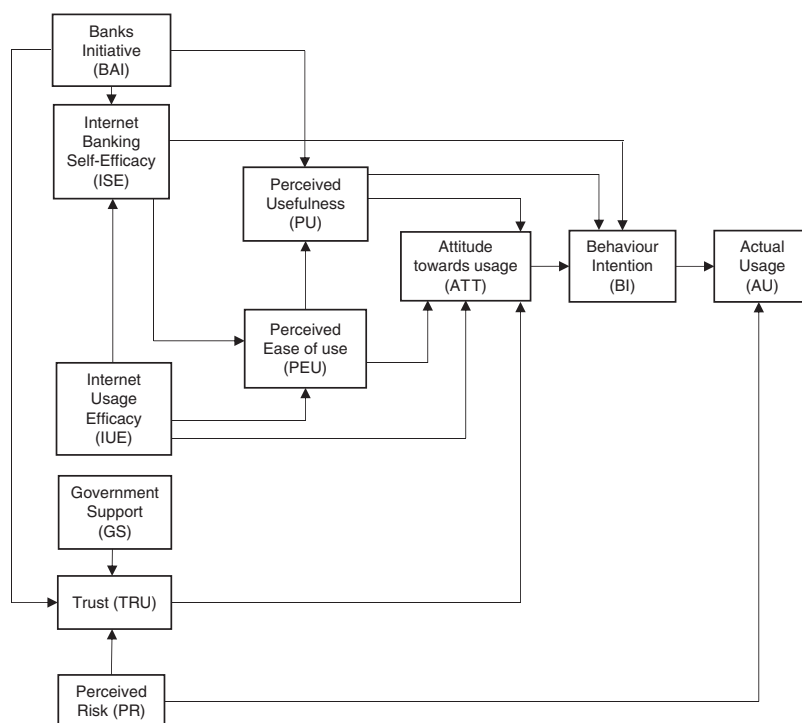
4.5 The structural model (augmented TAM)

The measurement model fit and convergent and discriminant validity were established using the measurement model. Hair *et al.* (1995), Kline (2005) and Anderson and Gerbing (1988) suggested that after achieving satisfactory measurement model fit and validating all the constructs a structural model could be tested. The structural model aims to specify the influence of latent constructs directly or indirectly on the other constructs in the model (Byrne, 2001). Following these guidelines in this stage, the structural model was tested in order to establish nomological validity. After verifying model fit, convergent validity and discriminant validity the hypothesized structural model was tested. The hypothesized model was described and shown in Figure 2. Subjective norm ( $\beta = 0.016, \rho = 0.420$ ) did not significantly affect perceived usefulness. Subjective norm ( $\beta = 0.009, \rho = 0.676$ ) did not significantly affect behavioural intention. The path from image to perceived usefulness ( $\beta = 0.008, \rho = 0.7$ ) was not significant. The path from trialability to ( $\beta = 0.0320, \rho = 0.4$ ) other constructs was non-significant. The path from government support to behavioural intention ( $\beta = 0.0265, \rho = 0.40$ ) was not significant. The path from government support to attitude ( $\beta = 0.0012, \rho = 0.5$ ) was not significant. The path from image to perceived usefulness ( $\beta = 0.0282, \rho = 0.2473$ ) was not significant. The path from perceived risk to perceived ease of use ( $\beta = 0.01204, \rho = 0.7514$ ) was not significant and, therefore, these constructs were removed from the model. Guided by the modification index, some new paths were established (PR to AU, BAI to TRU, BAI to ISE and ISE to BI). The revised extended structural model is as shown in Figure 4.

The revised extended structural model was tested by using the goodness of fit indices, which indicates how well the data fits the model. The path coefficients, which indicate the

**Table V.**  
Correlation among constructs, AVE and squared inter-construct correlation (SIC) of the latent variables in the extended TAM

	AU	BI	ATT	IM	TRI	BKI	GS	IUE	SN	PEU	PU	SE	PR	TRU
AU	0.411	0.262	0.164	0.002	0.0001	0.151	0.0004	0.0396	0.050	0.184	0.152	0.081	0.139	0.054
BI	0.512	0.741	0.643	0.0005	0.036	0.481	0.035	0.204	0.0009	0.251	0.363	0.291	0.069	0.122
ATT	0.405	0.802	0.828	0.013	0.034	0.347	0.040	0.218	0.00001	0.283	0.263	0.25	0.135	0.178
IM	-0.049	0.024	0.116	0.770	0.095	0.011	0.093	0.0015	0.077	0.004	0.005	0.001	0.027	0.003
TRI	0.012	0.192	0.186	0.309	0.715	0.019	0.002	0.0007	0.034	0.00004	0.00002	0.0484	0.015	0.0019
BKI	0.388	0.694	0.589	0.106	0.139	0.738	0.179	0.297	0.0231	0.2981	0.391	0.2981	0.052	0.269
GS	0.020	0.188	0.201	0.306	0.045	0.424	0.782	0.091	0.199	0.035	0.037	0.042	0.003	0.075
IUE	0.199	0.452	0.467	-0.034	0.027	0.545	0.302	0.605	0.022	0.285	0.356	0.274	0.057	0.137
SN	-0.224	-0.031	-0.004	0.278	0.187	0.152	0.447	0.147	0.721	0.001	0.001	0.0002	0.011	0.003
PEU	0.429	0.501	0.532	-0.067	0.007	0.546	0.187	0.534	-0.039	0.661	0.5	0.368	0.075	0.292
PU	0.389	0.603	0.513	-0.073	0.005	0.626	0.192	0.597	0.034	0.707	0.713	0.284	0.032	0.25
SE	0.285	0.539	0.500	0.036	0.220	0.546	0.205	0.524	0.016	0.607	0.533	0.721	0.059	0.124
PR	-0.373	-0.263	-0.367	0.166	-0.123	-0.230	0.058	-0.239	0.105	-0.274	-0.181	-0.244	0.558	0.153
TRU	0.234	0.350	0.422	0.063	0.044	0.519	0.274	0.371	0.062	0.540	0.500	0.353	-0.392	0.7542



**Figure 4.** Revised version of the augmented TAM after removing the non-significant paths

strengths of the relationship between the different constructs, were evaluated. The  $R^2$  values for the endogenous variables that indicates the variance explained by the predictor variable was estimated.

The structural model had  $\chi^2 = 1,381.951$ ,  $df = 570$ ,  $p = 0.000$ ,  $\chi^2/df = 2.424$ .

The model fit indices for the measurement model showed  $GFI = 0.798$ ,  $AGFI = 0.764$ ,  $NFI = 0.848$ ,  $RFI = 0.832$ ,  $IFI = 0.905$ ,  $TLI = 0.894$ ,  $CFI = 0.904$ , standardized  $RMR = 0.0791$ ,  $RMSEA = 0.069$  ( $LO\ 90 = 0.064$ ,  $HI\ 90 = 0.074$ )  $PCLOSE = 0.000$ . Most of the fit measures met the recommended values indicating that the model was acceptable.

#### 4.6 Results

Path coefficients of the revised extended TAM are shown in Table VI. Path coefficients are standardised regression indicative of the possible linkages between two variables.

The squared multiple correlation (SMC) values for the constructs are shown in Table VII. The SMC values indicate the relative amount of variance of the dependent variables accounted by the explanatory variables.

Banks initiative and internet usage efficacy were found to be significant factors which determined internet banking self-efficacy, with path coefficients 0.307 and 0.393, respectively, and explained 38.6 per cent of the variance.

Banks initiative and government support had a positive effect on trust and perceived risk had a negative effect, with path coefficients 0.41, 0.122 and  $-0.308$ , respectively and explained 37.4 per cent of the variance.

Internet banking self-efficacy and internet usage efficacy had a positive effect on perceived ease of use with path coefficients 0.455 and 0.312, respectively, and explains 45.5 per cent variance in perceived ease of use.

**Table VI.**  
The regression weights of the variables in the revised and extended TAM

Path	Standardized regression weights	Estimates	SE	CR	<i>p</i>
ISE←IUE	0.307	0.315	0.070	4.502	***
ISE←BAI	0.393	0.432	0.076	5.680	***
PEU←ISE	0.455	0.377	0.055	6.806	***
PEU←IUE	0.312	0.265	0.053	4.995	***
PU←PEU	0.521	0.395	0.047	8.426	***
PU←BAI	0.372	0.257	0.038	6.817	***
TRU←PR	-0.308	-0.336	0.068	-4.921	***
TRU←GS	0.122	0.117	0.057	2.044	0.041
TRU←BAI	0.410	0.489	0.076	6.399	***
ATT←PU	0.180	0.223	0.096	2.316	0.021
ATT←PEU	0.215	0.201	0.076	2.663	0.008
ATT←TRU	0.161	0.115	0.041	2.816	0.005
ATT←IUE	0.203	0.162	0.054	2.995	0.003
BI←ATT	0.622	0.611	0.053	11.593	***
BI←PU	0.236	0.286	0.070	4.075	***
BI←ISE	0.110	0.084	0.042	2.008	0.045
AU←BI	0.449	0.615	0.125	4.920	***
AU←PR	-0.246	-0.258	0.089	-2.903	0.004

Note: \*\*\**p*<0.001

**Table VII.**  
Squared multiple correlations of the constructs in the extended TAM

	Internet banking self-efficacy (IBSE)	Trust (TRU)	Perceived ease of use (PEU)	Perceived usefulness (PU)	Attitude (ATT)	Behavioural intention (BI)	Actual usage (AU)
Estimate	0.386	0.374	0.455	0.580	0.343	0.676	0.299

Perceived ease of use and banks initiative had a positive effect on perceived usefulness, with path coefficient 0.521 and 0.372, respectively, and explained 58 per cent of the variance in perceived usefulness.

Perceived usefulness, perceived ease of use, internet usage efficacy and trust contributed to attitude towards using internet banking. These factors had path coefficients of 0.18, 0.215, 0.203 and 0.161, respectively, and they explained 34.3 per cent of the variance.

Perceived usefulness, attitude and internet banking self-efficacy contributes to behavioural intention. These factors had path coefficients 0.236, 0.622 and 0.11, respectively, and they explained 67.6 per cent variance in behavioural intention.

Behavioural intention and perceived risk are associated with actual usage, with path coefficients 0.449 and -0.236, respectively, and are able to explain 29.9 per cent variance in actual usage of internet banking.

The structural revised and extended TAM enabled testing of the following hypothesis as shown in Table VIII.

*4.6.1 Measurement invariance and moderating effects of the demographic variables on the variables in the model.* Measurement invariance gives evidence that the instrument is working in the same manner across different groups. Horn and McArdle (1992) argue that establishing psychometric properties of an instrument with just one representative of the overall population does not guarantee identical measurement properties for population subgroups. According to Doll and Torkzadeh (1988) and Klenke (1992), the invariance of the model across different subgroups is important as it confidence to the researcher about the findings. The seminal work of Jöreskog (1971) led to the development of the process of multi-group invariance testing. The parameters of interest, while testing for equivalence across groups are usually factor loading, structural regression paths and factor covariances.

Hypothesis	
H22	Subjective norm will positively affect behavioural intention towards use of internet banking
H20	Subjective norm will positively affect perceived usefulness of internet banking
H21	Subjective norm will have a positive influence on image
H33	Image will have a direct positive influence on attitude towards using internet banking.
H32	Image will positively affect perceived usefulness of internet banking
H34	Image will have a direct positive influence on intention towards using internet banking
H29	Trialability will have a direct positive influence on intention towards using internet banking
H30	Trialability will positively affect perceived ease of use towards internet banking
H31	Trialability will have a direct positive influence on perceived usefulness
H24	Government support will positively affect attitude towards internet banking
H23	Government support will positively affect behavioural intention towards internet banking
H25	Government support will positively affect trust towards internet banking
H5	Trust in internet banking will have a positive effect on perceived ease of use
H6	Trust in internet banking will have a positive effect on perceived usefulness
H8	Trust in internet banking will have a positive effect on behavioural intention towards internet banking
H15	Internet banking self-efficacy positively influences the perceived usefulness towards using internet banking
NR	Internet banking self-efficacy positively influences the behavioural intention towards using internet banking
H18	Internet usage efficacy positively influences the perceived usefulness towards using internet banking
H27	Banks initiative will positively influence perceived ease of use towards internet banking
H7	Trust in internet banking will have a positive effect on attitude towards internet banking
H3	Perceived ease of use will positively affect perceived usefulness of internet banking
H2	Perceived usefulness will positively affect attitude towards internet banking
H4	Perceived ease of use will positively affect the attitude towards internet banking
H35	Attitude will positively affect the behavioural intention towards internet banking
H1	Perceived usefulness positively influences behavioural intention towards internet banking
H36	Behavioural intention positively influences actual usage of internet
NR	Perceived risk will negatively affect usage of internet banking
H9	Perceived risk will negatively affect perceived usefulness towards internet banking
H10	Perceived risk will negatively affect perceived ease of use towards internet banking
H11	Perceived risk will negatively influence intention towards internet banking
H12	Perceived risk will negatively affect trust towards internet banking
H14	Internet banking self-efficacy will positively affect perceived ease of use towards internet banking
H17	Internet usage efficacy will positively affect perceived ease of use towards internet banking
H19	Internet usage efficacy will positively affect internet banking self-efficacy towards internet banking
H16	Internet usage efficacy will positively affect attitude towards internet banking
NR	Banks initiative will positively affect internet banking self-efficacy towards internet banking
NR	Banks initiative will positively affect trust towards internet banking
H26	Banks initiative will positively affect perceived usefulness towards internet banking

Note: NR, new relationship found in this study

**Table VIII.**  
Hypotheses tested using extended TAM

Traditionally, the  $\chi^2$  difference test had been employed for assessing invariance between groups. The  $\chi^2$  difference test is influenced by sample size (Kelloway, 1998; Brannick, 1995). Cheung and Rensvold (2002) based on a simulation analysis of 20 fit indices proposed that a CFI difference of less than 0.01 is required for evaluating multi-group

measurement invariance. This alternative criteria based on the difference in CFI is increasingly being used by researchers. Byrne (2001) points out that researchers can be confronted with diametrically opposite conclusions based on these two criteria for determining measurement invariance and recommend the CFI difference approach to be more practical. The  $\chi^2$  difference and the CFI difference are reported, but the decision to decide invariance was guided by the CFI difference based on a cut-off of 0.01.

The data based on four demographic dimensions gender, age, income, education were divided into two groups for each of these demographic dimensions. The invariance test was first performed on the measurement model and then on the structural model. The measurement model and structural model were subjected to tests of equivalence of parameters across groups.

4.6.1.1 Testing for invariance across gender. In the original TAM, the CFI difference values for the model with measurement weights and structural covariance constrained equal was below the cut-off value of 0.01, which suggested that the constraints associated with metric and scalar invariance did not significantly degrade the overall fit of the model. On reviewing for individual factors and factor loading non-invariance was found for three items PEU3 ( $p < 0.05$ ), PEU4 ( $p < 0.1$ ) and PEU5 ( $p < 0.1$ ). The non-invariance for these three items indicated that they operate differently for male and female respondents.

The extended TAM also had CFI difference values less than 0.01. However, factor-loading non-invariance was found for only one item BAI2 indicating that this item operates differently for both the groups.

In the original TAM, a significant difference in the relationship between perceived ease of use and attitude was found between male and female respondents with female respondents exhibiting a stronger effect.

In the extended TAM the relationship between the seven constructs were significantly different.

The link perceived ease of use and attitude was strong in the case of females and not significant for males. The relation between internet usage efficacy and internet banking efficacy not significant in females but was significant in case of males. Banks initiative and perceived usefulness relationship non-significant in the females and was significant in the case of males. The relation between trust and attitude was not significant for female but was significant in males. The relation between internet usage efficacy and attitude was not significant for females but significant for males. Banks initiative and trust relationship is not significant in the case of females but was strong in case of males. perceived risk and actual usage is negative and strong for females and not significant for males.

4.6.1.2 Testing for invariance across age. There were 158 respondents less than or equal to 30 years of age, they were classified as age group 1 the other 142 respondents who were above 30 years of age were classified as age group 2.

In the measurement model the CFI difference for factor covariance exceeds the cut off 0.01 for TAM and extended TAM indicating that the factor covariances are not equivalent across the groups. Results reveal non-invariance for two items PEU3 and PU2 in the original TAM. In the extended TAM non-invariance was found for the items SE1, PU2, PEU5, SN2, IUE2, IUE3, BAI2, BAI1 and IM2.

In the structural model the CFI difference for the original TAM was below the cut-off for factor loading, structural weights and structural covariance but for the extended TAM, the CFI difference was above the cut-off for structural weights. In the original TAM, the relationship of PEU with PU was significantly different with age group 1 showing a stronger influence. The relationship between PU and BI was also significantly different with age group 1 having a strong influence and this link is not significant in the case of age group 2. In the extended TAM, the relationship between PEU and PU was also found to be

significantly different across the two groups with age group 1 showing a stronger influence. The relationship between BAI and PU was found to be stronger in age group 1 compared to age group 2. The relationship between BAI and TRU was also found to be significantly different across both the groups with age group 1 exhibiting a stronger influence and age group 2 showing a non-significant path. The relationship between PU and ATT was not significant for age group 1 but was significant and strong in age group 2. The relationship between PU and BI was also significantly different with age group 2 showing a non-significant relationship. The relationship between PR and AU was found to be negative and this link was not significant in case of age group 2.

4.6.1.3 Testing for invariance across income level. In this study, there were 116 respondents belonging to income level 1 and 182 respondents who belonged to income level 2. Respondents who belonged to income level 1 had an annual income less than or equal to five lacs and respondents belonging to income level 2 had an annual income more than five lacs.

In the measurement model the CFI difference in the case of the original TAM and extended TAM were found to be less than the cut-off of 0.01. In the original TAM, there was no significant difference in the factor loading across the two groups and all factor loading were found to be significant. In the extended TAM the factor loading were found to be significantly different for the two groups for the items BAI1 and AU1.

In the structural model the CFI difference was more than the cut-off for TAM and extended TAM when structural weights and structural covariances are constrained. In the original TAM, the relationship between PEU and PU was stronger for income level 1. The relationship between PEU and ATT was not significant for respondents from income level 1 but strong for respondents belonging to income level 2. The ATT and BI relationship was significantly different across the two groups with the influence being stronger for income level 1. The PU and BI relationship was found to be not significant for income level 2. The BI and AU relationship was found to be not significant for income level 1. For the extended TAM, significant difference was found between PEU and PU with the influence stronger for income level 1. The relationship between BAI and TRU was found to be stronger for income level 2. The relationship between BI and AU was strong for income level 2 and not significant for income level 1 respondents. The relationship between PR and AU was negative and stronger for income level 1, but for income level 2 respondents this relationship was not significant.

4.6.1.4 Testing for invariance across education levels. There were 144 respondents who had bachelors or lower education and the other 153 respondents had a masters or higher degree. These respondents were classified as having limited and expanded education.

The CFI difference criteria was below the cut-off when measurement weights and covariances were constrained for the original TAM but for the extended TAM the CFI difference was equal to the cut-off when structural covariances were constrained. In the measurement model, the original TAM did not show any significant difference in the factor loading for all the items for both groups. The extended TAM showed significant difference in factor loading for nine items TRU3, SE2, SE1, SN2, SN1, IUE2, GS2, BAI2 and AU1.

The structural model for the original TAM showed significant difference in the relationship between PU and BI with the respondents belonging to the expanded education group showing a higher significance. In the extended TAM, four relationships were significantly different for the two groups. ISE and PEU had a stronger influence shown by respondents belonging to the limited education group. IUE and PU had stronger influence shown by respondents from the expanded education group. BAI and PU were stronger for the respondents with expanded education. PR and AU with a negative structural weight and respondents with expanded education showing a stronger influence and was not significant for the limited education group.



## 5. Conclusions

The study has empirical evidence to show that TAM is appropriate to understand the relationship between factors that lead to internet banking usage. Sheppard *et al.* (1988) after a meta-analysis of 87 studies involving TAM report that on an average 28 per cent variation in usage is determined by its predictors. The TAM is a parsimonious model, however in the internet banking context the relatively low value of SMC for internet banking usage is a limitation. In this study on internet banking 26.5 per cent variation in usage was explained by its predictors and in case of augmented TAM 29.9 per cent variation in usage was explained by its predictors.

### 5.1 Contributions to theory

One of the important limitations of the existing body of knowledge is that it is based almost entirely on research carried out in high-income, industrialized countries in Europe and North America. Undertaking more research in emerging economies is important for the development of marketing science and practice (Burgess and Steenkamp, 2006). Information technology models established in developed countries may not be appropriate to less developed countries (Sukkar and Hasan, 2005). This study is an attempt to contribute to literature by examining internet banking as a whole and the TAM for user acceptance of internet banking particularly from an Indian perspective. This study introduces new variables into a well-accepted TAM and has applied it to the internet banking context. The study is instrumental in bringing out the positive effects of banks initiative and government support on internet banking adoption which has been largely ignored in the existing literature on internet banking adoption. This approach of identifying relevant factors that facilitate or hamper internet banking adoption may lead to a development of a stable internet banking acceptance model.

### 5.2 Contributions to practice

Underutilization of the internet banking channel by bank customers in India is a major problem, as banks have failed to reap the tangible and intangible benefits of internet banking implementation. The marketing strategies and efforts directed at changing behavioural intention without understanding the factors responsible for low-internet banking usage may not result in increasing internet banking usage. The regression weights along the paths in the model give useful insights as to the importance of each factor that contributes directly or indirectly to usage of internet banking. The path coefficient from PEU to PU has a high weight and therefore improving the usability of the website by improving readability, making content easy to understand, using visuals strategically. The findings of this study would enable banks to streamline their marketing strategies by focussing on the factors that are important contributors to the usage of internet banking. The study found a significant difference in the relationship between the latent constructs across gender, age, income level, education level. These findings can be of use to marketers for target specific marketing by customizing the marketing campaign, focussing on the factors that were found to be strong influencers leading to usage of internet banking for the each target audience. Marketing professionals can devise their communication strategy according to gender, age, income level and education, based on the findings.

## 6. Limitations of the study and scope for future work

As in previous research studies (Szymanski and Hise, 2000; Wolfinbarger and Gilly, 2003; Jaiswal *et al.*, 2010), this study also had difficulties in generating random samples for online applications due to the lack of a sampling frame. The limitation of this study as in previous studies is that the sample was regional and convenience sampling method was employed.

Internet banking behaviour may not be static. In technology acceptance, during the various phases from introduction to the maturity phase, the respondent's perceptions tend to change.

There are other variables, which have been identified in previous studies such as computer anxiety, perceived enjoyment and computer playfulness, among many others that were not included in the model used in the study. There is scope for modifying these variables for the internet banking context and can be used to extend TAM further for better understanding internet banking adoption in future studies. The predictor variables in the augmented TAM developed in this study were able to explain 29.9 per cent of the variance in actual usage of internet banking. Research should be directed to find other relevant factors that explain the remaining 70 per cent variation in internet banking usage.

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### Further reading

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