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Emerald Article: The impact of trust and perceived risk on internet banking adoption in India: An extension of technology acceptance model

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The impact of trust and perceived risk on internet banking adoption in India
An extension of technology acceptance model
Ankit Kesharwani and Shailendra Singh Bisht
IBS Hyderabad, Hyderabad, India

Abstract
Purpose – The main purpose of this paper is to extend the technology acceptance model (TAM) in the context of internet banking adoption in India under security and privacy threat.
Design/methodology/approach – Keeping the TAM proposed by Davis as a theoretical basis, an extended TAM incorporating security- and privacy-related issues for internet banking adoption is conceptualized. The authors have incorporated various inhibitors of internet banking which restrict the use of internet banking adoption under “perceived risk”, and also consider the role of the bank web site as a key determinant of perceived risk and of perceived ease of use in the context of internet banking services.
Findings – The paper reveals that perceived risk has a negative impact on behavioral intention of internet banking adoption and trust has a negative impact on perceived risk. A well-designed web site was also found to be helpful in facilitating easier use and also minimizing perceived risk concerns regarding internet banking usage.
Practical implications – Financial bank institutions should give attention to the inhibitors or perceived risk factors of internet banking adoption in order to retain existing customers as well as attract new consumers. The study also suggests that banks should build a web site with features to facilitate users’ assessment of internet banking services and thus minimize the perceived risk and maximize the perceived ease of internet banking services. Web-based retailers depending on online payments would also benefit by incorporating the elements of perceived risk and trust in their own web design and online services.
Originality/value – In addition to the traditional construct of TAM, a new construct of perceived risk has been added. The impact of web site design and trust on internet banking adoption has also been examined and shown to be significant in India in the context of internet banking adoption.

Keywords Internet banking, Technology Acceptance Model, Trust, Perceived risk, India, Virtual banking, Perception, Consumer behaviour

Introduction
Banking via internet is leading the world into another spectrum of banking by allowing the customers to conduct their day-to-day business and banking related activities at their place. Internet banking services have a relative advantage over brick-and-mortar banks in terms of “timeliness and accuracy of information flow” that minimizes the information latency in an intense decision-making environment. In information system research, technology acceptance model (TAM) is considered to be the most widely used and robust model to predict the individual adoption of a new technology (Venkatesh and Davis, 1996; Venkatesh and Davis, 2000; Venkatesh and
Using TAM as a theoretical base, this study has hypothesized and tested an integrated model to explain various factors affecting individual acceptance and usage of internet banking in India. In addition to the traditional constructs of TAM, perceived ease of use and perceived usefulness, a new construct perceived risk has been added to the model. Perceived risk has web site design and trust as its antecedents. The rationale behind integrating perceived risk in TAM is increasing managerial focus on critical challenge to offer safe and secure virtual environment to empower their customers to make full use of e-banking services.

There are growing concerns about risk in online banking services across the world. Perceived risk reflects the consumer’s perception about the uncertainty of outcomes that pertain primarily to searching and choosing information of product and/or services before making any purchasing decision. If the customers find any difference in their actual buying experiences and buying goals, they will perceive higher risk and thus they may discontinue or avoid the use of the product or service in question. Since most of the internet services are operating in an open environment, their applications and outcomes are vulnerable to security and privacy threats such as phishing activities, malwares, spywares, spoofing, and password-sniffing, etc. (Vivo et al., 1998). During the last few years, internet-based attacks have increased tremendously and also highlighted the multiple cases of the theft or fraud, breaches of personal privacy and attacks by hackers (So and Sculli, 2002; Littler and Melanthiou, 2006). This coupled with the perception that online services involve more risk than any other traditional transaction services has led to customers belief that when someone uses online services such as internet banking, e-ticket booking, online shopping, etc. his/her personal security may also be jeopardized (Tan, 1999; Martin and Camarero, 2008).

Internet banking in India

Internet banking in India emerged in mid nineties as newly introduced private sector banks came up with a new business model revolving around a strong information technology (IT) backbone. Internet bank in India was initiated by ICICI bank, a private bank, in 1998. Though it started to facilitate information sharing, storing personal and financial information among banks. Recent development shows that most of brick and mortar banks have evolved themselves by shifting their focus towards up gradation of their own new e-banking capabilities. And internet banking services are progressively turning as “need to have” rather than “nice to have”. But, in a study by Internet and Mobile Association of India (IAMAI) in December 2005, it has been found that the people are hesitant/reluctant to do banking/financial transactions through banks’ internet web sites because of reasons such as:

- security concerns (43 percent);
- preference for face-to-face transactions (39 percent);
- lack of knowledge about online transactions (22 percent);
- lack of user friendliness environment (10 percent); and
- lack of this facility in current bank (2 percent).

In this survey nearly 83 percent out of total bank users was male and about 43 percent of internet banking customers in the survey was in the 26-35 years age group. Moreover, even after around five year the usage of internet banking is in subtle
condition. In a recent study conducted in 2009 on internet users conducted by IAMAI, it was found that only about 12 percent of the online users prefer internet banking as the banking channel in 2009 as compared to 20 percent of the same in 2008. These figures indicate that still a significant number of online users do not use or avoid the use of internet as a banking medium in India. There has been very limited research done in this field to explore the factors that promotes and also factors that inhibits the acceptance and use of internet banking in India (Kannabiran and Narayan, 2009; Prakash and Malik, 2008; Malhotra and Singh, 2009).

Why need to integrate?
The rapid increase in internet based services has also attracted an increasing number of misleading and fraudulent practices over internet (Baker, 1999). During the last few years, these internet-based attacks have been increased tremendously against users and e-commerce systems. Researchers (So and Sculli, 2002; Rotchanakitumnuai and Speece, 2003; Cheng et al. 2006; Littler and Melanthiou, 2006) have highlighted many cases of the theft or fraud, breaches of personal privacy and attacks by hackers. Since internet based services are operating in an open environment, their applications and outcomes are vulnerable to security threats such as phishing activities, malwares, spywares, spoofing, and password-sniffing, etc. (Vivo et al., 1998). However, the amounts at stake, and the buyer’s subjective assessment of the chances of an unfavorable consequence, determine the total amount of risk in any purchase decision (Dowling and Staelin, 1994). Some researchers have argued that online services involve more risk than any other traditional transaction services (Tan, 1999; Martin and Camarero, 2008). Therefore, when someone uses online services such as internet banking, his personal security may also be jeopardized. Though, there is plethora of research available on role of perceived risk in affecting the individual behavior towards internet banking use (Cheng et al., 2006; Gerrard and Cunningham, 2003; Jayewardene and Foley, 2000; Littler and Melanthiou, 2006; Manzano et al., 2009; Sathy, 1999; Suganthi et al., 2001); there is scarcity of studies which have focused on technology acceptance model (refer to Table I). So, we have made an attempt to integrate perceived risk with TAM. Table I clearly highlights that in spite of extensive empirical support existing TAM is not addressing the perceived risk element, which has been identified as an important element of diffusion of innovation literatures.

<table>
<thead>
<tr>
<th>Diffusion of innovation models</th>
<th>Technology acceptance model (TAM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observability (Rogers, 1962)</td>
<td>Perceived usefulness (Venkatesh, 2000)</td>
</tr>
<tr>
<td>Perceived risk (Ostlund, 1974)</td>
<td>Not addressed</td>
</tr>
<tr>
<td>Societal issues (Black et al., 2001)</td>
<td>Subjective norms (Venkatesh and Bala, 2008)</td>
</tr>
</tbody>
</table>

Table I. A comparison of various elements of diffusion of innovation with TAM
Hypotheses and model development

TAM posits that the effect of external influences such as system design characteristics and individual differences on the user’s intention is mediated by his/her perception about easiness and usefulness of the new system (Davis, 1986). Throughout its development, TAM has received extensive empirical support through its applications in different technology/country contexts (Karjaluoto et al., 2002; Chan and Lu, 2004; Chiemeke et al., 2006, Lee et al., 2007); comparisons with other theoretical models (Davis et al., 1989; Mathieson, 1991; Taylor and Todd, 1995; Venkatesh et al., 2008; etc.); and extensions (Venkatesh and Davis, 2000; Gefen et al., 2003; Pikkarainen et al., 2004; Venkatesh and Bala, 2008; etc.). Though most of the services have been done in organizational setting, it will be interesting and worthwhile to see if their findings can be confirmed in a consumer setting like acceptance of internet banking services.

Perceived usefulness

Nevertheless, the TAM has been chosen in this study to understand the customers’ acceptance of internet banking technology. In the context of user acceptance of internet banking services, perceived usefulness could be because of transactions like online request for cheque/demand draft, sending monthly e-statements, online payments, etc. that improves performance, saves time and increase effectiveness of service or some or several add-on benefits such as bill payments, mobile recharge, etc. These benefits are also expected to be further enhancing over a period of time through technological advancement or breakthrough. Many researchers have empirically proven that perceived usefulness exert a significant and positive effect on attitude towards using IT or associated systems (Venkatesh and Bala, 2008; Davis, 1989; Venkatesh and Davis, 2000). So, we hypothesized that perceived usefulness has a significant impact on individual behavioral intention to use internet banking services:

\[ H1. \] Perceived usefulness has a positive and significant impact on individual behavioral intention to use internet banking services.

Perceived ease of use

Perceived ease of use is conceptualized as an individual’s assessment of the mental effort involved in using the new technology (Davis, 1989). Venkatesh (2000) found several determinants of perceived ease of use by integrating internal control (computer self-efficacy) and external control (facilitating condition) into TAM. Various other studies (Davis, 1986, 1989) also pointed that perceived ease of use can influence perceived usefulness because other thing being equal the easier the technology is to use the more useful it can be. In the context of internet banking, research shows that perceived ease of use has a positive and significant effect on perceived usefulness (Philips et al., 1994; Wang et al., 2003). Thus, customers are more likely to accept the internet banking services if there is ease of use in operation/process which can be instrumental to the utilization of technology and contribute to the individual by reducing transfer costs and improving work performance:

\[ H2. \] Perceived ease of use has a positive and significant impact on perceived usefulness to use internet banking services.

\[ H3. \] Perceived ease of use has a positive and significant impact on behavioral intention to use internet banking services.
Perceived risk
Bauer (1960) has defined the perceived risk in terms of the uncertainty and unfavorable consequences associated with consumers’ expectation. It reflects the consumer’s perception about the uncertainty of outcomes that pertain primarily to searching and choosing information of product and/or services before making any purchasing decision (Cox, 1967). Perceived risk plays an important role of catalyst in many online financial transactions (Ndubisi and Sinti, 2006; Rotchanakitumnuai and Speece, 2003). If the customers find any difference in their actual buying experiences and buying goals, they will perceive higher risk and in turn that perceived risk would be dependent on the degree of subjective uncertainty of outcomes. In online services, the spatial and temporal separation between consumers and e-retailers and the unpredictability of the internet services generate an implicit uncertainty around on-line transactions (Al-Gahtani, 2011). It has been found that threats of hacking and phishing attempts can push users to opt out of various forms of participation in the internet based services such as providing personal and sensitive information to web sites (Gerrard et al., 2006; Ndubisi and Jantan, 2003; Nor and Pearson, 2008; Polasik and Wisniewski, 2009). The central value proposition of internet banking relies on to keep transactions safe from such serious security vulnerability. It is expected that perceived risk would lower consumers’ intentions to use internet sites for transactions. For example, consumers are not likely to engage in online transactions with an e-retailer thought to be opportunistic. Similarly, fears that an e-retailer has not taken adequate steps to reduce infrastructure-related risks will also negatively affect transaction intentions. The relationship between perceived risk and transaction intentions can be explained by the notion of perceived behavioral control, described in the theory of planned behavior (Ajzen, 1991). Since attitudes typically lead to actions, reduction of perceived risk is expected to positively influence willingness to transact. In fact, Jarvenpaa et al. (2000) suggested that reducing the risk associated with buying from an internet store would increase the probability of a consumer purchasing from it. Perceived risk has been shown to negatively influence transaction intentions with e-retailer. The perceived risk associated with online transactions may reduce perceptions of behavioral and environmental control, and this lack of control is likely to negatively influence transaction intentions. However, consumers are likely to transact online if their risk perceptions about behavioral and environmental uncertainties are alleviated, so that they gain control over their online transactions. The theory of reasoned action predicts that consumers would be willing to transact if their risk perceptions were low. Thus, we hypothesize that:

H4. Perceived risk has a negative and significant impact on behavioral intention towards use of internet banking technologies.

Social influences
Social influence on technology acceptance behavior has been widely acknowledged. Most of the previous works have emphasized on subjective norm to understand the essence of social influence, but they have got mixed results and its effect on technology has also been inconsistent. Venkatesh and Davis (2000) have found that social influence has only a significant impact on technology adoption under mandatory settings, and also that its effect moderates as users begin to have direct experiences with the target system. In addition, several researchers such as Conner and Armitage
(1998) and Terry and Hogg (2000) have disagreed that the construct has limited conceptualization because it emphasizes only on the normative part of societal beliefs as opposed to wider societal contexts. Therefore, researchers have expressed the need to further articulate the link between social influence and technology acceptance (Matheison, 1991; Karahanna and Limayem, 2000).

Whereas there is a direct relationship between subjective norm and intention in TRA and TPB is based on compliance, TAM2 encompasses two additional theoretical construct: internalization and image (Venkatesh and Davis, 2000). Internalization refers to the process by which one thinks that when an important referent thinks one should use a system, one incorporates the referent’s belief into one’s own belief structure. Internalization is an informational (as opposed to normative) social influence, and defined as the influence to accept information from another as evidence about reality. In the present context, if a family member/friend/colleague recommends that use of internet as a banking channel might be useful, a person may also believe that it is actually useful, and in turn form an intention to use it. Research has shown that individuals are very receptive to social normative influences to ascertain or maintain a favorable image within a reference group. Drawing from research on diffusion of innovations, Moore and Benbasat (1991) have defined image as “the degree to which use of an innovation is perceived to enhance one’s status in one’s social system.” Venkatesh and Davis (2000) have found that subjective norm positively affect image because, if important members of an individual’s social group at work think that he/she should use a system, then using that system will be likely to enhance his/her social status within the group. Drawing inferences from these two related concepts, we hypothesized that social influences will affect the individual intention to use internet banking services. Thus we hypothesized that:

H5. Social influences have a positive and significant impact on an individual behavioral intention to use internet banking services.

H6. Social influences have a positive and significant impact on individual perceived usefulness of internet banking services.

Varadarajan and Yadav (2002, p. 297) have defined the e-marketplace as “a networked information system that serves as an enabling infrastructure for buyers and sellers to exchange information, transact, and perform other activities related to the transaction before, during, and after the transaction”. Most of the internet-based services allows their consumers to interactions/ communications among themselves that help to diminish their uncertainties related to online services. Many online shoppers would tend to wait and observe the experiences of others who have tried it before considering adopting it. While these experience could be either positive (successful cases) or negative (bad experiences), here we are more interested in positive experience because it reduces the customers perception regarding risk related issues and thus facilitates internet banking services. Hence we hypothesize that:

H7. Positive social influences have a negative and significant impact on perceived risk of using internet banking services.
**Perceived behavioral control**

In addition to attitudes and subjective norms (as suggested in Theory of Reasoned Action), theory of planned behavior introduces the concept of perceived behavioral control, which originates from Social Cognitive Theory (Bandura, 1977). Bandura (1982) has decomposed these behavioral beliefs into two distinct constructs: self-efficacy and outcome expectancy. He defined self-efficacy as the individual belief about his or her capability to perform in a certain manner to attain certain goals (Bandura, 1977, 1982). The outcome expectancy refers to a person’s estimation that a given behavior will lead to certain outcomes. Recently, in their integrative model, Fishbein and Cappella (2006) have found that both self-efficacy and perceived behavioral control are same. Moreover, they also suggest that perceived behavioral control can also be assessed by same items of self-efficacy.

In IT usage context, self-efficacy can be conceptualized as computer self-efficacy (Venkatesh, 2000). Various studies (Ndubisi and Jantan, 2003; Taylor and Todd, 1995; Venkatesh and Davis, 1996; Venkatesh and Davis, 2000; Wang et al., 2003) have empirically supported the causal flow from computer self-efficacy to technology-specific perceived ease of use and also from computer self-efficacy to perceived ease of use of internet banking technology in IT context (Wang et al., 2003). Thus we hypothesize that:

**H8.** Perceived behavioral control has a positive and significant impact on perceived ease of use.

**Web site design**

In internet banking services, users interact with the bank web site to perform their transactions and thus the web site provides a platform where customers can perform a series of actions to complete their transactions successfully (Alhudaithy and Kitchen, 2009). If the web site interface is poorly structured, lacks security and clarity or includes noise and distortion then transaction may be adversely affected (Ganguly et al., 2009). Ideally, web site should provide content information clearly in such a way that is simple to navigate and has low level of complexity. It has been found that the perceived ease of use also determined on the internet banking web sites features such as web site connectivity, clarity of instructions, speed of upload and download, etc. i.e. as internet bank services gives advantages to their consumers by allowing the customers to access their banking accounts from any location and at any time of the day (Agarwal and Venkatesh, 2002; Ndubisi and Sinti, 2006). So, we hypothesized that:

**H9.** Well-designed web site has a negative and significant impact on perceived risk to use internet banking technologies.

**H10.** Well-designed web site has a positive and significant impact on perceived ease of internet banking technology use.

**Trust**

Trust has been conceptualized as “trustor’s cognitive beliefs that results from observing the trustee’s action, and attributing the cause of the behaviour to the trustee’s internal trust-related characteristics” (McKnight et al., 1998). But several researchers such as Komiak and Benbasat (2004) have viewed trust from the emotional point of view and defined as the extent to which an individual feels secure and
confident about relying on the trustee. Ennew and Sekhon (2007) have defined the trust as “individual’s willingness to accept vulnerability on the grounds of positive expectations about the intentions or behavior of another in a situation characterized by interdependence and risk.” This definition combines both the emotional as well as cognitive dimensions of trust. Therefore, consumer trust could be described as a function of the degree of risk involved in the situation and it is basically needful only in uncertain situations.

Trust has also been shown to reduce the risk of being taken advantage of by e-vendor in online transactions (Yousafzai, 2010). Whereas research focuses on the relationship between trust and risk, the trust literature and empirical evidence predominantly focus on industrial relationships, but theoretical and empirical validation in B2C e-commerce is scarce. Indeed, Jarvenpaa et al. (2000) extended the inter-organizational trust literature into consumer behavior in order to show that trust in an internet store reduces the risks of buying from that store. Trust in e-commerce reduces behavioral uncertainty and related risks associated with the possibility that an e-retailer might behave opportunistically. When people trust others, they assume that those they trust will behave as expected, reducing the complexity of the interaction. Consumers tend to assume that a trusted e-retailer will not engage in opportunistic behavior. Thus trust reduces the perceived risk. When an e-retailer can be trusted to show competence, integrity, and benevolence, there is much less risk involved in interacting with it. Moreover, a trusted e-retailer can be expected to take steps to reduce environmental uncertainty and related risks associated with the internet infrastructure, reducing the environmental risk associated with a focal transaction. In general, trust improves the consumer’s beliefs about e-retailer and the associated infrastructure, attenuating the perceived level of risk associated with the transaction process (Yousafzai, 2005, 2009). Hence, trust reduces the risk involved in transacting with e-retailer. Thus, trust in an e-banking institution reduces risk beliefs about on-line banking transactions with that e-banking institution (see Figure 1). Hence, we hypothesize that:

\[ H11. \text{ Trust has a negative and significant impact on perceived risk to use internet banking technologies.} \]

**Research methodology**

**Instrument development**

The measurement instrument contained the scales from previous studies based on TAM, web site interactivity, trust, and perceived risk. One obvious advantage of TAM scales is that these scales have been validated in e-commerce and online shopping contexts (Wang et al., 2003; Ndubisi and Junta, 2003; McKechnie et al., 2006). The four items scales for perceived ease of use, perceived usefulness, perceived behavioral control, social influence, and behavioral intention are adapted from Venkatesh and Bala (2008). Items relating to trust, perceived risk were taken from Dash and Saji (2007). In their (Dash and Saji, 2007) study in Indian context, authors have used the seven items trust scale by adapting four items from Chellappa (2005) and three items from Suh and Han (2003); and perceived risk four items scale from Chan and Lu (2004). In our study we have taken four items scales for each based on their higher loadings. This approach is consistent with recommendations in psychometric literature (e.g. Venkatesh et al., 2008). The eight-item scale relating to web site design is taken
from an Indian study conducted by Cyr (2008). Thus, measurement instrument was consists of 35 items. Each item was measured using a seven-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). Several other information like demographic details (age, gender, family annual income, and educational qualification), name of bank they are dealing with, were also collected. In cases, respondents having internet banking access of more than one bank they were asked to mention the name of most preferred bank. The self-reported usage details regarding duration of using internet banking and frequency of using internet banking in a month are also recorded.

A questionnaire was administered to postgraduate students at a premier business school (one of top 10 B-Schools) in India, who use internet banking services. In e-commerce and other online services (including online shopping), internet banking is the most common payment mechanism. Our research design was deliberately aimed to capture perception of users to this common and most widely used payment gateway.

**Primary data analysis and descriptive statistics**
The questionnaires were administered over 1,050 students and were asked to return the completed questionnaire within a week. The student sample is considered to be
appropriate for this study because, according to an Internet and Mobile Association of India (IAMAI) report, most of the online financial transactions are done by users of younger age and their age group; and this age group is heavy users of internet (I-cube 2009). Out of 740 received responses, some respondents who didn’t have any exposure of internet banking service and/or who did not fill the questionnaire correctly i.e. mark more than one score in most of the items, filled same score in all items, etc. were not included in final sample. The questionnaires with more than three missing values were also excluded from the data analysis. Rests of the missing values were replaced with series mean. Thus, final sample size got reduced to 619 respondents. Out of these respondents, 44.2 percent respondents were female and 55.8 percent were male. All respondents were between 20-33 years of age with majority of them in range of 22-24 years (52.4 percents). Most of the respondents (78.6 percent), using internet banking at least once a month, and fell under the definitional requirement of active user by IAMAI report (I-cube 2009). About 85.8 percent respondents have adequate experience with internet banking as they were using internet banking services for more than one year.

Data analysis
Before doing data analysis, an exploratory factor analysis (EFA) was done on the 35 items to identify the underlying factors. KMO value was 0.910, which was more than the recommended value of 0.6 for sample adequacy. Bartlett’s test of sphericity was also significant ($p < 0.001$). Factors with Eigen value greater than 1 and factor loading greater than 0.50 have been retained for further analysis. This step has resulted in eight factors explaining the 68.06 percent of the variance after varimax rotation. The scale reliability coefficients were also more than acceptable level of 0.70 (Hair et al., 2010).

After this a two-stage structure equation modeling approach (Gerbing and Anderson, 1984) was used for data analysis. In this approach, both, measurement model and structural models are evaluated separately using different sample. So, the sample was divided into two sub-samples of size 322 and 291 respectively. First sub-sample was used for assessment of measurement model and later one was used for examination of structural model.

Measurement model
A confirmatory factor analysis (CFA) of measurement model was done using AMOS 16.0. The initial measurement model was reflecting adequate model fit ($\text{CMIN} = 1310.673$, $\frac{\text{CMIN}}{\text{DF}} = 1.968$, $\text{GFI} = 0.912$, $\text{AGFI} = 0.836$, $\text{NFI} = 0.927$, $\text{CFI} = 0.906$, $\text{RMR} = 0.099$, $\text{RMSEA} = 0.054$) (Byrne, 2010; Hair et al., 2010), but number of indicators per item was large, e.g. web site design has eight indicators. Subsequently, the measurement model in the CFA was further refined by deleting certain items. Items were deleted, one at a time, on the basis of their standardized residual i.e. those having a larger amount of error variance with their measurement items. Each item deleted was cautiously read to ensure that its error variance also seems reasonable from theoretical viewpoint. This procedure of refining construct and assessing Unidimensionality of each construct is supported by Churchill (1979, p. 69) “Though this application [exploratory factor analysis] may be satisfactory during the early stages of research on a construct, the use of factor analysis in a confirmatory
fashion would seem better at later stages” and Gerbing and Anderson (1984, p. 191) “to
demonstrate that an explicit evaluation of Unidimensionality is accomplished with a
confirmatory factor analysis of the individual measures as specified by a
multiple-indicator measurement model. Coefficient alpha is important in the
assessment of reliability, but it does not assess dimensionality. Though item-total
correlations and exploratory factor analysis can provide useful preliminary analyses,
particularly in the absence of sufficiently detailed theory, they do not directly assess
Unidimensionality. The reason is that a confirmatory factor analysis makes possible
an assessment of the internal consistency and external consistency criteria of
Unidimensionality implied by the multiple-indicator measurement model.” After
deleting items, the CFA model depicted acceptable model fit. The chi-square
value (CMIN) of 257.62 with 161 degree of freedom resulted in chi-square to degree
of freedom ratio (CMIN/df), at 1.600, less than the recommended value of 4 (Hair
et al., 2010). Also, other model fit indices were also reflecting adequate model of the data
ðGFI ¼ 0.931; AGFI ¼ 0.901; NFI ¼ 0.922; CFI ¼ 0.969; RMR ¼ 0.070; RMSEA ¼ 0.047
(Byrne, 2010; Hair et al., 2010).

Reliability and validity measures
Fornell and Larcker (1981) have emphasized on both the reliability of each indicator
variable (measurement item) as well as the reliability of each construct. Reliability of
each measurement item is measured by squared multiple correlation (SMC). SMC
represents the amount of variance explained by an individual indicator/construct of its
respective factor; and measured by square of its (indicator’s) standardized factor
loading. Cronbach’s alpha (α) is used to measure the reliability of each construct.

<table>
<thead>
<tr>
<th>Construct</th>
<th>Item</th>
<th>Mean</th>
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<th>CR</th>
<th>α</th>
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<td>4.58</td>
<td>1.41</td>
<td>0.866</td>
<td>0.750</td>
<td></td>
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<tr>
<td>Perceived behavioral control</td>
<td>PBC1</td>
<td>4.36</td>
<td>1.70</td>
<td>0.808</td>
<td>0.653</td>
<td>0.873</td>
<td>0.869</td>
<td>0.696</td>
</tr>
<tr>
<td></td>
<td>PBC3</td>
<td>4.78</td>
<td>1.51</td>
<td>0.891</td>
<td>0.794</td>
<td></td>
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<tr>
<td></td>
<td>PBC4</td>
<td>4.90</td>
<td>1.47</td>
<td>0.801</td>
<td>0.641</td>
<td></td>
<td></td>
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<tr>
<td>Web site design</td>
<td>WB3</td>
<td>5.33</td>
<td>1.32</td>
<td>0.803</td>
<td>0.645</td>
<td>0.822</td>
<td>0.822</td>
<td>0.607</td>
</tr>
<tr>
<td></td>
<td>WB4</td>
<td>5.10</td>
<td>1.20</td>
<td>0.747</td>
<td>0.559</td>
<td></td>
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<tr>
<td></td>
<td>WB5</td>
<td>5.21</td>
<td>1.29</td>
<td>0.785</td>
<td>0.617</td>
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<tr>
<td>Social influence</td>
<td>SI1</td>
<td>4.76</td>
<td>1.42</td>
<td>0.896</td>
<td>0.803</td>
<td>0.692</td>
<td>0.697</td>
<td>0.672</td>
</tr>
<tr>
<td></td>
<td>SI4</td>
<td>4.80</td>
<td>1.31</td>
<td>0.735</td>
<td>0.540</td>
<td></td>
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<td></td>
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<tr>
<td>Perceived risk</td>
<td>PR1</td>
<td>4.12</td>
<td>1.62</td>
<td>0.801</td>
<td>0.641</td>
<td>0.813</td>
<td>0.809</td>
<td>0.592</td>
</tr>
<tr>
<td></td>
<td>PR2</td>
<td>4.33</td>
<td>1.49</td>
<td>0.801</td>
<td>0.642</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>PR4</td>
<td>4.66</td>
<td>1.54</td>
<td>0.703</td>
<td>0.494</td>
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<td></td>
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<tr>
<td>Behavioral intention</td>
<td>BI1</td>
<td>5.44</td>
<td>1.19</td>
<td>0.858</td>
<td>0.736</td>
<td>0.824</td>
<td>0.824</td>
<td>0.701</td>
</tr>
<tr>
<td></td>
<td>BI2</td>
<td>5.43</td>
<td>1.20</td>
<td>0.816</td>
<td>0.666</td>
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</tbody>
</table>

Notes: SD = standard deviation, λ = standardized factor loading, SMC = squared multiple
correlation, CR = composite reliability, α = Cronbach alpha, AVE = average variance explained

Table II. Reliability and validity measures
loading. Column 5 of Table II shows that all values of SMC are greater than cut-off of 0.30 suggested by Bagozzi and Yi (1988). Reliability of each construct is assessed by Cronbach alpha. As suggested by Hair et al. (2010), alpha values are more than the acceptable cut-off criterion of 0.7 (Table II).

According to Hair et al. (2010), there are three common approaches to ensure convergent validity used by researchers:

1. standardized factor loading (0.5 or greater);
2. average variance explained (0.5 or higher); and
3. composite reliability (0.7 or above).

As shown in Table II, each standardized factor loadings ($\lambda$) was statistically significant ($p < 0.001$) and loadings ranged from 0.604 to 0.926, which reflect adequate convergent validity. The values of average value explained (AVE) and construct reliability (discussed as “composite reliability”) were also more than their cut-off level 0.5 and 0.7 respectively and acceptable. Therefore, these measures exhibited adequate convergent validity.

Discriminant validity was ensured through comparison of shared variance between factors with the average variance explained of individual factor. Table III presented the correlation matrix of constructs, where non-diagonal elements are correlation among constructs and diagonal elements are square root of average variance explained by that construct. Fornell and Larcker (1981) suggested that the diagonal value should be greater than non-diagonal value for adequate discriminant validity. Table II clearly shows that all eight factors are different from each other.

### Structural model: measurement of research hypotheses

After judging the reliability and validity of these eight constructs, a structure model was estimated to examine the research hypotheses. For this purpose sub-sample two has been used. The structural model also fitted well to the data ($\chi^2 = 344.7$, df = 177, $\chi^2$/df = 1.947, GFI = 0.900, AGFI = 0.869, NFI = 0.880, RMR = 0.090, RMSEA = 0.057).

$H1$, $H2$ and $H3$ are basic TAM relationships proposed by Davis (1986, 1989). Except $H3$ that is perceived ease of use has a significant effect on individual behavioral

<table>
<thead>
<tr>
<th>Constructs</th>
<th>PU</th>
<th>PEOU</th>
<th>PR</th>
<th>TR</th>
<th>PBC</th>
<th>WB</th>
<th>SI</th>
<th>BI</th>
</tr>
</thead>
<tbody>
<tr>
<td>PU</td>
<td>0.739</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PEOU</td>
<td>0.667</td>
<td>0.731</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PR</td>
<td>0.309</td>
<td>0.345</td>
<td>0.769</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TR</td>
<td>0.440</td>
<td>0.424</td>
<td>0.603</td>
<td>0.894</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PBC</td>
<td>0.167</td>
<td>0.013</td>
<td>-0.046</td>
<td>0.087</td>
<td>0.834</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WB</td>
<td>0.606</td>
<td>0.539</td>
<td>0.332</td>
<td>0.318</td>
<td>0.121</td>
<td>0.779</td>
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</tr>
<tr>
<td>SI</td>
<td>0.406</td>
<td>0.337</td>
<td>0.460</td>
<td>0.412</td>
<td>0.208</td>
<td>0.325</td>
<td>0.820</td>
<td></td>
</tr>
<tr>
<td>BI</td>
<td>0.678</td>
<td>0.666</td>
<td>0.521</td>
<td>0.531</td>
<td>0.103</td>
<td>0.554</td>
<td>0.624</td>
<td>0.837</td>
</tr>
</tbody>
</table>

**Table III.** Comparison of inter-construct correlation with AVE for discriminant validity

**Note:** Diagonal elements are square-root of average variance explained; Non-diagonal elements are correlation between constructs
intention, both hypotheses \( H1 \) and \( H2 \) are found to be significant. Findings indicate that individual intention could be affected by perceived usefulness (\( H1: \beta = 0.595, p < 0.001 \)). However, path coefficients suggest that PEOU has significant impact on perceived usefulness (\( H2: \beta = 0.761, p < 0.001 \)). It has insignificant impact on behavioral intention (\( H3: \beta = 0.048, p = 0.711 \)). These findings confirm the TAM relationships hypothesized by Davis (1986, 1989) and also previous studies, which supports that PEOU as an antecedent of PU (Venkatesh and Davis, 2000; Wang et al., 2003). The total effect of PEOU on BI was 0.453 (\( = 0.761 \times 0.595 \)). Results also reveal that BI is also an affected by perceived risk (\( H4: \beta = 0.181, p < 0.01 \)) and social influence (\( H5: \beta = 0.169, p < 0.01 \)).

As shown in Table IV, SI has also a positive impact on PU (\( H6: \beta = 0.128, p < 0.05 \)) and PR (\( H7: \beta = 0.173, p < 0.01 \)). PBC, which is hypothesized to have significant impact on PEOU, is supported (\( H8: \beta = 0.124, p < 0.01 \)). The total effect of SI on BI was 0.276 (\( = 0.169 + 0.128 \times 0.595 + 0.173 \times 0.181 \)). Hypotheses related to web site design (\( H9 \) and \( H9 \)) have tested to see the impact of WB on PR and PEOU, respectively. Result shows that WB has a greater influence on PEOU (\( H10: \beta = 0.685, p < 0.001 \)) as compared to PR (\( H9: \beta = 0.125, p < 0.05 \)). WB has total effect of 0.333 (\( = 0.125 \times 0.181 + 0.685 \times 0.761 \times 0.595 \)) on BI. TR has also a positive and significant effect on PR (\( H11: \beta = 0.535, p < 0.001 \)).

**Discussion**

Drawing upon the theory of reasoned action, this paper theoretically develops an extensive set of interrelationships among these variables and examines their comparative effect on consumer intentions to use the internet for online transactions. By indicating the relevance of TRA in the proposed model, the study makes a theoretical and empirical contribution to the emerging e-commerce literature by validating a theory-driven research model of how to influence transaction behavior in web retailers. The present research tries to integrate the fragmented theories and research on perceived risk and individual acceptance of internet banking technology into a conceptual model that may help in understanding, explaining and predicting the individual acceptance of internet banking services. We have drawn on TRA & TAM to develop an integrated model for understanding consumer adoption of internet banking.

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Hypothesized relationship</th>
<th>Path coefficient</th>
<th>( p )-value</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>( H1 )</td>
<td>PU \rightarrow BI</td>
<td>0.595***</td>
<td>0.001</td>
<td>Supported</td>
</tr>
<tr>
<td>( H2 )</td>
<td>PEOU \rightarrow PU</td>
<td>0.761***</td>
<td>0.001</td>
<td>Supported</td>
</tr>
<tr>
<td>( H3 )</td>
<td>PEOU \rightarrow BI</td>
<td>0.048 (ns)</td>
<td>0.930</td>
<td>Not supported</td>
</tr>
<tr>
<td>( H4 )</td>
<td>PR \rightarrow BI</td>
<td>-0.181**</td>
<td>0.010</td>
<td>Supported</td>
</tr>
<tr>
<td>( H5 )</td>
<td>SI \rightarrow BI</td>
<td>0.169**</td>
<td>0.010</td>
<td>Supported</td>
</tr>
<tr>
<td>( H6 )</td>
<td>SI \rightarrow PU</td>
<td>0.128*</td>
<td>0.030</td>
<td>Supported</td>
</tr>
<tr>
<td>( H7 )</td>
<td>SI \rightarrow PR</td>
<td>-0.173**</td>
<td>0.010</td>
<td>Supported</td>
</tr>
<tr>
<td>( H8 )</td>
<td>PBC \rightarrow PEOU</td>
<td>0.124*</td>
<td>0.030</td>
<td>Supported</td>
</tr>
<tr>
<td>( H9 )</td>
<td>WB \rightarrow PR</td>
<td>-0.125*</td>
<td>0.030</td>
<td>Supported</td>
</tr>
<tr>
<td>( H10 )</td>
<td>WB \rightarrow PEOU</td>
<td>0.685***</td>
<td>0.001</td>
<td>Supported</td>
</tr>
<tr>
<td>( H11 )</td>
<td>TR \rightarrow PR</td>
<td>-0.535***</td>
<td>0.001</td>
<td>Supported</td>
</tr>
</tbody>
</table>

**Notes:** *\( p < 0.05 \), **\( p < 0.01 \), ***\( p < 0.001 \); ns = not significant
One of the most important contributions has been in integrating the element of perceived risk to understand, explain and predict the consumer acceptance of internet banking services. So, from a theoretical perspective, the present model aims to provide a more refined and comprehensive view of the determinants of behavioral intention by integrating perceived risk into TAM.

In the early stages of internet banking technology acceptance among general bank users, the present model provides an additional element of perceived risk consideration of service providers. This would help in encouraging customers to try and stick with internet banking based on technology complexity, facilitating condition, perceived behavioral control, and social influences. Our model has an advantage over TAM or other similar models through the addition of consumer evaluation of perceived risk with respect to bank web site and trust as determinant of user intention to use internet banking services. Similar results have been reported by Jiang et al. (2010), who found that web sites with higher involvement and reciprocal communication might lead to higher purchase intention. Thus, our model, which includes web site design as an important element, enriches the extant literature by providing an examination. It would be helpful to future researchers in the understanding and generation of more comprehensive guidelines for enhancing the user acceptance and use of internet banking services. This could be done by analyzing the impact of web site interactivity and also the effect of specific features of web site on internet banking adoption.

We found that web site features have a negative impact on perceived risk and positive impact on perceived ease of use. Thus, we conclude that financial institutions with well-designed web sites would be able to offer a more secure presentation of their internet banking services and thus reduce the perceived risk in the transaction. We had also hypothesized a negative relationship between trust and perceived risk. The results show that measures that enhance trust can go a long way in reducing perceived risk. Financial institutions offering internet banking services need to incorporate significant measures to enhance trust as that would reduce perceived risk and thereby increase customer intention to use internet banking services. This also points to the fact that well-designed web sites for internet banking would increase the perceived ease of use and thus facilitate more trials and stickiness with the internet banking services.

In terms of theory building, this study attempts to develop a new theory by grounding new variables in a well-accepted general model (TRA) and applying them to a new context. It is important to note that the two new variables – trust and perceived risk, is placed within the nomological structure of the original model and is compatible with TAM variables that have already been placed within the TRA framework. This approach is likely to ensure a consistent model of the drivers of B2C e-commerce as well as stable theory development. Hence, the proposed model makes an important contribution to the emerging literature on e-commerce. It is suggested that e-banking institutions gain a better understanding of consumers’ trust towards e-banking services in order to build a positive image in the mind of both, existing as well as potential customers. Integration of these additional factors/variables and the hypothesized relationships also elevates the conceptualized TAM for internet banking technology up to a more comprehensive level, promoting and facilitating future research concerning acceptance of internet banking technology. However, attention should be called to the fact the model does not include all factors influencing
the actual adoption of internet banking technology. Therefore, proposed model can be modified and improved through additional studies.

Besides the financial institutions providing internet banking services, even the web-retailers opting for online payments should acknowledge that consumer trust and perceived risk may result a barrier to online transactions. In fact, if the web-retailers can build trust and decrease perceived risk, it will positively influence consumer intentions and actions. Web-retailers could employ several trust-building mechanisms to manipulate favorable consumer attitudes and the ultimate transaction behaviour.

We have not been able to conclusively examine the directionality of the causal relationship between trust and perceived risk. Though, the present study shows that trust is a significant antecedent of perceived risk. However, future research could further examine the interrelationships among trust, perceived risk, and behavioral intention for technology acceptance in general and internet banking in particular. Though, the proposed model can serve as a blueprint for understanding the customer acceptance of internet technologies across cultures as it incorporates the elements of trust and perceived risk which generally vary across cultures. But, future research is also needed to understand and differentiate technology acceptance across cultures as that would be critical for the MNCs planning to enter new countries with similar internet banking services.

References


Impact of trust on internet banking


Further reading


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