

## Viewpoint

# Understanding the Internet banking adoption: A unified theory of acceptance and use of technology and perceived risk application



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## ABSTRACT

Understanding the main determinants of Internet banking adoption is important for banks and users; our understanding of the role of users' perceived risk in Internet banking adoption is limited. In response, we develop a conceptual model that combines unified theory of acceptance and use of technology (UTAUT) with perceived risk to explain behaviour intention and usage behaviour of Internet banking. To test the conceptual model we collected data from Portugal (249 valid cases). Our results support some relationships of UTAUT, such as performance expectancy, effort expectancy, and social influence, and also the role of risk as a stronger predictor of intention. To explain usage behaviour of Internet banking the most important factor is behavioural intention to use Internet banking.

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## 1. Introduction

In recent years the Internet has been growing and offering many Web-based applications as a new way for organizations to retain customers and offer them new services and products (Tan & Teo, 2000). In order for both parties (customers and organizations) to take advantage of these applications, it is crucial to analyze the genuine perception and main reasons of people's willingness to adopt these technologies (Lee, 2009; Liao & Cheung, 2002).

Internet banking has emerged as one of the most profitable e-commerce applications (Lee, 2009). Most banks have deployed Internet banking systems in an attempt to reduce costs while improving customer service (Xue, Hitt, & Chen, 2011). Despite the potential benefits that Internet banking offers consumers, the adoption of Internet banking has been limited and, in many cases, fallen short of expectations (Bielski, 2003).

While earlier research has focused on the factors influencing the end-user IT adoption, there is limited empirical work which simultaneously captures the success factors (positive) and resistance factors (negative) that drive customers to adopt Internet

banking (Lee, 2009). Building upon the premise that purchasing Internet banking services is perceived to be riskier than purchasing traditional banking services (Cunningham, Gerlach, Harper, & Young, 2005), this study introduces the perceived risk factor. Drawing from perceived risk theory, this study couples specific perceived risk facets (Featherman & Pavlou, 2003) – namely performance, financial, time, psychological, social, privacy, and overall risk – with unified theory of acceptance and use of technology (UTAUT) to propose an integrated model to explain customers' intention to adopt and use Internet banking.

Our research merges an existing and empirically validated theoretical model with a perceived risk factor, which is also an important construct that will be tested on the adoption of Internet banking for the first time. Thus, this study may help banks to understand the determinant factors that influence users and to create the right policies and actions to attract customers to use this service. Additionally, it is in the banks' and clients' interest to direct their communication from bank branches to online channels in order to be more productive and cost-effective for both parties.

The structure of the paper is as follows. In the next section the concept of Internet banking, the current theories that explain customers' acceptance of technology, the definition of perceived risk, and earlier research on this topic are presented. The research model is then conceptualized. The second part of the paper presents the research design, methodology, and results. Finally, the results are discussed, including the implications for theory and practice, and further possible research directions are outlined.

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## 2. Theoretical background

### 2.1. The concept of Internet banking

Concerning the increasing innovation and urgent need of up-to-date, convenient and reliable data, information systems (IS) have gained high importance in the organizational context. Against this background, a great dependency between the organizations' performance and their IS is emerging. Organizations can now profit from the evolution of new technologies and adapt to the emerging ways of interacting with their clients. The banking sector has been using IS not only to run internal business activities and to promote products, but also to provide main services to their customers. The dematerialization of customer relationships, that is, the better use of the numerous new IS available in the market, is a topical challenge facing this sector. Adjusting to this challenge will allow clients to satisfy almost all their banking needs with minimum human intervention (Jayawardhena & Foley, 2000; Tan & Teo, 2000).

Internet banking is defined as the use of banking services through the computer network (the Internet), offering a wider range of potential benefits to financial institutions due to more accessibility and user friendly use of the technology (Aladwani, 2001; Yiu, Grant, & Edgar, 2007). Literature suggests many concepts to identify Internet banking, namely electronic banking, online banking, and e-banking. With Internet banking, customers can perform, electronically, a wide range of transactions, such as writing checks, paying bills, transferring funds, printing statements, and inquiring about account balances through the bank's website-banking solution. Furthermore, Internet banking has a significant impact on e-payments, offering a platform to support many e-commerce applications, such as online shopping, online auction, and Internet stock trading (Aladwani, 2001; Lee, 2009; Tan & Teo, 2000).

When Internet banking became popular, it was used mainly to provide information for marketing the products and services on the bank's website, but with the technological development of secured electronic transactions, more banks have been using it also as a transactional framework (Tan & Teo, 2000; Yiu et al., 2007). Recently, online banks have been expanding their presence in the market (including the Portuguese market) and adopting other channels, such as call centres, but their impact on the whole banking sector has been limited (DECO, 2010; Tan & Teo, 2000).

Pikkarainen, Pikkarainen, Karjaluoto, and Pahnla (2004) highlighted two main reasons for the development and proliferation of Internet banking. First, the cost savings by the banks compared with the traditional channels; second, the reduction of branch networks and, therefore, the costs with staff. Jayawardhena and Foley (2000) also identified the benefit of increasing the customer base, because using multiple distribution channels (branch networks, Internet banking, mobile banking, etc.) amplifies market coverage by enabling different products to be targeted at different demographic segments. With a larger customer base, banks can profit from marketing and communication, with the possibility of mass customization for each group of clients, offering innovative products. This is an important issue because many organizations today are saturated with mass automation and homogenized products and services. In the customer view, there is an increase in the autonomy, with less dependency on the branch banking and, consequently, less time and effort. Recently, the Portuguese Association of Consumer Defence (DECO) performed a study about costs and benefits of Internet banking usage and concluded that users can save more than € 300 per year if they use these services instead of the traditional ones (DECO, 2012). On the Internet platform, users can benefit from financial products that are online exclusive, and

these may have higher returns than those in the traditional channels of banks.

Regarding the profile of Internet banking customers, they have an increased banking activity, acquire more products, and maintain higher asset and liability balances, demonstrating that they are more valuable than the traditional ones (Hitt & Frei, 2002; Xue et al., 2011). Additionally, customers who have greater transaction demand and higher efficiency, and reside in areas with a greater density of online banking adopters, are faster to adopt Internet banking. These adopters also have a lower propensity to leave the bank.

Looking at the current situation in Portugal, we see that there are many Internet platforms available in almost all leading banks. Since 2005 the use of Internet banking services by Portuguese banking consumers has increased by 82%, while personal and telephone contacts have decreased approximately 17% (Grupo Marktest, 2011, 2012). Despite this recent surge in the use of Internet banking services, many banking users (approximately 70%) are not comfortable with this channel and prefer to use the traditional ones (Automated Teller Machine – ATM, personal contact, and telephone contact). Grupo Marktest has also undertaken a characterization of Internet banking adopters and concluded that they are men, young (25–34 years), and from medium/upper classes of society. Regarding the type of job, they found that medium/upper management have an adoption rate 2.5 times above the average, with 74% of them using it.

Despite the increase in adoption of these kinds of service, consumers still show some reluctance towards them, due mainly to risk concerns and trust-related issues (Lee, 2009).

### 2.2. Adoption models

The acceptance and use of IT systems has been the subject of much research, and in recent years several theories that offer new insights have emerged at both the individual and organizational levels, focused on a country or a set of countries (Im, Hong & Kang, 2011). Each of the several models that have been proposed in the literature has the same dependent variable, use or intention to use, but with various antecedents to understand acceptance of technology.

The most well-known theoretical models at the individual level that have sought to explain the relationship between user beliefs, attitudes, and intentions include *Theory of Reasoned Action* (TRA – Fishbein & Ajzen, 1975), *Theory of Planned Behaviour* (TPB – Ajzen, 1991), and *Technology Acceptance Model* (TAM – Davis, 1989). TAM was designed to predict information technology acceptance and use on the job, in which perceived usefulness and perceived ease of use are the main determinants of the attitudes (Davis, 1989). TPB is more focused on the perceived behavioural control, that is, the perceived ease or difficulty of performing the behaviour (Ajzen, 1991). Both models were based on TRA, which proposes that beliefs influence attitudes that in turn lead to intentions and then consequently generate behaviours (Fishbein & Ajzen, 1975). It is a model drawn from social psychology, and is one of the most important theories of human behaviour. According to the researchers, attitude (attitude towards performing behaviour) and subjective norms (social pressures to perform behaviour) are considered as the determinants of behaviour in TRA.

Venkatesh, Davis, Davis, and Morris, (2003) provide a comprehensive examination of eight prominent models and derive a *Unified Theory of Acceptance and Use of Technology* (UTAUT), which can explain as much as 70% of the variance in intention. The eight models studied by these researchers are TRA, TAM, *Motivational Model* (MM – Davis, Bagozzi, and Warshaw, 1992), TPB, a hybrid model combining constructs from TAM and TPB (C-TAM-TPB – Taylor & Todd, 1995), *Model of PC Utilization*

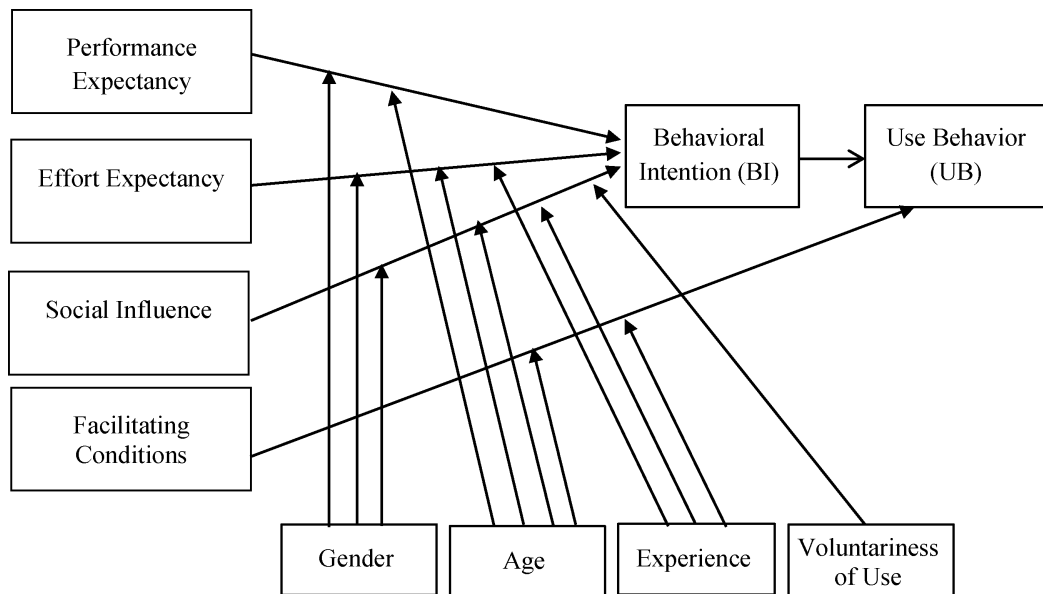


Fig. 1. Research model of Venkatesh et al. (2003) investigation.

(MPCU – Thompson, Higgins, and Howell, 1991), *Innovation Diffusion Theory* (IDT – Moore & Benbasat, 1996), and *Social Cognitive Theory* (SCT – Compeau & Higgins, 1995). The UTAUT model (Fig. 1) postulates that four constructs act as determinants of behavioural intentions and use behaviour: (i) performance expectancy, (ii) effort expectancy, (iii) social influence, and (iv) facilitating conditions. In addition, UTAUT also posits the role of four key moderator variables: gender, age, experience, and voluntariness of use.

Since its inception in 2003, researchers have increasingly turned to testing UTAUT to explain technology adoption. It was tested and applied to several technologies, such as online bulletin boards (Marchewka, Liu, & Kostiwa, 2007), instant messengers (Lin & Anol, 2008), and Web-based learning (Chiu & Wang, 2008). For instance, the adoption factors of Internet banking and mobile banking in Malaysia were investigated by Tan, Chong, Loh, and Lin (2010) with the use of this same model; Im et al. (2011) undertook to discover if the UTAUT constructs were affected by the culture, comparing the mp3 player and Internet banking technologies in Korea and the US; and Yuen, Yeow, Lim, and Saylani (2010) tested the UTAUT model in two groups of culturally different countries, i.e. the developed (US and Australia) and developing (Malaysia) countries.

Much research has addressed Internet banking adoption, as shown in Table 1. There we find the main conclusions of each investigation and its predictive power in explaining intention and use of Internet banking services, by the *r*-square (when available).

### 2.3. Earlier research on perceived risk

According to Bauer (1960) and Ostlund (1974), the negative consequences that may arise from consumers' actions lead to an important well-established concept in consumer behaviour: perceived risk. Many authors have studied the impact of risk on the adoption of Internet banking and some of them will be discussed.

Kuisma, Laukkanen, and Hiltunen (2007) investigated the resistance to Internet banking and their connections to values of individuals and concluded that both functional and psychological barriers arise from service, channel, consumer, and communication. ATM services are still preferred by customers, because of their old routine and the Internet's insecurity, inefficiency, and inconvenience. Besides the fear of possible misuse of changeable passwords

and the lack of proof provided by an official receipt, they found that some customers seem to perceive no performance-to-price value due to the high purchasing costs of a computer and Internet connection. Additionally, non-users also complain about the lack of social dimension, that is, the absence of a face-to-face encounter, as at a branch.

In a similar way, Rotchanakitumnuai and Speece (2003) investigated how corporate customers perceive barriers to using the Internet banking provided by Thai banks. The findings were that trust and security are the most critical issues, especially amongst non-users who have higher levels of worry, do not have confidence to make any financial transactions via the Web, and have no intention of adopting Internet banking services.

According to Featherman and Pavlou (2003), perceived risk is defined as “the potential for loss in the pursuit of a desired outcome of using an e-service”. The purpose of their research was to discover how important the risk perceptions are to the overall e-services adoption decision, integrating TAM with perceived risk (research model in Fig. 2). They identified seven types of risks, namely (i) performance risk, (ii) financial risk, (iii) time risk, (iv) psychological risk, (v) social risk, (vi) privacy risk, and (vii) overall risk. The authors stated that it was crucial to include a measure of perceived risk into TAM because consumers identify and value risk when evaluating products/services for purchase/adoption, which may create anxiety and discomfort for them. Therefore, regarding perceived risk, they tested (i) if e-service's

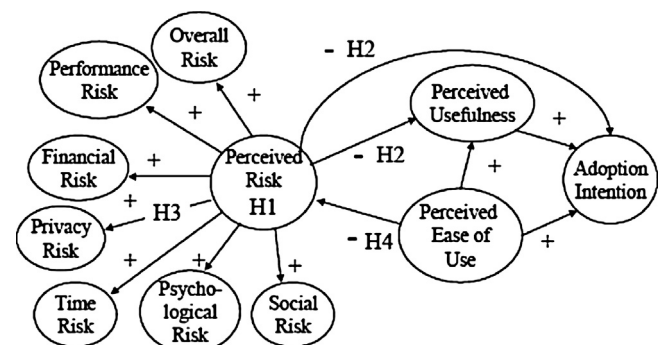


Fig. 2. Research model of Featherman & Pavlou (2003) investigation.

**Table 1**  
Summary of previous research on Internet banking adoption.

Theory	Findings	References
Technology acceptance model (TAM) and self-efficacy as one of the antecedent variables such as risk, Internet experience, facilitating conditions	<ul style="list-style-type: none"> <li>• Self-efficacy plays a prominent role in influencing the intention to use Internet banking in South Korea</li> <li>• 32.3% of intention explained by experience, perceived usefulness, and perceived ease of use</li> <li>• 4.8% of use explained by intention</li> </ul>	Lee and Chung (2011)
Theory of planned behaviour (TPB) and diffusion of innovations theory (DIT)	<ul style="list-style-type: none"> <li>• Attitudinal (relative advantage, compatibility with respondent's values, experience, needs, trialability, and risk) and perceived behavioural control factors as the major determinants of intention to adopt Internet banking</li> </ul>	Tan and Teo (2000)
Technology acceptance model (TAM)	<ul style="list-style-type: none"> <li>• Perceived usefulness and information on the website were the main factors influencing Internet banking adoption intention</li> <li>• 12.4% of intention explained by the model</li> </ul>	Pikkarainen et al. (2004)
Technology acceptance model (TAM) and some additional important control variables	<ul style="list-style-type: none"> <li>• Perceived usefulness and perceived ease of use, resistance to change, trust, age, gender, education, and income, explained 85% of the variance in attitude towards online banking use. Attitudes towards use explain 83% of the variance in intention</li> </ul>	Al-Somali et al. (2009)
Technology acceptance model (TAM), personal innovativeness in information technology (PIIT) and perceived risk	<ul style="list-style-type: none"> <li>• Perceived usefulness is the strongest predictor of Internet banking adoption intention, followed by perceived ease of use and perceived risk</li> </ul>	Yiu et al. (2007)
Perceived risk, perceived benefit, technology acceptance model (TAM), theory of planned behaviour (TPB)	<ul style="list-style-type: none"> <li>• 80% of intention explained by security risk, financial risk, perceived behaviour control, subjective norm, attitude, perceived benefit, and perceived usefulness</li> </ul>	Lee (2009)
Unified theory of acceptance and use of technology (UTAUT), trust, awareness of service, output quality, perceived playfulness, and web-design	<ul style="list-style-type: none"> <li>• All constructs contributed to explain intention and use of internet banking, except social influence</li> <li>• Moderating effects from UTAUT model were not important to explain intention</li> </ul>	Riffai et al. (2012)
Extended technology acceptance model (TAM2) and social cognitive theory (SCT)	<ul style="list-style-type: none"> <li>• Both subjective norm and computer self-efficacy indirectly play significant roles in influencing the intention to adopt Internet banking</li> <li>• Perceived ease of use has a significant indirect effect on intention to adopt/use through perceived usefulness, while its direct effect on intention to adopt is not significant</li> </ul>	Chan and Lu (2004)
Decomposed theory of planned behaviour (TPB)	<ul style="list-style-type: none"> <li>• The adoption of Internet banking is encouraged by attitudinal factors (features of the web site and perceived usefulness) and impeded by a perceived behavioural control factor (external environment), but not by subjective norms</li> </ul>	Bussakorn and Dieter (2005)

perceived risk reduces their perceived usefulness and adoption; (ii) if perceived ease of use of e-service significantly reduces perceived risks of usage; (iii) if perceived ease of use influences e-service's adoption. As seen below, perceived risk has been modelled as a composite variable and decomposed into its theorized sub-facets.

### 3. Research model

As seen above, the UTAUT model is able to explain 70% of the variance in usage intention, which is a substantial improvement over any of the eight original models used to build it. Thus, it demonstrates that UTAUT is the most complete model to predict information technologies adoption, and it is therefore used in this investigation. According to this model, three constructs are significant direct determinants of intention (performance expectancy, effort expectancy, and social influence). Facilitating conditions and intention explain use behaviour. Regarding the moderating effects, both experience and voluntariness of use lie outside the scope of this research. Experience is not evaluated because only one moment in time is being observed; voluntariness of use is also not feasible because no one is obliged to use Internet banking in this context. As gender and age may have a considerable influence on users' acceptance of Internet banking, both will be considered (Wang, Wang, Lin, & Tang, 2003).

As our investigation merges two sensitive subjects, namely money and Internet, there is always a risk factor that is important to be measured in the process of Internet banking adoption.

Users always fear losing money with transactions, losing passwords, making errors on the platform, etc. We therefore propose to test the UTAUT on Internet banking, adding a risk factor to the model. In this section, we define each of the determinants of UTAUT and risk factor and specify the role of key moderators.

Performance expectancy (PE) reflects user perception of performance improvement by using Internet banking on tasks, i.e., it is the degree to which an individual believes that using Internet banking will help to attain gains in performing banking tasks (Venkatesh et al., 2003). It reflects user perception of performance improvement by using Internet banking, such as convenience of payment, fast response, and service effectiveness (Zhou, Lu, & Wang, 2010). According to the authors, it is similar to the perceived usefulness of TAM and the relative advantage of IDT. Effort expectancy (EE) is the degree of ease associated with the use of Internet banking. It is equivalent to the perceived ease of use of TAM and the complexity of IDT. According to UTAUT, effort expectancy positively affects performance expectancy. When users feel that Internet banking is easy to use and does not require much effort, they will have a high expectation towards acquiring the expected performance; otherwise, their performance expectancy will be low (Zhou et al., 2010). Social influence (SI) reflects the effect of environmental factors such as the opinions of user's friends, relatives, and superiors on user behaviour and is similar to subjective norm of TRA (Venkatesh et al., 2003). Their opinions will affect user's intention to adopt Internet banking services. Facilitating conditions (FC) reflect the effect of organizational and technical infrastructure to support the use of Internet banking, such as user's knowledge, ability, and resources (Venkatesh et al., 2003). It is similar to



perceived behavioural control of TPB. Internet banking requires users to have certain skills such as configuring and operating computers, and connecting to the Internet. In addition, users need to bear usage costs such as data service and transaction fees when using Internet banking. If users do not have these necessary financial resources and operational skills, they will not adopt or use Internet banking (Hong, Thong, Moon, & Tam, 2008; Zhou et al., 2010).

Therefore, and according to the UTAUT model, it can be postulated that:

**H1.** The influence of Performance Expectancy (PE) on Behavioural Intention (BI) will be positive and moderated by age and gender, such that it will be stronger for younger individuals and men.

**H2.** The influence of Effort Expectancy (EE) on Behavioural Intention (BI) will be positive and moderated by age and gender, such that it will be stronger for younger individuals and women.

**H3.** The influence of Social Influence (SI) on Behavioural Intention (BI) will be positive and moderated by age and gender, such that it will be stronger for older individuals and women.

**H4.** The influence of Facilitating Conditions (FC) on Usage Behaviour (UB) will be positive and moderated by age, such that it will be stronger for older individuals.

To maintain consistency with the underlying theory for all of the intention models, it is expected that behavioural intention will have a significant positive influence on technology usage (Venkatesh et al., 2003). It can be hypothesized that:

**H5.** Behavioural Intention (BI) will have a significant positive influence on Usage Behaviour (UB).

According to Featherman and Pavlou (2003), (i) performance risk is defined as the possibility of the results not being as they were designed to be and therefore failing to deliver the desired benefits; (ii) financial risk reflects the potential monetary loss from the initial purchase of the product and its subsequent maintenance; (iii) time risk occurs when users lose time by making poor purchasing decisions, with researching and making the purchase, and learning how to use it; (iv) psychological risk is defined as the risk that the performance of the product will have a negative effect on the consumer's peace of mind and the potential loss of self-esteem from the frustration of not achieving a buying goal; (v) social risk reflects the potential loss of status in a social group, as a result of adopting a product or service; (vi) privacy risk is the potential loss of control over personal information, such as when information about an individual is used without that person's knowledge; (vii) finally, overall risk is a general measure with all criteria together. All these perceived risks comprise the perceived risk, being a second order factor of them, and influencing the intention negatively. It is expected that the more the user's aversion to the risk concerns are lowered, the more s/he is likely to adopt Internet banking services (Bussakorn & Dieter, 2005).

Thus, perceived risk has been modelled both as a composite variable and decomposed into its theorized sub-facets, and we can postulate that:

**H6.** Perceived Risk (PCR) is a second order factor of seven risks.

**H6a.** Perceived Risk (PCR) will positively influence Performance Risk (PFR).

**H6b.** Perceived Risk (PCR) will positively influence Financial Risk (FR).

**H6c.** Perceived Risk (PCR) will positively influence Time Risk (TR).

**H6d.** Perceived Risk (PCR) will positively influence Psychological Risk (PSR).

**H6e.** Perceived Risk (PCR) will positively influence Social Risk (SR).

**H6f.** Perceived Risk (PCR) will positively influence Privacy Risk (PR).

**H6g.** Perceived Risk (PCR) will positively influence Overall Risk (OR).

**H7.** Perceived Risk (PCR) will negatively influence Behaviour Intention (BI).

Regarding the effects of perceived usefulness and perceived ease of use in the approach of Featherman and Pavlou (2003), when we focus on the research of Venkatesh et al. (2003), the equivalent constructs are performance expectancy (PE) and effort expectancy (EE). It is expected that only individuals who perceive using Internet banking as a low risk undertaking would have a tendency to perceive it as useful (Chan & Lu, 2004). Also, it is expected that only those who perceive low effort to use Internet banking would have a tendency to perceive it as a not risky service. As a results, we can postulate that:

**H8.** Perceived Risk (PCR) will negatively influence Performance Expectancy (PE).

**H9.** Effort Expectancy (EE) will negatively influence Perceived Risk (PCR).

From these hypotheses the conceptual model shown in Fig. 3 emerges.

## 4. Methods

### 4.1. Measurement instruments

All measurement items were adapted, with slight modifications, from the literature – PE, EE, SI, FC and BI were adopted from Venkatesh et al. (2003) and Davis (1989); UB from Im et al. (2011); perceived risk constructs from Featherman and Pavlou (2003). The items for all constructs are included in the Appendix A.

The questionnaire was initially developed in English, based on the literature, and the final version was independently translated into Portuguese by a professional translator. The questionnaire was put on the Web through a free Web hosting service.

Most items were measured using seven-point Likert scales, ranging from totally disagree (1) to totally agree (7). Behaviour Intention (BI) was measured by asking respondents about their intentions and plans to use the technology during the next months. To evaluate Usage Behaviour (UB), one item measured users' actual frequencies of Internet banking use (have not used, once a year, once in six months, once in three months, once a month, once a week, once in 4–5 days, once in 2–3 days, and almost every day). We also included two demographic questions relating to age and gender. Age was measured in years. Gender was coded using a 0 or 1 dummy variable where 1 represented women.

### 4.2. Data collection

Firstly, a pilot survey (with 100 answers) was conducted (in April of 2012) in order to refine the questions and gain additional comments on the content and structure. The most important change was in the items of Usage Behaviour (UB), which initially were from Venkatesh et al. (2003). These generated misunderstandings and the simulation of the PLS estimation with a few samples gave statistically poor results. The items were "I intend to use the system in the next <n> months.", "I predict I would use Internet Banking in the next <n> months." and "I plan to use the system in the next

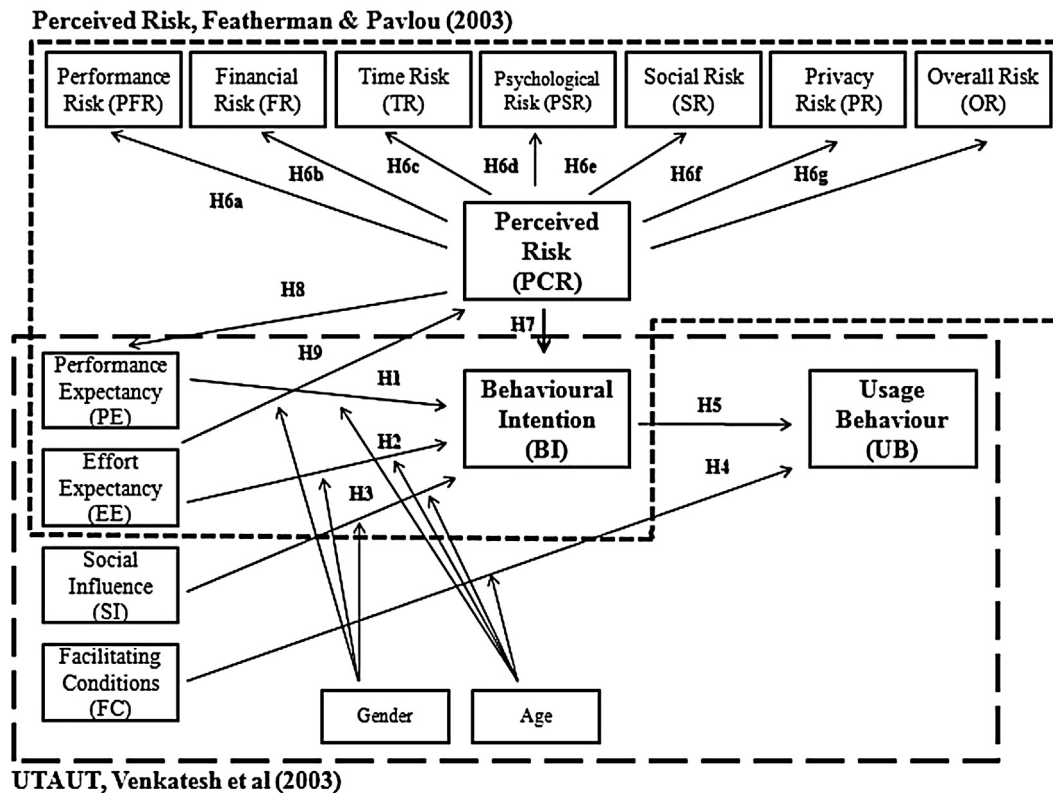


Fig. 3. Research model.

<n> months.”. The possible answers were from 1 to +12. Internet banking users understood it as the period that they effectively will use Internet banking (and therefore answered +12) and others as the nearest month that they will use it (that is, next month, with 1 as response). These items were replaced by one from Im et al. (2011), already used in this context. Regarding the other items, a number of suggestions were made about the phrasing and the overall structure of the questionnaire. The suggestions were discussed and some changes were made. The data from the pilot survey were not included in the main survey.

A total of 726 students and ex-students from a university were contacted by e-mail in May of 2012 and provided with the hyperlink of the survey, from which 173 responses were validated. A second e-mail was then sent to those who had not responded after two weeks, and finally, after the refining process, a total of 249 valid cases were analyzed (34% response rate). To test for non-response bias, we compared the sample distribution of the first and second respondents groups. We used the Kolmogorov–Smirnov (K–S) test to compare the sample distributions of the two groups (Ryans, 1974). The K–S test suggests that the sample distributions of the two independent groups do not differ statistically (Ryans, 1974). This means that nonresponse bias is not present. Further, we examined the common method bias by using Harman’s one-factor test (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). These tests found no significant common method bias in our dataset.

The majority of respondents (63%) responded that they used Internet banking services once a week. Fourteen percent admitted that they are non-users and of these, almost all were men with an average age of 27, and characterized by low levels of education.

Concerning demographic data (Table 2), 59% of the respondents are male and the average age is 30 years. Their education level is elementary and high school for 47% of individuals; the others have an undergraduate degree or more.

## 5. Results

Structural equation modelling (SEM) is a statistical technique for testing and estimating causal relations using a combination of statistical data and qualitative causal assumptions. Careful researchers acknowledge the possibilities of distinguishing between measurement and structural models and explicitly take measurement error into account (Henseler, Ringleand, & Sinkovics, 2009). There are two families of SEM techniques: (i) covariance-based techniques and (ii) variance-based techniques. Partial least squares (PLS) is a variance-based technique and is used in this investigation since: (i) not all items in our data are distributed normally ( $p < 0.01$  based on Kolmogorov–Smirnov’s test); (ii) the research model has not been tested in the literature; (iii) the research model is considered as complex. Smart PLS 2.0 M3 (Ringle, Wende, & Will, 2005) was the software used to analyze the relationships defined by the theoretical model.

In the next two subsections we (first) examine the measurement model in order to assess internal consistency, indicator reliability, convergent validity, and discriminant validity, and (secondly) test the structural model.

### 5.1. Measurement model

Firstly, in order to analyze the indicator reliability, factor loadings should be statistically significant and preferably greater than 0.7 (Chin, 1998; Hair & Anderson, 2010; Henseler et al., 2009). Means, standard deviations, loadings, and  $t$ -statistic values from items measured are in Table 3. The  $t$ -statistic obtained from bootstrapping (250 iterations) shows that all loadings are statistically significant at 1%. FC4 item was excluded due to its low loading and lack of statistical significance. All other items were retained. Furthermore, it is possible to conclude that all items have loadings

**Table 2**  
Demographic data of responses.

Age			Gender			Education		
18–21	23	9.2%	Male	146	58.6%	Elementary and high school	116	46.6%
21–25	89	35.7%	Female	102	41.0%	Undergraduate degree	70	28.1%
25–30	36	14.5%	Missing	1	0.4%	Graduate degree	61	24.5%
30–40	46	18.5%				Missing	2	0.8%
40–67	47	18.9%						
Missing	8	3.2%						

greater than 0.7, except the item of SI5 (which is on the threshold), suggesting internal consistency.

Secondly, to evaluate the constructs' reliability, two indicators were used – composite reliability (CR) and Cronbach's alpha (CA). The most usual criterion is CA, providing an estimate for the reliability based on the indicator intercorrelations and assuming that all indicators are equally reliable (Henseler et al., 2009). According to Hair and Anderson (2010), CR quantifies the reliability and

internal consistency of each construct and the extent to which the items represent the underlying constructs. Additionally, CR takes into account that indicators have different loadings (and Cronbach's alpha does not), and is therefore more suitable for PLS, which prioritizes indicators according to their individual reliability (Henseler et al., 2009). As seen in Table 4, CR and CA for each construct are above the expected threshold of 0.7, showing evidence of internal consistency.

**Table 3**  
Means, standard deviations, and loadings for the measurement model.

Construct		Mean	SD	Loading	t-Statistic
Performance expectancy (PE)	PE1	6.14	1.45	0.92	66.80
	PE2	5.95	1.56	0.88	23.61
	PE3	5.70	1.57	0.93	64.28
	PE4	5.52	1.64	0.89	45.10
Effort expectancy (EE)	EE1	5.51	1.48	0.91	42.41
	EE2	5.66	1.46	0.94	66.48
	EE3	5.61	1.33	0.93	52.56
	EE4	5.79	1.32	0.92	50.16
Social influence (SI)	SI1	3.91	1.85	0.90	17.87
	SI2	3.86	1.85	0.91	21.97
	SI3	2.67	1.71	0.71	6.12
	SI4	2.72	1.68	0.73	6.64
	SI5	2.41	1.54	0.67	5.64
Facilitating conditions (FC)	FC1	6.08	1.29	0.91	42.50
	FC2	5.85	1.40	0.94	71.01
	FC3	5.76	1.38	0.92	61.44
Perceived Risk					
Performance risk (PFR)	PFR1	2.88	1.50	0.87	38.83
	PFR2	3.20	1.53	0.86	37.70
	PFR3	3.08	1.50	0.92	83.88
	PFR4	3.08	1.49	0.93	69.09
	PFR5	2.88	1.53	0.89	44.62
Financial risk (FR)	FR1	3.06	1.66	0.89	51.20
	FR2	3.73	1.65	0.87	45.48
	FR3	3.19	1.65	0.93	97.33
	FR4	3.28	1.68	0.91	43.95
Time risk (TR)	TR1	2.43	1.62	0.77	17.21
	TR2	2.30	1.54	0.91	53.44
	TR3	2.13	1.36	0.94	69.83
	TR4	2.23	1.45	0.88	28.06
Psychological risk (PSR)	PSR1	1.92	1.41	0.97	75.75
	PSR2	1.79	1.29	0.97	128.07
Social risk (SR)	SR1	1.57	1.11	0.99	179.75
	SR2	1.56	1.10	0.99	230.05
Privacy risk (PR)	PR1	3.40	1.67	0.95	131.32
	PR2	3.49	1.70	0.93	69.22
	PR3	3.94	1.70	0.89	56.34
Overall risk (OR)	OR1	2.62	1.41	0.93	77.16
	OR2	2.62	1.43	0.96	135.00
	OR3	2.53	1.39	0.95	112.07
	OR4	2.43	1.38	0.92	48.88
	OR5	2.89	1.50	0.87	36.87
Behaviour intention (BI)	BI1	5.71	1.84	0.98	151.22
	BI2	5.70	1.84	0.99	471.95
	BI3	5.69	1.84	0.99	182.59
	BI4	5.76	1.80	0.98	157.31
	BI5	5.53	1.97	0.95	62.63
Usage behaviour (UB)	UB	6.05	2.80	NA	NA

NA, not applicable.

**Table 4**

Means, standard deviations, correlations, and reliability and validity measures (CR, CA, and AVE) of latent variables.

	Mean	SD	CR	CA	PE	EE	SI	FC	PCR	BI	UB	Age	Gender
PE	5.84	1.41	0.95	0.93	0.91								
EE	5.65	1.29	0.96	0.94	0.78***	0.92							
SI	3.16	1.41	0.89	0.87	0.30***	0.31***	0.79						
FC	5.90	1.25	0.95	0.92	0.71***	0.82***	0.26***	0.93					
PCR	2.69	1.12	0.97	0.97	−0.26***	−0.30***	0.16**	−0.32***	0.75				
BI	5.68	1.81	0.99	0.99	0.68***	0.68***	0.26***	0.65***	−0.38***	0.98			
UB	5.61	1.97	NA	NA	0.64***	0.61***	0.26***	0.60***	−0.35***	0.90***	NA		
Age	29.14	12.03	NA	NA	0.13*	0.11	0.05	0.08	−0.07	0.18**	0.11	NA	
Gender	0.58	0.50	NA	NA	−0.13*	−0.09	−0.02	−0.06	0.17**	−0.12	−0.09	−0.19**	NA

Diagonal elements are the square root of the average variance extracted (AVE).

PE, performance expectancy; EE, effort expectancy; SI, social influence; FC, facilitating conditions; PCR, perceived risk; BI, behavioural intention; UB, usage behaviour; NA, not applicable.

\*  $p < 0.05$ .\*\*  $p < 0.01$ .\*\*\*  $p < 0.001$ ; all other correlations are insignificant.

In order to assess convergent validity, average variance extracted (AVE) was used. The AVE is the amount of indicator variance that is accounted for by the underlying items of construct and should be greater than 0.5, so that the latent variable explains more than half of the variance of its indicators (Hair & Anderson, 2010; Henseler et al., 2009). As is also seen in Table 4, AVE for each construct is above the expected threshold of 0.5, ensuring convergent validity.

Finally, to grant discriminant validity, the square root of AVE should be greater than the correlations between the construct (Henseler et al., 2009). This is also reported in Table 4 for all constructs. We conclude that all the constructs show evidence of discrimination. Additionally, another criterion that assesses discriminant validity is the cross loadings, which should be lower than the loadings of each indicator (Hair & Anderson, 2010). This was also analyzed and we found that no indicator has loadings with lower values than their cross loadings.

## 5.2. Structural model

Finally, as the assessment of construct reliability, indicator reliability, convergent validity, and discriminant validity of the constructs are satisfactory, it is possible to analyze the structural model. The models tested were UTAUT and perceived risk (PCR) (UTAUT + PCR – the main model) with interaction effects (D + I) and without them (D) to understand if age and gender had influence on the intention and usage. Then, we also tested UTAUT (without perceived risk (PCR)) and also with direct effects only (D) and adding interaction effects (D + I). Table 5 shows path coefficients and  $r$ -squares for each model tested. Chin (1998) stated that  $r$ -squares of the structural model should be above 0.2, which is demonstrated both in intention and usage and in all models estimated, as seen in Table 5. Comparison of the estimated models reveals that on intention, moderating effects always have an impact on  $r$ -square, increasing it (0.52 vs. 0.56 in UTAUT and 0.56 vs. 0.60 in UTAUT + PCR). In a similar way, when we add perceived risk to

**Table 5**Structural model with path coefficients and  $r$ -squares for models with UTAUT and UTAUT and perceived risk, with direct (D) effects only, and with direct and interaction effects (D + I).

	UTAUT		UTAUT + PCR	
	D	D + I	D	D + I
<i>Behaviour intention</i>				
$R^2$	0.52	0.56	0.56	0.60
Performance expectancy (PE)	0.37***	0.34***	0.35***	0.32***
Effort expectancy (EE)	0.38***	0.39***	0.40***	0.33***
Social influence (SI)	0.03	0.03	0.09*	0.09*
Perceived risk (PCR)			−0.30***	−0.20***
Age		0.12*		0.11*
Gender		0.00		0.04
PE × Age		0.12		0.11
PE × Gender		0.12		0.13
EE × Age		−0.16		−0.17
EE × Gender		0.04		−0.02
SI × Age		−0.04		−0.04
SI × Gender		−0.02		−0.01
PE × Gender × Age		−0.13		−0.13
EE × Gender × Age		−0.19		−0.12
SI × Gender × Age		0.04		0.03
<i>Usage behaviour</i>				
$R^2$	0.81	0.81	0.81	0.81
Facilitating conditions (FC)	0.03	0.03	0.03	0.03
Behaviour intention (BI)	0.88***	0.89***	0.88***	0.89***
Age		−0.05		−0.05
FC × Age		0.01		0.01

PE, performance expectancy; EE, effort expectancy; SI, social influence; FC, facilitating conditions; PCR, perceived risk; BI, behavioural intention; UB, usage behaviour.

\*  $p < 0.05$ .\*\*\*  $p < 0.001$ ; all other path coefficients are insignificant.



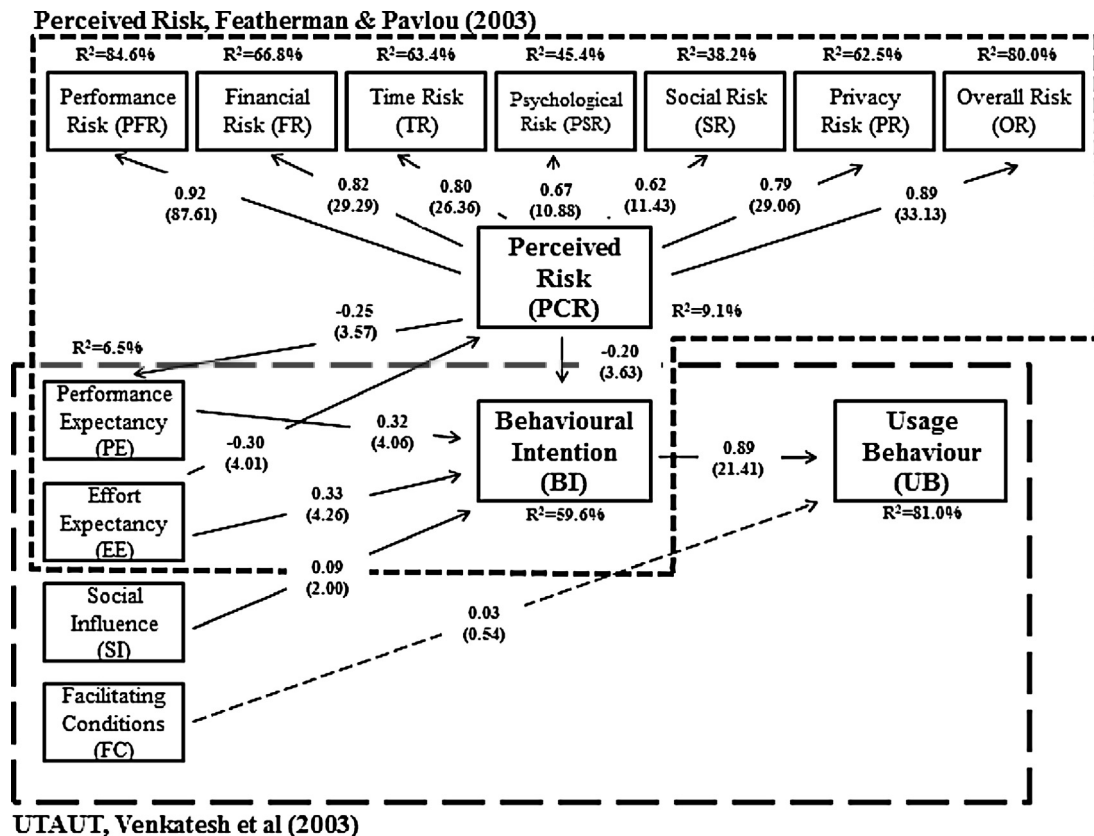


Fig. 4. Structural model (UTAUT + PCR-D + I) with path coefficients and *r*-squares.

the UTAUT model, *r*-square also increases (0.52 vs. 0.56 with direct effects only and 0.56 vs. 0.60 with direct and interaction effects). On the other hand, when we observe usage, neither moderating effects nor perceived risk have any impact on it, because the *r*-square is always the same (0.81).

With these facts, it is possible to conclude that our model that added perceived risk (PCR) to the UTAUT model, with their moderating effects, explains the intention better than all the others. We now focus our analysis on the main model, that is, UTAUT + PCR with moderating effects. Path coefficients and *r*-squares of this model are in Fig. 4.

We also calculated *t*-statistics derived from bootstrapping (250 iterations). Most direct effects are statistically significant, such as performance expectancy ( $\beta = 0.32$ ;  $p < 0.001$ ), effort expectancy ( $\beta = 0.33$ ;  $p < 0.001$ ), social influence ( $\beta = 0.09$ ;  $p < 0.05$ ), and perceived risk ( $\beta = -0.20$ ;  $p < 0.001$ ) over intention. To explain usage, facilitating conditions is not statistically significant ( $\beta = 0.03$ ;  $p > 0.05$ ), and behaviour intention is statistically significant ( $\beta = 0.89$ ;  $p < 0.001$ ). In summary, all of the direct effects are statistically significant for intention, and for usage only facilitating conditions is not statistically significant.

None of the interaction effects are statistically significant, as seen in Table 5. Only the direct effect of age on intention is statistically significant ( $\beta = 0.11$ ;  $p < 0.05$ ).

## 6. Discussion

### 6.1. Theoretical implications

Theoretically, our results suggest that perceived risk increases the predictive power of the UTAUT model in explaining

intention. While performance expectancy (PE), effort expectancy (EE), and social influence (SI) explain nearly 56% of the variance of behaviour intention (BI), by coupling perceived risk (PCR) to UTAUT, these variables contributed to an increase of 4 p.p. of variance explained, thereby providing a better explanatory power. Furthermore, the proposed joint UTAUT + PCR model explained 81% of usage behaviour variance. Compared with other investigations exploring Internet banking adoption, our study presents a stronger predictive power than similar studies. For instance, [Pikkarainen et al. \(2004\)](#) used TAM and explained 12.4% of intention, with perceived usefulness and information on the website as the main determinants; [Lee and Chung \(2011\)](#) also applied TAM and added self-efficacy as one of the antecedent variables such as risk, Internet experience, and facilitating conditions in South Korea's users, with intention being explained by 32.3% through Internet experience, perceived usefulness, and perceived ease of use; and usage presented an *r*-square of 4.8%, which is considerably lower than the one in this study.

Table 6 presents the outcomes of hypotheses tested. The results of the model showed that, contrary to our expectations, the effect of facilitating condition (FC) construct from UTAUT over usage (UB) was not significant. This suggests that our respondents are not concerned about the surrounding environment (necessary infrastructures, knowledge, capabilities, etc.) to influence their usage of Internet banking. As observed in some other research (e.g. [Al-Somali, Gholami, & Clegg, 2009](#); [Lee & Chung, 2011](#); [Riffai, Grant, & Edgar, 2012](#)), the effects of PE and EE over BI were substantial, meaning that individuals care about the outcomes of using Internet banking and the necessary effort to expend in order to use it. With a low magnitude, SI also showed an effect on BI, meaning that our respondents are concerned about environmental factors such as the opinions of user's friends, affecting their intention to adopt

**Table 6**  
Hypotheses conclusions.

Hypotheses	Independent variable	↑	Dependent variable	Moderators	Findings	Conclusion
H1	Performance expectancy	↑	Behaviour intention	Age, gender	Positive and statistically significant ( $\beta = 0.32$ ; $p < 0.001$ ).	Partially Supported
H2	Effort expectancy	↑	Behaviour intention	Age, gender	Effect not significant with moderators Positive and statistically significant ( $\beta = 0.33$ ; $p < 0.001$ ).	Partially Supported
H3	Social influence	↑	Behaviour intention	Age, gender	Effect not significant with moderators Positive and statistically significant ( $\beta = 0.09$ ; $p < 0.05$ ).	Partially Supported
H4	Facilitating conditions	↑	Usage behaviour	Age	Effect not significant with moderators Non-significant effect	Not Supported
H5	Behaviour intention	↑	Usage behaviour	None	Positive and statistically significant ( $\beta = 0.89$ ; $p < 0.001$ )	Supported
H6	Perceived risk	↑	Seven risks	None	Positive and statistically significant in all seven risks	Supported
H7	Perceived risk	↑	Behaviour intention	None	Negative and statistically significant ( $\beta = -0.20$ ; $p < 0.001$ )	Supported
H8	Perceived risk	↑	Performance expectancy	None	Negative and statistically significant ( $\beta = -0.25$ ; $p < 0.001$ )	Supported
H9	Effort expectancy	↑	Perceived risk	None	Negative and statistically significant ( $\beta = -0.30$ ; $p < 0.001$ )	Supported

Internet banking. The impact of BI on usage behaviour (UB) was also substantial, which indicates that Internet banking users are more likely to use the system if they had the intention to use it.

Regarding the perceived risk part of the model, it has demonstrated evidence for a second-order composite perceived risk variable. Performance, financial, time, and privacy risks proved to be the most salient concerns for perceived risk, that is, the ones related with performance. Social and psychological risks were less salient. The negative effects of PCR over BI and PE were also demonstrated.

Concerning the interaction effects, we found no support for either of those tested, similarly to Riffai et al. (2012) findings. We conclude that age explains behaviour intention of Internet banking service ( $\beta = 0.11$ ;  $p < 0.05$ ; in the main model). This means that if respondents are older, they will have more intention to use Internet banking.

## 6.2. Managerial implications

The findings of this study reveal that perceived risk is an important factor affecting end-user intention to use Internet banking. Therefore, managers need first of all to ensure that an Internet banking platform is technically sound, with good security practices put in place to minimize the risks for the end users. The focus, as previously noted, should be on performance risks, namely time, financial, performance, and privacy. Managers should advertise to potential users that Internet banking is not a risky service, by promoting information of security and trust on the platform. They should also prevent user concerns about computer crimes, invasion of privacy, and overall, attempt to provide transactions without errors and allocate sufficient resources to correct it, if necessary. The use of a secure channel from the consumer's personal computer to the bank server and handling of sessions with key encryption are two important issues that institutions should ensure that users know. Additional effective risk-reducing strategies may include money back guarantees and prominently displayed consumer satisfaction guarantees, so that consumers feel more comfortable and safe with the system.

In realizing that Internet banking platforms' performance and Internet banking platforms' ease of use are two other factors that affect intention, institutions need to promote clarification workshops, to teach people to use the platform and explain the main benefits of Internet banking (Bussakorn & Dieter, 2005).

Lastly, both Internet banking managers and users can take financial advantage from the adoption. With the self-service consumer software-based service via Internet, banks can decrease costs with branches, by encouraging and supporting the use of the platforms. Users can also decrease their costs, by not paying for transactions, benefiting from online exclusive products with higher profits, etc. Additionally, Internet banking can provide consumers with utility gains measured in convenience and efficiency.

## 6.3. Limitations and future research

While our study adds to the existing body of knowledge, we also acknowledge its limitations, mainly concerning the sampling. The respondents were mostly young, highly educated people whose behaviour might differ somewhat from the population average. They are generally more innovative and quicker to accept new technologies, and this may have biased the results. It is likely that elderly and less educated consumers or those who possess reduced computing/Internet skills would perceive greater difficulty in use of Internet banking and higher inherent usage risks.

Future research can be built based on this study by testing this model in different age groups. Furthermore, it could be interesting to apply the model to other countries and also other contexts. Next,

**Table 7**  
The items.

Constructs	Items	Source
Performance expectancy (PE)	Internet banking is useful to carry out my tasks	PE1
	I think that using Internet banking would enable me to conduct tasks more quickly	PE2
	I think that using Internet banking would increase my productivity	PE3
	I think that using Internet banking would improve my performance	PE4
Effort expectancy (EE)	My interaction with Internet banking would be clear and understandable	EE1
	It would be easy for me to become skilful at using Internet banking	EE2
	I would find Internet banking easy to use	EE3
	I think that learning to operate Internet banking would be easy for me	EE4
Social influence (SI)	People who influence my behaviour think that I should use Internet banking	SI1
	People who are important to me think that I should use Internet banking	SI2
	People in my environment who use Internet banking services have more prestige than those who do not	SI3
	People in my environment who use Internet banking services have a high profile	SI4
	Having Internet banking services is a status symbol in my environment	SI5
Facilitating conditions (FC)	I have the resources necessary to use Internet banking	FC1
	I have the knowledge necessary to use Internet banking	FC2
	Internet banking is not compatible with other systems I use	FC3
Performance risk (PFR)	Internet banking might not perform well and create problems with my credit	PFR1
	The security systems built into the Internet banking system are not strong enough to protect my checking account	PFR2
	The probability that something's wrong with the performance of Internet banking is high	PFR3
	Considering the expected level of service performance of Internet banking, for me to sign up and use, it would be risky	PFR4
	Internet banking servers may not perform well and thus process payments incorrectly	PFR5
Financial risk (FR)	The chances of losing money if I use Internet banking are high	FR1
	Using an Internet-bill-payment service subjects my checking account to potential fraud	FR2
	My signing up for and using an Internet banking service would lead to a financial loss for me	FR3
	Using an Internet-bill-payment service subjects my checking account to financial risk	FR4
Time risk (TR)	I think that if I use Internet banking then I will lose time due to having to switch to a different payment method	TR1
	Using Internet banking would lead to a loss of convenience for me because I would have to waste a lot of time fixing payments errors	TR2
	Considering the investment of my time involved to switch to (and set up) Internet banking, it would be risky	TR3
	The possible time loss from having to set up and learn how to use e-bill payment is high	TR4
Psychological risk (PSR)	I think that Internet banking will not fit in well with my self-image or self-concept	PSR1
	If I use Internet banking services, it would lead me to a psychological loss because it would not fit in well with my self-image or self-concept	PSR2
Social risk (SR)	If I use Internet banking, it will negatively affect the way others think of me	SR1
	My signing up for and using Internet banking would lead to a social loss for me because my friends and relatives would think less highly of me	SR2
Privacy risk (PR)	The chances of using the Internet banking and losing control over the privacy of my payment information is high	PR1
	My signing up and using of Internet banking would lead me to a loss of privacy because my personal information would be used without my knowledge	PR2
	Internet hackers (criminals) might take control of my checking account if I use Internet banking services	PR3
Overall risk (OR)	On the whole, considering all sorts of factors combined, it would be risky if I use Internet banking	OR1
	Using Internet banking to pay my bills would be risky	OR2
	Internet banking is dangerous to use	OR3
	I think that using Internet banking would add great uncertainty to my bill paying	OR4
	Using Internet banking exposes me to an overall risk	OR5
Behavioural intention (BI)	I intend to use the system in the next months	BI1
	I predict I would use Internet banking in the next months	BI2
	I plan to use the system in the next months	BI3
	I intend to consult the balance of my account on the platform of Internet banking	BI4
	I intend to perform a transfer on the platform of Internet banking	BI5
Usage behaviour (UB)	What is your actual frequency of use of Internet banking services? (i) Have not used; (ii) once a year; (iii) once in six months; (iv) once in three months; (v) once a month; (vi) once a week; (vii) once in 4–5 days; (viii) once in 2–3 days; (ix) almost every day	UB

others might use this study by applying the same assumptions, but with the extended UTAUT2 (Venkatesh, Thong, & Xu, 2012). Lastly, future research can shed light on other relevant variables that better explain intention and use of Internet banking, such as trust (in bank as institution, in Internet as communication channel, etc). This is a variable that we also found important during the investigation.

## 7. Conclusions

IT adoption is one of the most analyzed fields in IT/IS literature. Adoption models and frameworks are increasingly applied to various individual and organizational contexts to explore factors affecting specific technology's intention to use or to the use itself. However, the influence that risk image may exert on adoption decisions has received limited attention. To address this gap, we contribute to adoption theory by offering a conceptual framework that sheds more light on the influence of perceived risk on end-user adoption of IT.

Our research sought to understand the determinants of Internet banking adoption in which we combined the UTAUT model with a perceived risk factor. Interestingly, the data describe a more complex picture than might have been anticipated. While we found that individual expectations regarding performance expectancy, effort expectancy, social influence, and perceived risk were the most important in explaining users' intentions, facilitating conditions was not deemed important to explain usage. By including perceived risk in the proposed framework we added a stronger determinant to predict intention to use Internet banking, and thus provided more predictive power to existing UTAUT.

## Appendix A. Appendix

See Table 7.

## References

- Ajzen, I. (1991). The theory of planned behaviour. *Organizational Behaviour and Human Decision Processes*, 50(2), 179–211.
- Al-Somali, S., Gholami, R., & Clegg, B. (2009). An investigation into the acceptance of online banking in Saudi Arabia. *Technovation*, 29, 130–141.
- Aladwani, A. M. (2001). Online banking: A field study of drivers, development challenges, and expectations. *International Journal of Information Management*, 21(3), 213–225.
- Bauer, R. A. (1960). *Consumer behavior as risk taking. Dynamic marketing for a changing world*. Chicago: American Marketing Association.
- Bielski, L. (2003). Striving to create a safe haven online: ID theft, worms, bugs, and virtual eavesdropping banks cope with escalating threat. *ABA Banking Journal*, 95(5).
- Bussakorn, J., & Dieter, F. (2005). Internet banking adoption strategies for a developing country: The case of Thailand. *Internet Research*, 15(3), 295–311.
- Chan, S., & Lu, M. (2004). Understanding Internet banking adoption and use behavior: A Hong Kong perspective. *Journal of Global Information Management*, 12(3), 21–43.
- Chin, W. W. (1998). Issues and opinion on structural equation modeling. *MIS Quarterly*, 22(1), 7–25.
- Chiu, C.-M., & Wang, E. T. G. (2008). Understanding Web-based learning continuance intention: The role of subjective task value. *Information & Management*, 45(3), 194–201.
- Compeau, D. R., & Higgins, C. A. (1995). Computer self-efficacy: Development of a measure and initial test. *MIS Quarterly*, 19(2), 189–211.
- Cunningham, L. F., Gerlach, J. H., Harper, M. D., & Young, C. E. (2005). Perceived risk and the consumer buying process: Internet airline reservations. *International Journal of Service Industry Management*, 16(4), 357–372.
- Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), 319–339.
- Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1992). Extrinsic and intrinsic motivation to use computers in the workplace. *Journal of Applied Social Psychology*, 22(14), 1111–1132.
- DECO. (2010). Bancos on-line: BiG e ActivoBank com mais clientes satisfeitos. Retrieved from: <http://www.deco.proteste.pt/dinheiro/nc/noticia/bancos-on-line-big-e-activobank-com-mais-clientes-satisfeitos>
- DECO. (2012). Contas à ordem: Internet rende boas poupanças. Retrieved from: <http://www.deco.proteste.pt/nt/nc/comunicado-de-imprensa/contas-ordem-internet-rende-boas-poupancas>
- Featherman, M. S., & Pavlou, P. A. (2003). Predicting e-services adoption: A perceived risk facets perspective. *International Journal of Human-Computer Studies*, 59(4), 451–474.
- Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention and behaviour: An introduction to theory and research*. Reading, MA: Addison-Wesley.
- Grupo Marktest. (2011). Aumenta penetração de homebanking. Comportamento face aos Bancos. Retrieved from: <http://www.marktest.com/wap/a/n/id~171b.aspx>
- Grupo Marktest. (2012). Aumenta penetração de Internet Banking. Comportamento face aos Bancos. Retrieved from: <http://www.marktest.com/wap/a/n/id~18e4.aspx>
- Hair, J. F., & Anderson, R. E. (2010). *Multivariate data analysis*. Prentice Hall.
- Henseler, J., Ringleand, C. M., & Sinkovics, R. R. (2009). The use of partial least squares path modelling in international marketing. *New Challenges to International Marketing*, 20, 277–319.
- Hitt, L. M., & Frei, F. X. (2002). Do better customers utilize electronic distribution channels? The case of PC banking. *Management Science*, 48(6), 732–748.
- Hong, S.-J., Thong, J. Y. L., Moon, J.-Y., & Tam, K. Y. (2008). Understanding the behavior of mobile data services consumers. *Information Systems Frontier*, 10(4), 431–445.
- Im, I., Hong, S., & Kang, M. S. (2011). An international comparison of technology adoption: Testing the UTAUT model. *Information & Management*, 48(1), 1–8.
- Jayawardhena, C., & Foley, P. (2000). Changes in the banking sector – The case of Internet banking in the UK. *Internet Research*, 10(1), 19–30.
- Kuisma, T., Laukkanen, T., & Hiltunen, M. (2007). Mapping the reasons for resistance to Internet banking: A means-end approach. *International Journal of Information Management*, 27(2), 75–85.
- Lee, K. C., & Chung, N. (2011). Exploring antecedents of behavior intention to use Internet banking in Korea: Adoption perspective. In *E-adoption and socio-economic impacts: Emerging infrastructural effects*. New York: IGI global.
- Lee, M.-C. (2009). Factors influencing the adoption of Internet banking: An integration of TAM and TPB with perceived risk and perceived benefit. *Electronic Commerce Research and Applications*, 8(3), 130–141.
- Liao, Z., & Cheung, M. T. (2002). Internet-based e-banking and consumer attitudes: An empirical study. *Information & Management*, 39(4), 283–295.
- Lin, C. P., & Anol, B. (2008). Learning online social support: An investigation of network information technology based on UTAUT. *Cyber Psychology and Behavior*, 11(3), 268–272.
- Marchewka, J. T., Liu, C., & Kostiwa, K. (2007). An application of the UTAUT model for understanding student perceptions using course management software. *Communications of the IIMA*, 7(2), 93–104.
- Moore, G. C., & Benbasat, I. (1996). Integrating diffusion of innovations and theory of reasoned action models to predict utilization of information technology by end-users. In J. Kautz, & K. Pries-Hege (Eds.), *Diffusion and adoption of information technology* (pp. 132–146). London: Chapman and Hall.
- Ostlund, L. E. (1974). Perceived innovation attributes as predictors of innovativeness. *Journal of Consumer Research*, 1, 23–29.
- Pikkariainen, T., Pikkariainen, K., Karjaluo, H., & Pahnla, S. (2004). Consumer acceptance of online banking: An extension of the technology acceptance model. *Internet Research*, 14(3), 224–235.
- Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology*, 88(5).
- Riffai, M. M. M. A., Grant, K., & Edgar, D. (2012). Big TAM in Oman: Exploring the promise of on-line banking, its adoption by customers and the challenges of banking in Oman. *International Journal of Information Management*, 32, 239–250.
- Ringle, C. M., Wende, S., & Will, A. (2005). *SmartPLS 2.0*. Retrieved from: <http://www.smartpls.de>
- Rotchanakittumnuai, S., & Speece, M. (2003). Barriers to Internet banking adoption: A qualitative study among corporate customers in Thailand. *International Journal of Bank Marketing*, 21(6–7), 312–323.
- Ryans, A. B. (1974). Estimating consumer preferences for a new durable brand in an established product class. *Journal of Marketing Research*, 11(4).
- Tan, K. S., Chong, S. C., Loh, P. L., & Lin, B. (2010). An evaluation of e-banking and m-banking adoption factors and preference in Malaysia: A case study. *International Journal of Mobile Communications*, 8(5), 507–527.
- Tan, M., & Teo, T. S. H. (2000). Factors influencing the adoption of Internet banking. *Journal of the Association for Information Systems*, 1(1).
- Taylor, S., & Todd, P. A. (1995). Assessing IT usage: The role of prior experience. *MIS Quarterly*, 19(2), 561–570.
- Thompson, R. L., Higgins, C. A., & Howell, J. M. (1991). Personal computing: Toward a conceptual model of utilization. *MIS Quarterly*, 15(1), 124–143.
- Venkatesh, V., Davis, G. B., Davis, F. D., & Morris, M. G. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, 27(3), 425–478.
- Venkatesh, V., Thong, J. Y. L., & Xu, X. (2012). Consumer acceptance and use of information technology: Extending the unified theory of acceptance and use of technology. *MIS Quarterly*, 36(1), 157–178.
- Wang, Y.-S., Wang, Y.-M., Lin, H.-H., & Tang, T.-I. (2003). Determinants of user acceptance of Internet banking: An empirical study. *International Journal of Service Industry Management*, 14(5), 501–519.
- Xue, M., Hitt, L. M., & Chen, P. (2011). Determinants and outcomes of Internet banking adoption. *Management Science*, 57(2), 291–307.
- Yiu, C. S., Grant, K., & Edgar, D. (2007). Factors affecting the adoption of Internet banking in Hong Kong – Implications for the banking sector. *International Journal of Information Management*, 27(5), 336–351.

- Yuen, Y. Y., Yeow, P. H. P., Lim, N., & Saylani, N. (2010). Internet banking adoption: Comparing developed and developing countries. *Journal of Computer Information Systems*, 51(1), 52–61.
- Zhou, T., Lu, Y., & Wang, B. (2010). Integrating TTF and UTAUT to explain mobile banking user adoption. *Computers in Human Behavior*, 26, 760–767.

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