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Mobile banking and mobile payment acceptance

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Mobile banking and mobile payment acceptance

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Abstract

Technological advancements registered in the last three decades have revolutionized the financial industry, promoting major changes in the financial services provided. The spread of Internet-enabled phones, smart phones and tablets combined with fast and reliable communications networks, have encourage banks and service providers to provide a new set of self-service banking applications to mobile devices. These facts combined with the globalisation of business and systems are reinforcing the need to acquire a deeper understand on the impact of the acceptance of mobile services.

With this dissertation we intend to contribute to a better understanding of the determinants of mobile banking and mobile payments services acceptance and use, at individual level. For this reason we developed a total of five different studies; four about mobile banking and one about the mobile payment. We started in chapter two with a mobile banking literature weight and meta-analysis. The impact of culture in the mobile banking acceptance in an African developing country is analysed in chapter three, trying to better identify how culture influences individual use behaviour. In chapter four we study the mobile payment, trying to identify the direct and indirect effects on the determinants of adoption and the intention to recommend this technology. In chapter five we return to mobile banking, intending to identify the potential impact of the utilization of game mechanics and game design techniques in the acceptance of these services. In the fifth and last study, presented in chapter six, we analyse data from three different countries in three distinct continents, combining acceptance with trust and risk, simultaneously capturing success and resistance factors towards mobile banking intention and use behaviour.

In epistemological terms, we adopted a posture characteristic of positivism. With regard the theoretical framework, besides the weight and meta-analysis study, we use the extended unified theory of acceptance and use of technology (UTAUT2) (Venkatesh et al., 2012) in all the studies; namely combining it with (i) cultural moderators (Hofstede, 1980) in the third chapter, (ii) the innovation characteristics of the diffusion of innovations (DOI) (Rogers, 2003), the perceived technology security, and the intention to recommend constructs in the fourth chapter, (iii) a gamification impact construct in the fifth chapter, and (iv) trust and risk model (Bélanger & Carter, 2008) in the sixth chapter.

This work provides several contributions for research and practice, contributing to the advancement of knowledge, exploring and discussing direct implications for banks, financial

institutions, service providers, service managers, IT and marketing departments, users, and researchers. The innovative models that we use in our work combine the strengths and constructs from well-known theoretical models, providing a solid foundation to our studies. In summary, considering all studies and datasets used, the intention best drivers were (i) habit, found significant in three studies and five datasets and (ii) performance expectancy, found significant in all five studies and in six datasets, and in the use best drivers were (i) habit, found significant in three studies and five datasets and (ii) intention, found significant in two studies. Considering the studies individually, collectivism, uncertainty avoidance, short term, and power distance were found to be the most significant cultural moderators, providing new insights into factors affecting the acceptation and how culture influences individual use behaviour. In terms of mobile payment, the relevance of customer's intention to recommend mobile payment technology in social networks and other means of communication was confirmed, supporting the recommendation to include it in social marketing campaigns and in future technology adoption studies. A direct and strong relationship between gamification and intention was also confirmed, showing that, when used and designed properly, gamification can help make banking activities more exciting, more interesting, and more enjoyable, and in turn increase customer acceptance, engagement and satisfaction. From the multi-group analysis between countries additional results were found, supporting services customization and marketing campaigns adaptations accordingly. For the intention to use mobile banking, (i) performance expectancy is a more important factor for Portuguese than Brazilian users, (ii) hedonic motivation is a more important factor for Mozambican users than Portuguese or Brazilian ones, and (iii) price value is significant and more important for Mozambican than Portuguese users. For the use behaviour, (i) behavioural intention is a more important factor for Mozambican than Portuguese or Brazilian users and (ii) the facilitating conditions is a more important factor for Mozambican than Portuguese or Brazilian users. A theoretical model based in the best intention and use predictors found in literature is presented, from the weight and meta-analysis' results, supporting further and future studies in this area.

Keywords: Mobile, banking, payment, acceptance, UTAUT2, culture, gamification, trust, risk, intention to recommend.

Resumo

Os avanços tecnológicos registados nas últimas três décadas revolucionaram a indústria financeira, promovendo mudanças significativas nos serviços prestados. A propagação de telefones com Internet, *smartphones* e *tablets* combinado com redes de comunicação rápidas e fiáveis encorajou os bancos a disponibilizar um conjunto de novas ferramentas e aplicações *self-service* para dispositivos móveis. Estes factos combinados com a globalização dos negócios e dos sistemas reforçam a necessidade de adquirir uma maior compreensão do impacto da aceitação dos serviços móveis.

Com esta dissertação pretendemos contribuir para o melhor o entendimento dos fatores que influenciam a aceitação e o uso de serviços de *mobile banking* e *mobile payment*, a nível individual. Por esta razão desenvolvemos um total de cinco diferentes estudos; quatro sobre *mobile banking* e um sobre *mobile payment*. Começámos no capitulo dois com uma meta-analise da literatura sobre *mobile banking*. O impacto da cultura na aceitação do *mobile banking* num país africano em vias de desenvolvimento é analisado no capítulo três. No capítulo quatro é estudado o *mobile payment*, tentando identificar os efeitos diretos e indiretos nos determinantes da adoção e da intenção para recomendar esta tecnologia. No capítulo cinco voltámos ao *mobile banking*, pretendendo identificar o impacto potencial da utilização de mecanismos e técnicas de jogos na aceitação destes serviços. No quinto e último estudo, apresentado no capítulo seis, são analisados dados de três países de três continentes distintos, combinando a aceitação com a confiança e o risco, capturando simultaneamente fatores de sucesso e de resistência relacionada com a intenção o uso do *mobile banking*.

Em termos epistemológicos, adotamos uma postura característica do positivismo. No que diz respeito ao enquadramento teórico, além do estudo da meta-analise, usamos a *extended unified theory of acceptance and use of technology* (UTAUT2) (Venkatesh et al., 2012) em todos os estudos; nomeadamente combinando-o com (i) moderadores culturais (Hofstede, 1980) no terceiro capítulo, (ii) as características de inovação da teoria *diffusion of innovations* (DOI) (Rogers, 2003), a segurança percebida e a intenção de recomendar esta tecnologia no quarto capítulo, (iii) uma variável de gamificação no quinto capítulo, e (iv) modelo de confiança e risco (Bélanger & Carter, 2008) no sexto capítulo.

Este trabalho apresenta várias contribuições para a investigação e para a prática, contribuindo para o avanço do conhecimento, explorando e discutindo implicações diretas para os bancos, instituições financeiras, prestadores de serviços, gerentes de serviços,

departamentos de marketing e de tecnologias de informação, utilizadores e investigadores. Os modelos inovadores que usamos no nosso trabalho combinam as variáveis e os pontos fortes de modelos teóricos bem conhecidos, proporcionando uma sólida base para os nossos estudos. Em resumo, considerando todos os estudos e conjuntos de dados, as principais variáveis influenciadoras da intenção identificadas foram (i) o hábito, significativo em três estudos e cinco conjuntos de dados e (ii) a expectativa de desempenho, significativa em todos os cinco estudos e em seis conjuntos de dados e, em termos do uso foram (i) o hábito, significativo em três estudos e cinco conjuntos de dados e (ii) a intenção, significativa em dois estudos. Considerando os estudos individualmente, o coletivismo, a aversão à incerteza, o curto prazo, e distância face ao poder foram considerados os moderadores culturais mais significativos, apresentando novos contributos sobre os fatores que afetam a aceitação e como a cultura influencia o comportamento individual de uso. Em termos do *mobile payment* confirmou-se a relevância da intenção de recomendação desta tecnologia em redes sociais e outros meios de comunicação, suportando a recomendação para incluí-la em campanhas de marketing sociais e em estudos futuros de adoção de tecnologias. A relação direta e forte entre a gamificação e a intenção também foi confirmada, mostrando que a gamificação, quando usada e desenhada corretamente, pode ajudar a tornar as atividades bancárias mais emocionantes, mais interessantes e mais agradáveis, aumentando a aceitação, o envolvimento e a satisfação por parte de clientes. Resultados adicionais foram ainda identificados através da análise multi-grupo entre países, suportando a personalização de serviços e a adaptação de campanhas de marketing em conformidade. Para a intenção de utilizar o *mobile banking*, (i) a expectativa de desempenho é um fator mais importante para os utilizadores portugueses do que para os brasileiros, (ii) a motivação hedônica é um fator mais importante para os utilizadores moçambicanos do que para os portugueses ou brasileiros, e (iii) o preço/valor é significativo e mais importante para os utilizadores moçambicanos do que para os portugueses. Para o comportamento de uso (i) a intenção é um fator mais importante para os utilizadores moçambicanos do que para os portugueses ou brasileiros e (ii) as condições facilitadoras é um fator mais importante para os utilizadores moçambicanos do que os portugueses ou brasileiros. Um modelo teórico baseado nas principais variáveis influenciadoras da intenção e do uso encontrados na literatura é apresentado, tendo por base os resultados da meta-análise, apoiando novos e futuros estudos nesta área.

Palavras-chave: Mobile, banking, payment, acceptance, UTAUT2, cultura, gamificação, confiança, risco, intenção de recomendação.

Publications

List of publications resulting from this dissertation.

Papers (published or accepted):

Baptista, G., & Oliveira, T. (2015). Understanding mobile banking: The unified theory of acceptance and use of technology combined with cultural moderators. *Computers in Human Behavior*, *50*, 418–430. doi:10.1016/j.chb.2015.04.024

Baptista, G., & Oliveira, T. (2016a). A weight and a meta-analysis on mobile banking acceptance. *Computers in Human Behavior*, *63*, 480–489. doi:10.1016/j.chb.2016.05.074

Baptista, G., & Oliveira, T. (2016b). Why so serious? Gamification impact in the acceptance of mobile banking services. Internet Research, 27(2).

Oliveira, T., Thomas, M., Baptista, G., & Campos, F. (2016). Mobile payment: Understanding the determinants of customer adoption and intention to recommend the technology. Computers in Human Behavior, 61, 404–414. doi:10.1016/j.chb.2016.03.030

Papers (submitted or under review):

Baptista, G., & Oliveira, T. (2016). What drives mobile banking acceptance? Insights from an intercontinental study.

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Chapter 1 – Introduction

1.1. Introduction

Technological advancements in the area of telecommunications and information technology revolutionized the banking industry. The delivery of financial services has experienced major changes during the last three decades. The ever-increasing spread of Internet-enabled phones, smart phones and tablets, increasingly multifunctional, slimmer and sophisticated, combined with fast, good, reliable and affordable communications networks, have encourage banks to develop and provide self-service banking applications to mobile devices, creating an all new subset of electronic banking services. Mobile business has been developing rapidly in the world (Poushter, 2016), providing ever-widening content and services (Baptista & Oliveira, 2016a), fostering stronger relationships than the previous existing ones between financial institutions and clients (Riquelme & Rios, 2010). From an information systems perspective mobile banking is one of the major technological innovations for financial institutions (Lin, 2011), it provides customer value creation due to being inherently time and place independent (Lin, 2012), anywhere and anytime, free from temporal and spatial constraints (Chong, 2013). Although some authors refers to mobile payments and mobile banking as being equivalent (Donner & Tellez, 2008), or that some of their characteristics overlap (Slade et al., 2013), they are quite distinctive systems in terms of the number of players involved; the mobile banking is a simple direct consumer-bank relation while mobile payment is a three parts process between costumer, merchant and bank. Moving clients to electronic channels is an important issue for banks and service providers because it allows them to reduce operational costs (Afshan & Sharif, 2016), providing to customers, at the same time, a more convenient mean to meet their banking and payment needs, more complete and with more timely information (Lin, 2011). For these reasons, it is of extreme importance to understand the most important mobile banking and payment drivers of acceptance and use. The main motivational factors to do this research are presented as follow.

1. Even though past literature has covered certain drivers of mobile banking acceptance, service adoption rates are still more underused than expected, has only been adopted by a minority of users (Zhou, 2012b), indicating that new constructs or relationships should be explored, contributing to advancement in knowledge.

2. Previous research on mobile banking adoption and cultural differences analysis is very limited. Assuming that studies that use cultural values are analytical superior to those that only test for country value effect (Kirkman, Lowe, & Gibson, 2006), several new insights into how culture influence individual behaviour can be provided.
3. Trust and risk may be extremely important factors in the mobile banking acceptance, believing in the premise that the perceived risk may be higher than in traditional branch services (Koenig-Lewis et al., 2010), due to the natural implicit uncertainty of the mobile environment (Lin, 2011), and therefore they should be studied in combination with the adoption theoretical models.
4. International studies on mobile banking with multiple countries in multiple continents are scarce, leaving us an interesting area of research. This is important because of globalisation of business and systems, following a pressing need to understand differences and similitudes between consumers in different countries.
5. Most of the mobile banking services are purely simple transactional services. Applying game mechanics to motivate and drive engagement in this nongame context might very well change mobile banking users' behaviour, improving service acceptance and use, in a movement that needs further attention.
6. Mobile payment have a tight relation with mobile banking, especially in some developing countries, where sometimes is hard to distinguish one from another.
7. Mobile payment is a relatively new area of research, under explored when compared to related areas of research such as commerce or Internet banking, where research have been widely conducted, and therefore must be more explored.

1.2. Adoption models

Among several different models that have been proposed through the years, five theoretical currents predominate in the literature (Hoehle et al., 2012), namely: (i) the innovation characteristics of the diffusion of innovations theory (DOI)(Rogers, 2003), (ii) theory of reasoned action (TRA) (Fishbein & Ajzen, 1975), (iii) theory of planned behaviour (TPB) (Ajzen, 1991), (iv) technology acceptance model (TAM) (Davis, 1989), and (v) theory of perceived Risk (TPR) (Featherman & Pavlou, 2003). In 2003 Venkatesh proposed the Unified theory of acceptance and use of technology (UTAUT), built on eight prominent theories: (i) TRA, (ii) TAM, (iii) the Motivational Model (MM) (Davis et al., 1992), (iv) TPB, (v) the PC utilization model (MPCU) (Thompson et al., 1991), (vi) DOI, (vii) the social cognitive theory

(SCT) (Compeau & Higgins, 1995), and (viii) an integrated model of technology acceptance and planned behaviour. Since their appearance, UTAUT model has gradually drawn researchers' attentions being recently applied to explore user acceptance of mobile technologies (Yu, 2012), being incrementally tested and applied to several technologies, from both individual and organizational use, within single or multiple countries. Despite providing a very good and detailed model for acceptance and use of technology, UTAUT has some limitations (Negahban & Chung, 2014). Trying to solve these issues, Venkatesh et al. (2012) presented UTAUT2, extending and adapting the previous version of the model to the individual context. Compared to its predecessor, UTAUT2 yields substantial improvement in the variance explained in behavioural intention and technology use (Venkatesh et al., 2012). UTAUT2 combined with others well-known theories as DOI (Rogers, 2003), trust and risk (Bélanger & Carter, 2008), and culture (Hofstede, 1980), are used in our work, as described in the following chapter.

1.3. Research focus

Understand the main drivers of mobile banking and payment acceptance, as well as the post acceptance behaviour, namely the use behaviour and intention to recommend, are the work main focus of interest, as presented in the **Figure 1.1**. Interrelated IT acceptance areas and subjects, such as Internet banking, mobile services, financial services, m-commerce, or mobile apps, are specifically excluded from the research. The study is only focused in the individual level of acceptance, no firm or business level will be analysed or studied.

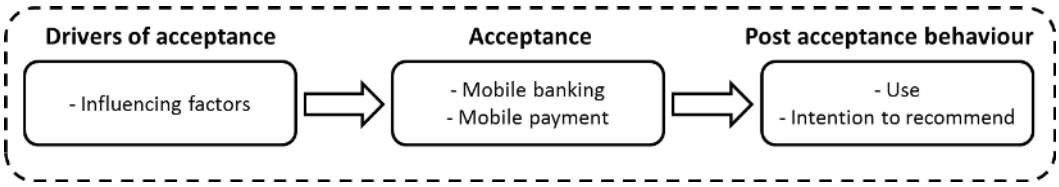


Figure 1.1 – Research focus

Mobile banking can be defined as a type of execution of financial services in the course of which, within an electronic procedure, the customer uses mobile communication techniques in conjunction with mobile devices (Pousttchi & Schurig, 2004) or as a service whereby customers use a mobile phone or mobile device to access banking services and perform financial transactions (Anderson, 2010). Ghezzi et al. (2010) summarize the concept

of mobile payment as a process in which at least one phase of the transaction is conducted using a mobile device (such as mobile phone, smartphone, PDA, or any wireless enabled device) capable of securely processing a financial transaction over a mobile network, or via various wireless technologies (NFC, Bluetooth, RFID, etc.).

In order to better understand mobile banking and payment acceptance it is important to study them in different contexts, samples, groups, and countries, and if possible with different theoretical models, trying to identifying relevant factors to extend them, and to contribute to knowledge. For that reasons, a total of five separate studies were developed; as presented in the **Figure 1.2**; four in the mobile banking field and one in the mobile payment one.

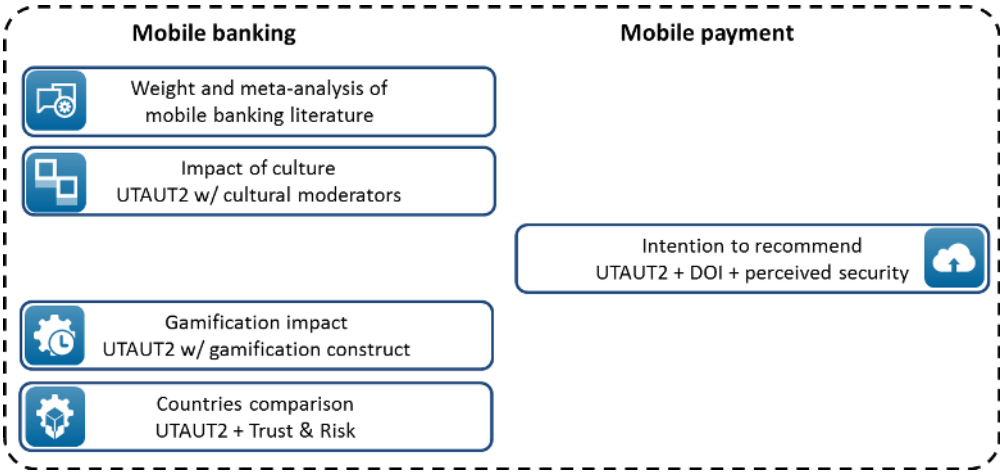


Figure 1.2 – List of studies, theoretical models, and constructed used

UTAUT2 (Venkatesh et al., 2012) is combined with others well-known theories as DOI (Rogers, 2003), trust and risk (Bélanger & Carter, 2008), and culture (Hofstede, 1980), as presented.

A visual representation of the world distribution of the mobile banking and payment studies included in our work, besides the ones included in the weight and meta-analysis, can be seen in the **Figure 1.3**. The bubbles are a proportional representation of the sum of the samples dimension used in the studies.

Figure 1.3 – Studies world distribution

Trust and risk are interrelated concepts (Hanafizadeh et al., 2014). When a new innovative service is introduced, customers may feel fearful about using it (Luarn & Lin, 2005). Literature suggest that trust will contribute to shape the acceptance of end-user (Kim et al., 2009; Oliveira et al., 2014), helping reduce fears, potential risks and facilitating business transactions (Corritore et al., 2003). On the other side, perceived risk sentiments towards mobile banking services are influenced by perceptions of risk and uncertainties regarding security, transactions, and data transfers (Duane et al., 2011). Consumers find it substantially more difficult to judge the trustworthiness of an institution in an mobile electronic setting than in the conventional business face-to-face context (Gefen et al., 2003; Mohammadi, 2015).

Gamification can be defined as the use of game mechanics and game design techniques in nongame contexts to design behaviours, develop skills, or to engage people in innovation (Burke, 2012a), or as a technique of influencing the motivation or engagement of people to solve complex problems, to perform certain actions, or to just have fun (Mishra, 2013).

1.4. Main objectives

Tying to better understand the main drivers of mobile banking and payment acceptance, as well their post acceptance behaviour, namely the use behaviour and intention to recommend, we divided our work in different studies, each of them presented in a separate chapter.

Our document starts with a weight and meta-analysis of mobile banking literature, as presented in the second chapter, trying to synthesize findings from existing research, identifying the relevance of the most used constructs and their most significant relationships, promoting an update of the current state-of-the-art knowledge, where possible. Historically, in terms of calendar, this study was the last one to be completed. As in every normal research situation, we started our work with a literature review that was the basis for the theoretical background review of all mobile banking and mobile payment studies, hereby presented in the following chapters; from third till the six one. Nevertheless, this study was only completed after all the others.

In the third chapter, we analyse the impact of culture in the mobile banking acceptance in an African developing country, trying to better identify how culture influences individual use behaviour. In developing countries, especially in Africa, mobile banking can play a strong role, providing a way to overcome financial exclusion and physical distance by allowing local population to conduct financial transactions. Acceptance studies in this region are scarce, leaving us an almost unexplored area of research.

In the fourth chapter, having in consideration that in some countries is hard to distinguish between mobile banking and mobile payment, and the importance of this technology, we analyse mobile payment trying to identify the direct and indirect effects on the determinants of adoption and the intention to recommend this technology.

In the fifth chapter we come back to mobile banking, intending to identify the potential impact of the utilization of game mechanics and game design techniques in the acceptance of these services, supported in the assumption that, when used and designed properly, gamification can help make banking activities more exciting, and more interesting, and in turn increase customer acceptance, engagement and satisfaction.

In the sixth chapter, data from three different countries in three distinct continents is analysed, combining acceptance with trust and risk, simultaneously capturing success and resistance factors towards mobile banking intention and use behaviour. International studies on this subject with multiple countries in multiple continents are scarce, leaving us an interesting area of research.

As an ending, in the seventh chapter, a summary of the main conclusion identified is provided, aiming to present the work most important conclusion redrawn from the studies presented in the previous chapters.

1.5. Methods

Epistemology can be defined as the relationship between the researcher and the reality (Carson et al. 2001). There are two dominant epistemological paradigms in information systems research; positivism and interpretivism (Smith, 2006). Supported in the fact that, in epistemological terms, the positivist research perspective is dominant in behavioural information systems research (Orlikowski & Baroudi, 1990), we adopted a posture characteristic of positivism in our work. We took a controlled and structural approach in conducting research, by identifying a clear research topic, constructing appropriate hypotheses and by adopting a suitable research methodology (Carson et al. 2001). To study mobile banking and payment acceptance we developed a specific design using cross-sectional survey methodology, supported in a number of survey instruments; one for each country or subject involved. The purpose of this design was to correlate the score of all independent determinants that influence mobile banking or payment acceptance and post-behaviour variables, namely use behaviour and intention to recommend. The theoretical framework and the quantitative approach followed in all studies are described as follow.

1.5.1. Theoretical frameworks

The extended unified theory of acceptance and use of technology (UTAUT2) (Venkatesh et al., 2012) is used in all the studies presented from chapter 3 till 6. In detail: (i) the study presented in the third chapter is based in UTAUT2 combined with cultural moderators (Hofstede, 1980), (ii) chapter four is based in a combination of UTAUT2, the innovation characteristics of the diffusion of innovations (DOI) (Rogers, 2003), with perceived technology security and the intention to recommend constructs, (iii) chapter five in UTAUT2 with a gamification impact construct, and (iv) chapter six in UTAUT2 with trust and risk model (Bélanger & Carter, 2008).

1.5.2. Quantitative research methods

The chapter three study used a cross-sectional on-line survey design to assess the main determinants of mobile banking acceptance and the influence of culture on it. The data collection was conducted in Mozambique, targeting local adult population that: (i) have one or more banking accounts in a local national bank that provides Internet and mobile banking services, (ii) own one or more mobile devices, such as mobile phone, smartphone, or tablet, with mobile internet access, and (iii) have one or more email addresses. In a consumer context the use of mobile banking services is a completely voluntary decision. A total of 252 valid survey answers had been collected. The model was tested using structural equation modelling (SEM), namely using variance-based techniques, i.e., partial least square (PLS). Following Anderson & Gerbing's (1988) guidelines, our analysis was done in two different steps, (i) reliability and validity assessment of the measurement model and (ii) structural model assessment and hypotheses testing.

An equivalent method was used in the study presented in the chapter four trying to understand the main drivers of mobile payment adoption and the intention to recommend the technology; namely the use of a cross-sectional on-line survey to collect data, SEM and PLS to test the theoretical model, and Anderson & Gerbing's (1988) guidelines to analyse the data. The data collection was conducted in Portugal targeting students and alumni from universities in Portugal. A total of 301 valid answers were collected.

The study presented in the chapter five also used a cross sectional on-line survey, SEM and PLS to analyse the supporting model, intending to identify the potential impact of the utilization of game mechanics and game design techniques in the acceptance of mobile banking services. The data collection was conducted in Brazil, targeting local individual adults that: (i) have one or more banking accounts on a local national bank that provide Internet and mobile banking services, (ii) own one or more mobile devices, such as mobile phone, smartphone or tablet, with mobile internet access, (iii) have one or more email addresses. A total of 326 answers were collected and used in the study. Anderson & Gerbing's (1988) guidelines to analyse were also followed.

In the chapter six study, three cross-sectional on-line surveys were designed in order to assess the main determinants of mobile banking acceptance combined with risk and trust constructs in three different countries, namely Portugal, Brazil, and Mozambique. The target population were local individuals' adults with one or more accounts on a local national bank,

that owned a mobile device. The theoretical model was tested using SEM and consistent partial least square (PLSc). A total of 1211 valid answers were collected; 633 from Portugal, 326 from Brazil, and 252 from Mozambique, that were used in this international study. The analysis was done in two steps, following Anderson & Gerbing's (1988) guidelines, starting with the reliability and validity assessment of the measurement model, followed by the structural model assessment and hypotheses testing. For PLSc, the correction for attenuation and the consistence coefficients were also calculated, following Dijkstra & Henseler (2015) guidelines. To deepen the analysis, we also produced a multi-group analysis testing the differences between the path coefficients across the three countries subsamples, two countries at each time.

1.6. Path of research

Our work is a collection of separated researches of interrelated subjects, namely mobile banking and mobile payment, reported separately in different chapters, some of them already published in international journals with double blinded review process, others are in other different stages; in development, under review, or submitted. The current stage of each of the studies is presented in the **Table 1.1**, as follow.

Table 1.1 – Studies current stage

Chapter	Study name	Current stage
2	A weight and a meta-analysis on mobile banking acceptance research	Published in the Computers in Human Behavior Journal
3	Understanding mobile banking: The unified theory of acceptance and use of technology combined with cultural moderators	Published in the Computers in Human Behavior Journal
4	Mobile Payment: Understanding the determinants of customer adoption and intention to recommend the technology	Published in the Computers in Human Behavior Journal
5	Why so serious? Gamification impact in the acceptance of mobile banking services	Accepted in Internet Research Journal
6	What drives mobile banking acceptance? Insights from an intercontinental study	Under review

Our work ends with the presentation of the major conclusions of the researches made, accordingly with what is presented between the chapter two and six. The majority of the chapters were accepted in international journals with blinded review process, which can be considered a positive indication of the work' quality developed.

Chapter 2 - A weight and a meta-analysis on mobile banking acceptance research

2.1. Introduction

The prevalence of mobile technology in daily life has increased the popularity of mobile banking (Chen, 2013) and the importance of these types of services for users, banks, and financial institutions. In the present work mobile banking is understood as a type of financial services in the course of which, within an electronic procedure, the customer uses mobile communication techniques in conjunction with mobile devices to perform financial transactions (Anderson, 2010). For some, mobile banking is considered to be one of the last major technological innovations (Lin, 2011), due to being inherently time and place independent (Lin, 2012), providing customers with a more convenient means to access banks and financial institutions. Several advantages, to both customers and banks, are boosting the number of services and content available, starting with more traditional transactions such as money transfers, bill payments, trading, or loans, to more advanced ones such as automatic check payments, virtual advisory/sales agent, personal savings plans, interactive games, or predictive cross-selling of products.

As a result of the increasing number of mobile banking studies and articles published in the last years, the research process has become more complex and time-consuming, covering several different subjects such as environment, rules, culture, trust, risk, technology, gamification, value, satisfaction, and loyalty. Consequently, there is a greater need to describe, synthesize, evaluate, and integrate the results of these articles (Fettke, 2006). A literature review can build a firm foundation for advancing knowledge (Webster & Watson, 2002), revealing relationships, contradictions, gaps, and irregularities in the relevant literature (Urbach et al., 2009). The review also facilitates theory development, closes areas where a plethora of research exists, and uncovers areas where research is needed (Webster & Watson, 2002). In spite of occasional criticism against it (Borenstein et al., 2009), some researchers consider that a meta-analysis is even better than a literature review (Schmidt & Hunter, 2014), and we therefore included it in our work. Combining it with a weight analyses provides one of the most profound analysis available (Rana et al., 2015). The main purpose of this research is to synthesize findings from existing research on mobile banking acceptance, providing a combination of weight and meta-analysis, in order to balance and identify the performance of the most used constructs described in the literature and their importance. To the best of

our knowledge, this the first time that a sustained meta-analysis combined with a weight analysis and with a period of analysis as large as ours has been addressed to the area of mobile banking. Is known that mobile banking studies have often produced contradictory results, depending on multiple factors such as theoretical models employed, constructs, moderators, samples sizes, periods of data collection, countries, and cultural aspects. In the same way that a meta-analysis has often been used to better understand and interpret the results of putatively conflicting results (Dennis et al., 2001), it will contribute to a clearer and more concise view of mobile banking acceptance. This what we intend to provide.

2.2. Research methodology

Our process of literature selection was based on Urbach et al.'s (2009) approach and comprised three steps: (1) selection of the literature sources, (2) definition of a time frame for the analysis, and (3) selection of the articles to be reviewed. Following Webster & Watson's (2002) recommendations, we began our literature review by identifying the relevant mobile banking literature through a keyword search in numerous electronics databases, such as Science Direct, ISI Web of Science, ACM Digital Library, Scopus, Emerald, Springer, Taylor & Francis, EBSCO, and JSTOR. Conference proceedings, dissertations, and these were also included in order to address bias toward higher effect sizes normally associated with published journal articles (Pappas & Williams, 2011; Rothstein et al., 2004). To ensure capturing all relevant articles we also used Google Scholar and Scopus search engines to cover publications in other databases. We systematically searched these sources for mobile banking and related words, such as: mobile, banking, adoption, acceptance, m-banking, m-bank, mb, electronic banking, smartphone, cell phone, mobile phone, tablet, financial services, financial, branchless banking, cross-channel banking, self-service technology, and e-services. Interrelated areas and subjects, such as Internet banking, mobile payments, mobile services, financial services, m-commerce, and mobile apps, were excluded. A systematic search is a condition to ensure that a relatively complete census of relevant literature is accumulated (Webster & Watson, 2002), and therefore it is used in our work.

Of the 121 articles identified, a rigorous set of criteria was developed to assess the studies' usefulness for the meta-analysis, namely: (i) the time frame was set between January of 2003 and February of 2016, and studies had to be published or be available on-line within this period, (ii) the unit of analysis had to be the individual level; all studies at firm or business

level were excluded, (iii) the type of analysis had to be quantitative; all qualitative studies, literature reviews, or conceptual articles were excluded, (iv) the studies had to provide values of correlations between related variables used in supporting the theoretical model, and (v) the studies had to provide independent databases; articles containing previous datasets were eliminated to avoid biasing the study through multiple counting (Wood, 2008). However studies with multiple independent datasets were included (e.g., Mortimer et al. (2015) contributed with two datasets). This resulted in a total of 57 papers and 58 datasets for the meta-analysis. Of these papers, 42 were journal articles (73.7%), 2 were dissertations (3.5%), and 13 were conference papers (22.8%). This is a larger sample compared with other meta-analysis published in top tier Journals, such as Mahmood et al. (2000), which included 45 studies, Wu & Lederer (2009) with 50, Gerow et al. (2014) with 30, and equivalent to others such as Dennis et al. (2001) with 61 studies.

Following Rana et al.'s (2015) guidelines, for the meta-analysis and weight analysis we selected only those relationships that have been explored three or more times in the literature, resulting in a total of 34 relationships. The meta-analysis is a very well-known method (Sharma & Yetton, 2003) that allows integrating earlier mobile banking studies' findings; even if their findings are the non-significant or inconsistent they can contribute to a pooled conclusion (Sabherwal et al., 2006), enhancing the general validity of interpretations (Cook, 1991). The method is considered suitable for highlighting gaps in knowledge, supporting further and future studies on patterns found (Lee et al., 2003), and is therefore used in our work.

With the correlation coefficients collected between each pair of constructs from the various studies, the average of the cumulative value was computed for each of the 34 relationships. These values combined with the studies' total samples sizes supported the meta-analysis results, produced using the Comprehensive Meta-Analysis software tool (www.meta-analysis.com). Additional views on data were produced using IBM Watson Analytics tool (www.ibm.com). The weight analysis was calculated based on the total number of significant relationships; for each pair of constructs found in the 57 mobile banking studies identified, considering that weight is a clear indicator of the predictive power of an independent variable (Jeyaraj et al., 2006), complementing the meta-analysis results.

2.3. Meta-analysis

Meta-analysis is a statistical technique that combines the results from theoretical studies that address similar themes or subject area (Lipsey & Wilson, 2001). We used meta-analysis to summarize and analyse the results of earlier research on mobile banking acceptance, considering that traditional literature reviews failed to achieve an integrative view of findings across the large number of studies published (Schmidt & Hunter, 2014). Instead, a meta-analysis allows a mathematical combination of correlations between two or more variables (Gerow et al., 2014). A random-effects model was used, according to Schmidt & Hunter's (2014) approach. This technique uses coding and statistical psychometric procedures to combine the results from independent empirical studies that address similar research questions. In our case we analysed the correlations between independent and dependent variables used in literature to study the mobile banking acceptance and interrelated variables such as intention, trust, attitude, and perceived usefulness.

2.3.1. Acceptance research studies

In accordance with the methodology described in Section 2.2, a total of 57 studies were identified meeting the criteria to be included in our work were found, as shown in the **Table 2.1**.

Table 2.1 – Research studies used in the meta-analysis

No	Author	Country	Sampling dimension
1	Al-Jabri & Sohail (2012)	Saudi Arabia	330
2	Aboelmaged & Gebba (2013)	United Arab Emirates	119
3	Püschel et al. (2010)	Brazil	666
4	Akturan & Tezcan (2010)	Turkey	311
5	Chen (2013)	Taiwan	610
6	Faria (2012)	Portugal	248
7	Zhou et al. (2010)	China	250
8	Zhou (2012b)	China	240
9	Luarn & Lin (2005)	Taiwan	180
10	Yu (2012)	Taiwan	441
11	Lin (2011)	Taiwan	386

No	Author	Country	Sampling dimension
12	Luo et al. (2010)	EUA	125
13	Saleem & Rashid (2011)	Pakistan	300
14	Suoranta (2003)	Finland	1253
15	Gu et al. (2009)	Korea	910
16	Zhou (2012a)	China	200
17	Lee & Chung (2009)	Korea	276
18	Wei et al. (2013)	China	369
19	Hanafizadeh et al. (2014)	Iran	361
20	Kim et al. (2009)	Korea	600
21	Riquelme & Rios (2010)	Singapore	600
22	Wessels & Drennan (2010)	Australia	314
23	Koenig-Lewis et al. (2010)	Germany	263
24	Shen et al. (2010)	Taiwan	400
25	Chitungo & Munongo (2013)	Zimbabwe	275
26	Sriwindono & Yahya (2012)	Indonesia	302
27	Oliveira et al. (2014)	Portugal	194
28	Bidar et al. (2014)	Turkey	128
29	Baptista & Oliveira (2015)	Mozambique	252
30	Mohammadi (2015)	Iran	128
31	Afshan & Sharif (2016)	Pakistan	198
32	Malaquias & Hwang (2016)	Brazil	1077
33	Mortimer et al. (2015)	Thailand and Australia	175
34	Sharma et al. (2016)	Oman	208
35	Alalwan et al. (2016)	Jordan	500
36	Tran & Corner (2016)	New Zealand	183
37	Negash et al. (2011)	USA	84
38	Baptista & Oliveira (2016b)	Brazil	326
39	Han & Yang (2010)	China	271
40	Masrek & Razali (2014)	Malaysia	312
41	Chu & Lu (2009)	China	313
42	Njenga & Ndlovu (2012)	South Africa	209
43	Xiong (2013)	China	190
44	Li (2013)	China	522
45	Sheng et al. (2011)	China	278

No	Author	Country	Sampling dimension
46	Masrek et al. (2014)	Malaysia	312
47	Daud et al. (2011)	Malaysia	300
48	Hsu et al. (2011)	Taiwan	275
49	Tan et al. (2010)	Malaysia	184
50	Teo et al. (2012)	Malaysia	193
51	Akturan & Tezcan (2012)	Turkey	435
52	Zhou (2014)	China	210
53	Amin et al. (2012)	Malaysia	152
54	Bankole et al. (2011)	Nigeria	231
55	Raleting & Nel (2011)	South Africa	465
56	Crabbe et al. (2009)	Ghana	271
57	Shanmugam et al. (2014)	Malaysia	202

A visual representation of the world distribution and coverage of the 57 mobile banking studies included in our work can be seen in **Figure 2.1**. China, Taiwan, Brazil, and Malaysia are the countries with the largest sum of samples identified, respectively with 2843, 2592, 2069, and 1655 respondents, distributed respectively by 10, 7, 3, and 7 different studies.

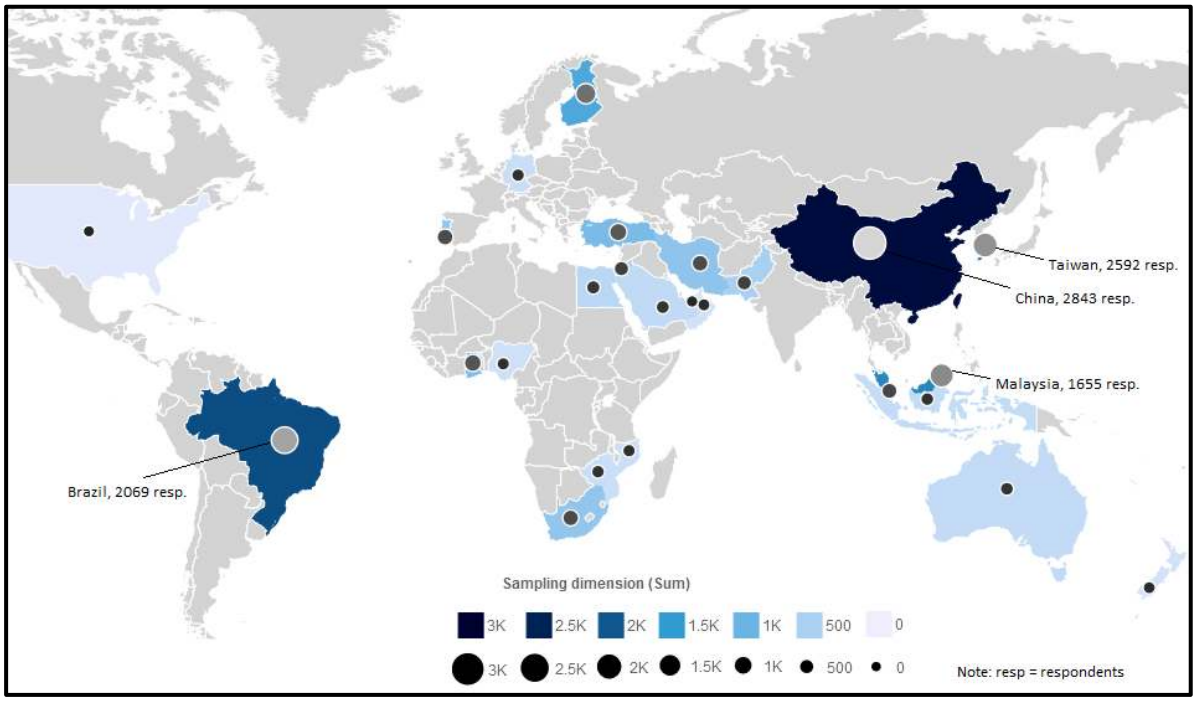


Figure 2.1 – World distribution and coverage of the studies included in the meta-analysis

Several top tier Journals have published mobile banking articles in the last years, as have several conferences, supporting the importance of this area of study. The distribution of the 57 articles included in our work by Journal and year is shown in the **Table 2.2**. In 2016, only the first two months of the year were considered.

Table 2.2 – Research studies used in the meta-analysis by Journal and year

No	Journal	2003 - 2008	2009	2010	2011	2012	2013	2014	2015	2016
1	Academic Research International							1		
2	African Journal of Business Management				1					
3	Australian Journal of Basic and Applied Sciences				1					
4	Behaviour & Information Technology			1						
5	Computers in Human Behavior	1		1		1			2	1
6	Conferences		2	2	2	2	4	1		
7	Decision Support Systems			1						
8	Expert Systems with Applications		1							
9	Information Systems Journal		1							
10	Information Technology and Management					1				
11	Interacting with Computers		1							
12	International Journal of Bank Marketing			3					2	
13	International Journal of Business Research and Development						1			
14	International Journal of Information Management			1				1		
15	International Journal of Mobile Communications		1	1	1	1				
16	International Journal of Trade, Economics and Finance				1					
17	Internet Research				1					1
18	Journal of Artificial Societies & Social Simulation						1			
19	Journal of Business Administration and Education						1			
20	Journal of Electronic Commerce Research					2				
21	Journal of Enterprise Information Management									2
22	Journal of Internet Banking and Commerce					1				
23	Managing Service Quality						1			
24	Marketing Intelligence & Planning					1				

No	Journal	2003 - 2008	2009	2010	2011	2012	2013	2014	2015	2016
25	Telematics and Informatics							1		1
26	The Electronic Journal on Information Systems in Developing Countries				1					
27	Thesis	1				1				
	Total	**2**	**6**	**10**	**8**	**10**	**8**	**4**	**4**	**5**

2.3.2. Network of constructs and relationships

As expected, several different constructs affecting mobile banking acceptance were identified in the literature review. These included trust, risk, enjoyment, gamification, technology, social influence, perceived usefulness, price, quality, and others. More than 520 construct relationships were also found. These constructs and relationships are visually presented in **Figure 2.2**, with the construct size increasing according to the number of times it is used in the literature. The biggest constructs are on the edges of the figure, namely: use, intention, attitude, perceived usefulness, social influence, trust, initial trust, effort expectancy, perceived risk, and perceived ease of use.

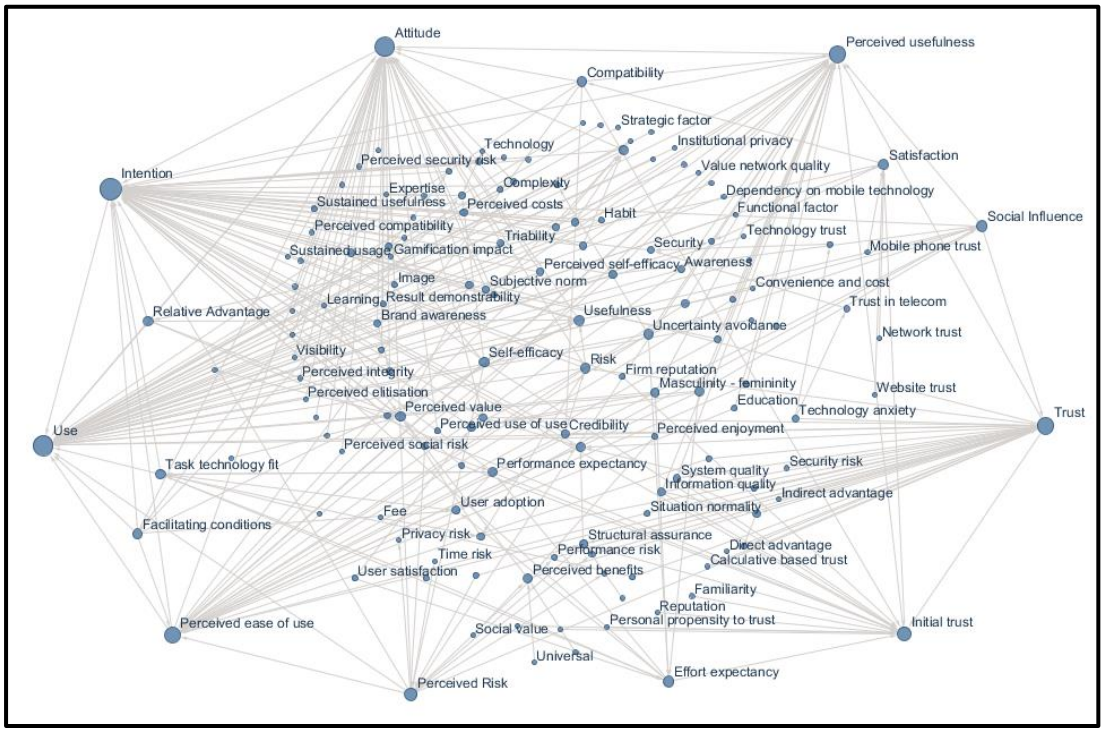


Figure 2.2 – Network of constructs and relationships identified

2.3.3. Meta-analysis constructs relationships

Following the research methodology, the number of relationships was initially reduced to 34, retaining the ones explored three or more times in the literature. Considering that according to Venkatesh et al. (2003), (i) perceived usefulness (TAM), (ii) relative advantage (DOI), and (iii) performance expectancy (UTAUT) are equivalent constructs, they were considered jointly as a single construct – performance expectancy. For the same reason, (i) perceived ease of use (TAM), (ii) ease of use (DOI), and (iii) effort expectancy (UTAUT) were all considered as effort expectancy, and (iv) compatibility (DOI) and (v) facilitating conditions (UTAUT2), considered jointly as facilitating conditions. This reduced the initial number of relationships from 34 to the final number of 29. **Table 2.3** shows the results of the meta-analysis of these most frequently used relationships. The number of times that a relationship was analysed (items), the total sample size, the average of all β values, effect size (p), standard normal deviation (Z), and upper and lower 95% of confidence interval, are also presented.

Table 2.3 – Summary of the meta-analysis of the most used construct relationships

Independent	Dependent	Items	Total size	Average β	Estimated p	Estimated Z	95% β confidence interval (low – high)	
Facilitating conditions	Attitude	3	1590	0.220	0.000	8.910	0.173	0.266
Effort expectancy		9	3046	0.263	0.000	14.857	0.230	0.296
Performance expectancy		8	2113	0.358	0.000	17.207	0.320	0.395
Firm reputation	Initial trust	3	1042	0.227	0.000	7.447	0.169	0.284
Performance expectancy		3	640	0.360	0.000	9.512	0.291	0.426
Personal propensity to trust		3	1042	0.040	0.197	1.290	-0.021	0.100
Structural assurance		7	2003	0.283	0.000	13.011	0.242	0.323
Attitude	Intention	10	3389	0.535	0.000	34.746	0.511	0.559
Credibility		3	924	0.200	0.000	6.153	0.137	0.261
Effort expectancy		19	5392	0.129	0.000	9.523	0.103	0.155
Facilitating conditions		11	3124	0.253	0.000	14.448	0.220	0.286
Firm reputation		4	1236	0.005	0.861	0.176	-0.051	0.061
Initial trust		5	1763	0.380	0.000	16.783	0.339	0.419
Need for interaction		3	709	-0.056	0.136	-1.490	-0.129	0.018
Perceived cost		3	938	0.090	0.006	2.759	0.026	0.153
Perceived risk		8	2497	-0.152	0.000	-7.650	-0.190	-0.113

Independent	Dependent	Items	Total size	Average β	Estimated p	Estimated Z	95% β confidence interval (low – high)	
Performance expectancy		34	9491	0.350	0.000	35.597	0.332	0.368
Social influence		12	3023	0.181	0.000	10.058	0.146	0.215
Subjective norm		4	1347	0.532	0.000	21.737	0.493	0.569
Trust		7	2654	0.364	0.000	19.642	0.331	0.397
Effort expectancy	Performance expectancy	8	2871	0.528	0.000	31.456	0.501	0.554
Task technology fit		3	692	0.643	0.000	20.035	0.597	0.685
Task characteristics	Task technology fit	4	890	0.048	0.153	1.431	-0.018	0.113
Technology characteristics		4	890	0.523	0.000	17.288	0.474	0.569
Facilitating conditions	Use	9	3300	0.232	0.000	13.568	0.199	0.264
Intention		9	2663	0.427	0.000	23.530	0.395	0.458
Effort expectancy		4	573	0.172	0.000	4.148	0.091	0.250
Performance expectancy		5	1073	0.234	0.000	7.799	0.177	0.290
Task technology fit		3	692	0.167	0.000	4.425	0.094	0.239

Note: * p value < 0.005, ** p value < 0.001, ***p value <0.000

The meta-analysis of the relationships indicates that the cumulative effect of 24 of the 29 relationships were found to be statistically significant (p<0.01). The exceptions are the five relationships between the following variables: (i) personal propensity to trust on initial trust, (ii) firm reputation on intention, (iii) need for interaction on intention, (iv) task characteristics on task technology fit, and (v) perceived cost on intention. From the **Table 2.3** the p values are respectively 0.197, 0.861, 0.136, 0.153, and 0.006. The significance is also supported by the high absolute Z values identified (>2.7 in all cases, >10 in some cases) in all of the significant relationships. The biggest Z values identified in our study were: (i) considering the positive values, performance expectancy on intention (35.597), attitude on intention (34.746), and effort expectancy on performance expectancy (31.456), and (ii) considering the negative values, perceived risk on intention (-7.650). In terms of confidence intervals all the statistically significant relationships have narrow ranges (i.e., falling in the 95% interval) (Rana et al., 2015), in what can be considered as a modest dispersion of values (Borenstein et al., 2009), supporting the consistency and confidence of the average of cumulative correlation values presented across the range of studies included.

2.3.4. Weight analysis

A weight analysis is a technique used to examine the strength of a predictor, in our case the independent variables, in a given relationship (Jeyaraj et al., 2006). The weight of the 29 most utilized relationships were analysed and are shown in **Table 2.4**. The weight significance of a relationship is the result of the division of the number of times a relationship is statistically significant by the total number of studies that uses it. The weight 1 (one) indicates that the relationship between the two constructs is significant in all studies, whereas 0 (zero) indicate the opposite, that it is non-significant across all (Jeyaraj et al., 2006).

Table 2.4 – Summary of construct relationship weight analysis results

Independent	Dependent	Sig	Non Sig	Total	Weight
Facilitating conditions	Attitude	3	0	3	1.000
Effort expectancy		6	3	9	0.667
Performance expectancy		8	0	8	1.000
Firm reputation	Initial trust	2	1	3	0.667
Performance expectancy		3	0	3	1.000
Personal propensity to trust		1	2	3	0.333
Structural assurance		7	0	7	1.000
Attitude	Intention	9	1	10	0.900
Credibility		2	1	3	0.667
Effort expectancy		10	9	19	0.526
Facilitating conditions		8	3	11	0.727
Firm reputation		1	3	4	0.250
Initial trust		5	0	5	1.000
Need for interaction		1	2	3	0.333
Perceived cost		2	1	3	0.667
Perceived risk		8	0	8	1.000
Performance expectancy		30	4	34	0.882
Social influence		6	6	12	0.500
Subjective norm		2	2	4	0.500
Trust		5	2	7	0.714
Effort expectancy		8	0	8	1.000

Independent	Dependent	Sig	Non Sig	Total	Weight
Task technology fit	Performance expectancy	3	0	3	1.000
Task characteristics	Task technology fit	4	0	4	1.000
Technology characteristics		4	0	4	1.000
Facilitating conditions	Use	7	2	9	0.778
Intention		8	1	9	0.889
Effort expectancy		2	2	4	0.500
Performance expectancy		4	1	5	0.800
Task technology fit		1	2	3	0.333

According to Jeyaraj et al. (2006), in order to identity the most effective predictors of mobile banking acceptance relationships between constructs should be classified into two different types: (i) “well-utilized”, if examined more than five times in the literature, and (ii) “experimental”, for the remaining ones. Two additional definitions of Jeyaraj et al. (2006) are also considered: (i) “best predictors”, as the well-utilized relationship that have a weight greater than 0.80, and (ii) “promising predictors”, as the experimental relationships that have a weight equal to 1.

In more detail, 9 out of 15 well-utilized relationships were classified as best predictors of mobile banking acceptance, namely: (i) performance expectancy on attitude, (ii) structural assurance on initial trust, (iii) attitude on intention, (iv) initial trust on intention, (v) perceived risk on intention, (vi) performance expectancy on intention, (vii) effort expectancy on performance expectancy, (viii) intention on use, and (ix) performance expectancy on use. Of the remaining relationships, 5 out of 14 were classified as promising predictors of mobile banking acceptance, needing further testing to be qualified as best predictor but having the potential to be, namely: (i) facilitating conditions on attitude, (ii) performance expectancy on initial trust, (iii) task technology fit on performance expectancy, (iv) task characteristics on task technology fit, and (v) technology characteristics on task technology fit. None of the 29 relationships identified were found to be non-significant across all studies. The least significant one was the firm reputation on intention (0.25).

2.4. Discussion

Mobile banking acceptance has been studied by several authors in the last years. Several distinct theoretical models, theories, and constructs have been used in many quantitative studies, their significance clear and making it appropriate to discuss their collective findings. The analysis of these studies indicates that the constructs and the relationships used are quite scattered in nature, as more than 520 different relationships were identified, and have been borrowed from contemporary information system disciplines. Combining the meta-analysis and the weight analysis provides additional confidence to the work results, delivering different but related views of the significance of the predictors on the corresponding dependent variables. The fixed method approach used in the meta-analysis was considered adequate due to the fact that it assumes a dissimilar and essential impact for each study, taking it as an added source of variation that corresponds to wider confidence intervals than in the fixed effects model (McFadzean et al., 1997).

We started our analysis with the best predictors of the relationships identified, assuming that the higher the greater of a predictor, the greater the probability that it is significant in performing the meta-analysis (Rana et al., 2015). 100% of the best predictors, namely 9 in 9 relationships, were found to be statistically significant in the meta-analysis. In terms of the promising predictors 80.0% (4 in 5 relationships), were found to be statistically significant; the non-significant exception was the relationship of task characteristics on task technology fit. All the remaining well-utilized predictors were also found to be statistically significant in the meta-analysis (6 in 6, 100%). Three other statistically non-significant relationships, besides task characteristics on task technology fit, were identified in relationships with fewer than five studies and weight < 0.80. Considering all the studies included in our work and the results presented, the most effective predictors of the intention to use mobile banking services are those that are simultaneously best predictors in the weight analysis and statistically significant in the meta-analysis, namely: (i) attitude, (ii) initial trust, (iii) perceived risk, and (iv) performance expectancy. In terms of use of mobile banking, considering the same assumptions, the best predictors are: (i) intention, and (ii) performance expectancy.

Assuming that the width of confidence interval depends on the accuracy of the individual studies (Rana et al., 2015), and as we obtained only narrow intervals, the significance of all the statistically significant relationships is supported. Concerning sample

sizes, only one study had a relatively small sample size (Negash et al., 2011), below 100, minimizing the risk and probability of having an incorrect representation of the possible outcomes, biasing the sum of correlations used in the meta-analysis, and therefore no additional measures were taken. The high absolute Z values identified in the statistically significant relationships are a sign that the datasets used in our work cover a broad range of values, sometimes substantially different from the observed mean.

Based on the results of our study it is possible to design a theoretical model to support future mobile banking acceptance studies, as presented in **Figure 2.3.** The criteria used to define the model are: (i) relationships that are significant in the meta-analysis, (ii) best predictors in the weight analysis, and (iii) constructs direct or indirectly related with the intention or with the use.

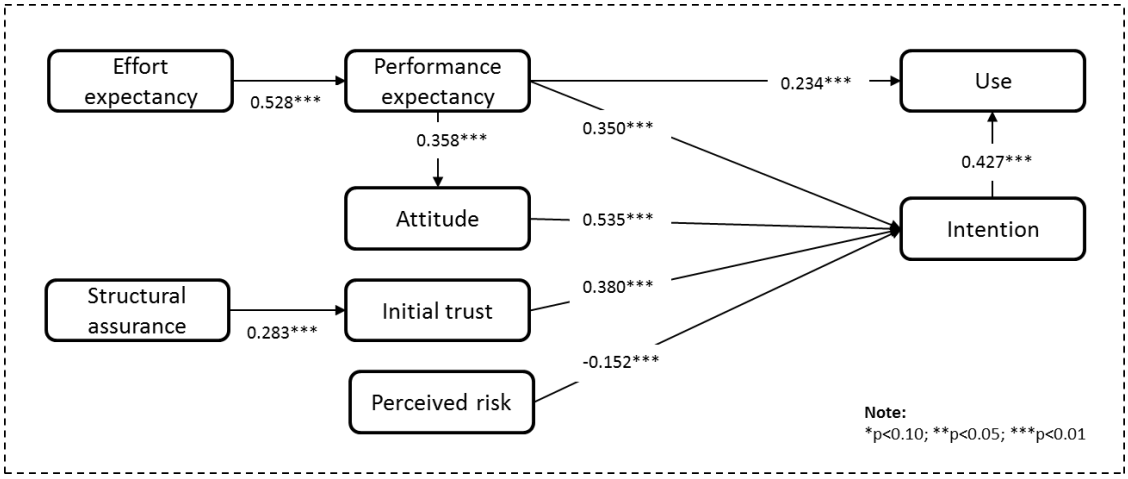


Figure 2.3 – Theoretical model based in the results of the meta and weight analyses

Even not considering the non-significant relationships, there are some correlations between variables with low values, making small contributions to the explanation of the dependent construct variation, namely the credibility, effort expectancy, perceived cost, perceived risk, and social influence on intention (respectively 0.200, 0.129, 0.090, -0.152, and 0.181), effort expectancy, and task technology fit on use (contributing respectively with 0.172 and 0.167). In the opposite position, the top relationships, with higher correlations values, contributing considerably to the explanation of the dependent variable, are the attitude and subjective norm on intention (respectively 0.535 and 0.532), effort expectancy on

performance expectancy (0.528), task technology fit on performance expectancy (0.643), technology characteristics on task technology fit (0.523), and intention on use (0.427).

The statistically non-significant relationships found in our work should not be refused outright when considering a new study, basically due to the fact of the low number of studies that have used them in the past (between 3 and 4); it suggests that further research is needed, seeking to confirm or refute the current tendency. The facilitating conditions on attitude, task technology fit on performance expectancy, and performance expectancy on initial trust relationships, with a weight of 1 in the studies identified in the meta-analysis, are candidates to be promoted to the best predictor level, but they still need further research as well.

2.5. Conclusions

Mobile banking is important for users, banks, and financial institutions (Baptista & Oliveira, 2015). Being time and place independent (Gu et al., 2009), it has the potential to improve people's quality of life, to bring efficiency (Malaquias & Hwang, 2016), and cost reduction to the banks (Calisir & Gumussoy, 2008). In terms of present work's objectives, they were fully accomplished, contributing to knowledge advancement. From the 121 mobile banking articles found in the literature, in the period between January of 2003 and February of 2016, we used a total of 57 papers and 58 datasets in the weight and meta-analysis. More than 520 construct relationships were found. From these we selected the relationships that have been explored three or more times in the literature, resulting in a final number of 29 different relationships analysed in our work. The most used constructs in literature were identified and their relevance highlighted, providing an update on current state-of-the-art knowledge. For researchers this study provides a strong support and a complete vision of the most significant variables, already studied at the individual level on mobile banking acceptance, and presents an integrated theoretical model than may be used as a basis for further refinement of individual models of acceptance as a starting point for future research. For practitioners, understanding the key constructs and relationships between variables is crucial for designing, refining, and implementing mobile banking services that can achieve high consumer acceptance, reinforcing where possible current levels of adoption. The meta-analysis proved to be very consistent in terms of the results obtained, with 24 of the 29 relationships being statistically significant. The best predictors of the intention to use mobile banking services that were identified (those that were simultaneously significant in the weight

and in the meta-analysis) are: (i) attitude, (ii) initial trust, (iii) perceived risk, and (iv) performance expectancy. In terms of use of mobile banking, considering the same assumptions, the best predictors are: (i) Intention, and (ii) performance expectancy. Facilitating conditions on attitude, task technology fit on performance expectancy, and performance expectancy on initial trust, with a weight of 1, could in the future be added to the list of most important predictors but they still need additional research confirming that tendency.

2.6. Implications for research and practice

This study offers several implications for research and practice. For researchers the study provides a complete vision of all variables available and already studied at individual level on mobile banking acceptance, presenting a basis for further refinement of individual models of acceptance, as a starting point for future research. For practitioners, understanding the key constructs and relationships between variables is crucial for designing, refining, and implementing mobile banking services that can achieve high consumer acceptance, reinforcing where possible current levels of adoption. The frequency of studies, weight of the variables, and the significant relationships from meta-analysis presented in our work can guide the researchers to a more careful selection of appropriate items to include *a priori* in their studies, as well as a validation guide, *a posteriori*, for the new studies' results. By providing an easy way to find gaps with earlier literature it allows researchers to focus on their own study's particularities, exploring if necessary new areas or research questions, analysing and explaining differences, where suitable.

This study also provides a basis of knowledge to support the correct design, analysis, and evolution of mobile banking services, allowing to adapt functionalities with real users' needs, to align marketing strategies (Ha et al., 2012), service development, design (Lee & Chung, 2009) and educational contents (Amin et al., 2012), leveraging benefits, boosting acceptance, and usage. Mobile banking service providers should continue informing consumers about the usefulness, convenience, and availability of the service (Aboelmaged & Gebba, 2013), improving whenever possible the functionalities available to users (Al-Jabri & Sohail, 2012), the level of fun, the user experience, and service usability (Rodrigues et al., 2014), supported by the significant relationships between these variables and intention and use constructs, as revealed in the weight and meta-analysis. Merely implementing a new

mobile banking system is not enough, banks and financial institutions should ensure its correct diffusion to target users, applying where possible measures to increase usage, such as price or product differentiation (Ehavior & Pavlou, 2002), marketing campaigns (Raleting & Nel, 2011), user support, adequate protection from fraud and violation of privacy (Luarn & Lin, 2005), on-line help, and other facilitating conditions (Zhou et al., 2010). Considering that trust is a mobile banking acceptance facilitator (Zhou, 2012b), marketers should reinforce their institutional image of security (Shen et al., 2010), credibility (Koenig-Lewis et al., 2010), and reputation (Faria, 2012), minimizing as possible the perceived risk (Luo et al., 2010). Enhancing peer and social influence through various channels can also be of importance to banks (Malaquias & Hwang, 2016; Sharma et al., 2016), mainly in the years to come, aligned with an expected growth in the use of social networking sites. Adequate technical infrastructure in place combined with proper human resource skills management (Gu et al., 2009), are additional critical aspects to take into consideration.

2.7. Limitations and future research

There are several limitations in this study requiring further examination and additional research. First, some studies were not included in this work because they were qualitative or experimental in nature, or because they did not present enough quantitative data. Incorporating these studies could produce some differences in terms of significance of the variables and/or relationships identified. Second, not all available statistical data were used to produce the meta-analysis; t-values and p-values, Pearson's and Spearman's correlations, and F-test were not used for this purpose, and could provide some additional findings worthy to analyse. Third, while the meta-analysis mathematically synthetize the studies included in the analysis, if these studies are a biased sample of all the mobile banking acceptance studies, then the mean effect reported by the meta-analysis study also reflects this bias. Fourth, and last, while meta-analysis is widely embraced by many in the research community, there are some authors who advise against it (Borenstein et al., 2009), with arguments that could also have been considered.

Facilitating conditions on attitude, task technology fit on performance expectancy, and performance expectancy on initial trust could be added to the list of most important predictors, but they still further research. Since beliefs and values are not necessarily static, incorporating longitudinal studies that examine how the mobile banking acceptance evolves,

as well as introducing new studies as they are being published, would reinforce our results or provide additional insights. Understanding culture and their impact on the acceptance of mobile banking services can also be an interesting research avenue to pursue (Crabbe et al., 2009; Sriwindono & Yahya, 2012). Only a few cultural constructs and relationships were identified in the mobile banking literature. Future research may examine the interplay between different levels of culture and formulate specific hypotheses linking the different levels together. Another interesting thing that could be done is to divide the meta-analysis study according to the different continents where the studies have been made, making a comparative analysis on results and differences, if possible relating them with culture. A study similar to this one made at the firm or business level could also provide interesting insights on mobile banking acceptance. Considering that most customers have access to both Internet and mobile banking services, future research could also consider a meta-analysis comparison between Internet and mobile banking services results with the goal of identifying affinities and the main drivers of user retention in each channel. Studying cross-channel cognitive influences may be another field of interesting future study.

Chapter 3 - Understanding mobile banking: The UTAUT2 combined with cultural moderators

3.1. Introduction

Mobile business has been developing rapidly in the world, providing ever-widening content and services (Zhang et al., 2012), fostering stronger relationships than earlier ones between financial institutions and clients (Riquelme & Rios, 2010). From an information systems perspective mobile banking is one of the major technological innovations for financial institutions (Lin, 2011). It provides customer value creation due to being inherently time and place independent (Lin, 2012) – "anywhere and anytime" – free from temporal and spatial constraints (Laukkanen, 2007). Moving clients to electronic channels is an important issue for banks because it allows them to reduce operational costs (Calisir & Gumussoy, 2008), providing a more convenient means for customers to meet their banking needs with more complete and more timely information (Gerrard & Cunningham, 2003). In several African countries authorities issued legislation during the 2000s allowing mobile telecom operators to partner with financial institutions to provide mobile financial services. This kind of initiative had a powerful impact on: (i) the release of several mobile payments services (bank to telecom to consumer) launched in the last years, such as Mozambican mKesk and m-Pesa, Kenyan m-Pesa, and South African Wizzit, and (ii) the development of the traditional mobile banking services (direct bank to consumer) provided by banks such as Mozambican BancoTerra (TerraMovel) and MozaBank (Mozamobile), Kenyan Bank of Africa (b-web), and South African Standard Bank (Standard Bank mobile). Regional innovation, knowledge and learning development strategies influenced, motivated innovation and learning abilities, allowing local enterprises to obtain competiveness (Zhao & de Pablos, 2011), as easily seen in the mobile banking service providers in these African countries.

Despites all efforts, initiatives and legislation, access to financial services remains problematic in most African countries (McKinsey, 2011; Simione & Xiao, 2014). The traditional approach of branch banking requires substantial investments in both infrastructure and personnel (Kimenyi & NDungu, 2009) and by that way is not an effective way to reach millions of persons, especially those that do not live in main cities. Nevertheless a significant improvement in the last years made in some countries, like in Mozambique with the significant increase of available bank branches that raised from 228, in 2005, to 502, in 2012 (BankofMozambique, 2013), a significant part of African regions still doesn't have a single

branch (Sarma, 2012), making it very difficult to have face to face financial transactions to a significant part of the population. In developing countries there are several more times mobile phones than PCs (Dona & Mouri, 2014), in a relation from 8.8 to 1 in African countries (ITC, 2014), more people with mobile phones than with bank accounts (Porteous, 2006), transforming mobile devices as the most potential platform to deliver financial services to the population. Mobile banking is normally seen as free of charges by African users, not associating it with others costs, such as mobile Internet access or device cost, in a feeling that may contribute to increase acceptance. There are not known reliable and actual African country statistics on mobile bank users numbers, but everyone believes that the potential of this service in this region is enormous; bank branches do not reach beyond capitals and some district capitals and costs for conducting basic financial transactions outside of this areas is very high (Tchouassi, 2012).

This work makes several contributions to researchers, contributing to the advancement of knowledge, by exploring and discussing direct implications for mobile banking managers, financial institutions and users. The main contributions of this study are twofold. First, we investigate the direct effects of the mobile banking acceptance determinants using an integrated model, following the suggestion of Venkatesh et al. (2012) to test the extended unified theory of acceptance and use of technology (UTAUT2) in different countries, age groups, and technologies, identifying relevant factors to extend it. Second, cultural moderators were included in the model to evaluate the impact of culture on mobile banking use. This is important because of globalisation of business and systems, following a pressing need to understand the impact of culture (Straub et al., 1997) on technology acceptance and use. Earlier research on mobile banking acceptance in African countries and cultural differences analysis is very limited. It is the first time, to our knowledge, that Venkatesh et al.'s (2012) UTAUT2 and Hofstede's cultural moderators are combined in a mobile banking acceptance work, joining the strengths of these two theories with data from an African country, Mozambique. Assuming that studies that use cultural values as moderators are analytically superior to those that test only for country value effect (Kirkman et al., 2006), Hofstede's cultural variables were used herein, aiming to further our understanding of individual and situational characteristics in mobile banking acceptance and use, providing new insights into how culture influences individual behaviour.

This chapter is organized as follows. In the next part an overview of the theoretical background is presented, introducing the mobile banking concept, earlier and most used

acceptance models, Venkatesh et al. (2012) UTAUT2 and cultural models, including that of Hofstede. The work continues with the research model and hypotheses presentation, followed by data collection methodology description, results, limitations, and possible future directions.

3.2. Theoretical background

3.2.1. Mobile banking concept

The prevalence of mobile technology in daily life, combined with more than 60% of coverage in Africa (Aker & Mbiti, 2010) has increased the popularity of mobile banking (Chen, 2013) and the importance of mobile banking services. Mobile banking can be defined as a type of execution of financial services in the course of which, within an electronic procedure, the customer uses mobile communication techniques in conjunction with mobile devices (Pousttchi & Schurig, 2004) or as a service whereby customers use a mobile phone or mobile device to access banking services and perform financial transactions (Anderson, 2010). Mobile banking is closely related to mobile devices and communications networks and could not exist without these. The device is the means to interact with banking applications and the communications network is the way to send/receive information and transactions to/from the bank.

3.2.2. Acceptance models

Earlier literature sought to explore individual mobile banking acceptance relying on the consideration that it is a technical innovation (Al-Jabri & Sohail, 2012). Among several different models that have been proposed, five theoretical currents predominated in the literature (Hoehle et al., 2012), until when Venkatesh et al. (2003) introduced the unified theory of acceptance and use of technology (UTAUT). These are the innovation diffusion theory (IDT) (Rogers, 1995), theory of reasoned action (TRA) (Fishbein & Ajzen, 1975), theory of planned behaviour (TPB) (Ajzen, 1991), technology acceptance model (TAM) (Davis, 1989), and theory of perceived risk (TPR) (Featherman & Pavlou, 2003). Since 1960, IDT sought to explain the main factors that affect individual technology or innovation acceptance over time by a given social system (Rogers, 1995). TRA defined the links between beliefs, attitudes, norms, intentions, and behaviours of individuals. According to this theory a person's

behaviour is determined by the behavioural intention to perform, which in turn is determined by the person's attitudes and his/her subjective norms toward the behaviour (Fishbein & Ajzen, 1975). TPB is an extension of TRA, resulting from limitations on behaviours in which people had little control (Ajzen, 1991). The perceived behavioural element was added referring to readily available resources, skills, and opportunities as well as to the person's own perception toward the importance of achieving the results. TAM is a simple and practical theoretical model (Qingfei et al., 2008). It is an adaptation drawn from TRA and the psychology field to information systems (Hanafizadeh et al., 2013), and appears to be the most widely accepted among information system researches (Luarn & Lin, 2005). It argues that the intention to use a particular technology is based on personal behavioural intention, which in turns is determined by perceived ease of use and perceived usefulness (Davis, 1989). Earlier research on consumer behaviour and information systems has also highlighted the importance of perceived risk as an inhibitor to acceptance (Luo et al., 2010).

In 2003 Venkatesh et al. (2003) proposed the unified theory of acceptance and use of technology (UTAUT), built on eight prominent theories, creating a strong new base model for acceptance studies, as briefly described in the following section.

3.2.3. UTAUT

The Unified theory of acceptance and use of technology (UTAUT) (Venkatesh et al., 2003), was developed through a review and consolidation of the constructs of eight prominent theories that earlier research had employed to explain information systems usage behaviour: TRA, TAM, the motivational model (MM) (Davis et al., 1992), TPB, the PC utilization model (MPCU) (Thompson et al., 1991), IDT, the social cognitive theory (SCT) (Bandura, 1986), and an integrated model of technology acceptance and planned behaviour (TAM-TPB) (Taylor & Todd, 1995). The model proposes four constructs (Venkatesh et al., 2003); namely (i) performance expectancy, (ii) effort expectancy, (iii) social influence, and (iv) facilitating conditions, grouping similar earlier constructs. Since its appearance, the UTAUT model has gradually attracted researchers' attention, and has recently been applied to explore user acceptance of mobile technologies (Yu, 2012), and incrementally tested and applied to several technologies for both individual and organizational use, within single and multiple countries (Im et al., 2011).

Even though UTAUT provides a very good and detailed model for acceptance and use of technology, it has some limitations (Negahban & Chung, 2014). Venkatesh et al. (2012) therefore developed UTAUT2 in 2012, extending and adapting the theory to the consumer context. The model (**Figure 3.1**) now has seven constructs: (i) performance expectancy, (ii) effort expectancy, (iii) social influence, (iv) facilitating conditions, (v) hedonic motivation, (vi) price value, and (vii) habit (Venkatesh et al., 2012). Three new constructs were added; hedonic motivation due to its inclusion as a key predictor in much earlier research and their importance reported therein (Venkatesh et al., 2003), price because in a consumer context users must bear the costs associated with the service use, and habit, supported in previous studies that showed it to be a critical factor in technology context use (Kim & Malhotra, 2005; Limayem et al., 2007). The moderating variables that influence the constructs are now age, gender, and experience, dropping voluntariness from the previous UTAUT. The model also adds a direct relationship between facilitating conditions and behavioural intention, and habit is also hypothesized to directly affect both behavioural intention and use behaviour. In addition to these changes, the effect of behavioural intention on use is also moderated by experience.

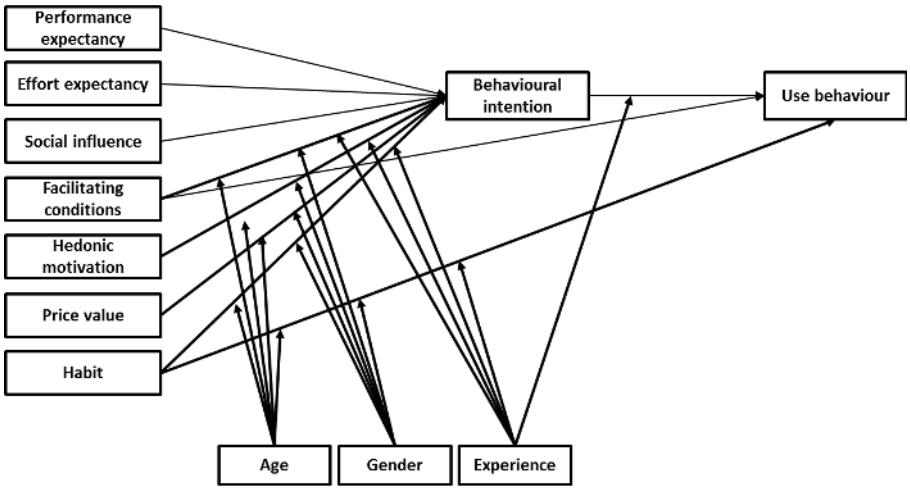


Figure 3.1 – Unified theory of acceptance and use of technology (UTAUT2) model

3.2.4. Cultural models

Several researchers report that cultural factors need to be included in acceptance models (Park et al, 2007), as the way that people use information systems is affected by culture (Im et al., 2011), or even that cultural values act as an important moderator in

technological acceptance (Srite & Karahanna, 2006). We should then expect a steady rise in empirical research into mobile technology and culture, but very little has combined both factors (Okazaki, 2005). Culture can be defined in several different ways; as the way in which people solve problems and reconcile dilemmas (Schein, 1985), as the transmitted and created content in patterns of values, ideas, and other meaningful symbol systems that are important for human behaviour (Kroeber & Parsons, 1958), or as the collective programming of the mind that distinguishes the members of one human group from another (Hofstede, 1980).

One of the most important and influential cultural studies was developed by Hofstede; even other authors advocating different models give credit to him for opening the public's eyes to the importance of the cultural dimension (Trompenaars, 1993). Hofstede's original classification contained four dimensions: (i) individualism/collectivism – the degree to which persons are expected to take care of themselves or their family in comparison to being part of social groups in which they are expected they take care of the group's individuals in exchange for their loyalty, (ii) power distance – the extent to which a society accepts the fact that power in institutions and organizations is distributed unequally, (iii) uncertainty avoidance – the extent to which a society feels threatened by uncertainty and ambiguous situations and tries to avoid it, and (iv) masculinity/femininity – the extent to which the dominant values are masculine; that is, assertiveness, strength, virility, and not caring for others, or the opposite, for feminine values, such as the quality of life or people (Hofstede et al., 2010). A fifth and new dimension was added in 1988 by Bond and Hofstede, named long/short Term – referring to future-oriented values such as persistence and thrift in opposition to past and present values such as respect for tradition and fulfilling social obligations (Hofstede & Bond, 1988).

Hofstede gathered data from all over the world, in more than 50 countries, within the multinational corporation IBM, and published the results according to cultural dimensions. Mozambique was not individually included in the initial ranking, but was included a few years later, scoring the country as 85 in power distance, 15 in individualism/collectivism, 38 in masculinity/femininity and 44 in uncertainty avoidance (Hofstede, 2014), classifying the region as a strongly hierarchical society, collectivist, feminine, low uncertainty avoidance, and short term oriented. In spite of the argument against using cultural dimensions for purposes other than country-level studies (Hofstede, 1980) or that it is inappropriate to use country scores on a cultural dimension to predict individual behaviour (Straub et al., 2002), most researchers had adopted them for use at the individual level (Kirkman et al., 2006), believing

that at the individual level of analysis culture can be treated essentially as an individual difference variable, and as such considered appropriate and meaningful (Srite & Karahanna, 2006). More than three decades have passed from the publication of Culture's Consequences (Hofstede, 1980), and Hofstede's cultural model remains current, inspiring thousands of empirical studies (Kirkman et al., 2006) whose results sustain and even amplify Hofstede's conclusions (Smith & Bond, 1999).

3.3. Research model and hypotheses

A combination of unified theory of acceptance and use of technology (UTAUT2) with Hofstede's cultural moderators was used as the theoretical support base-line for the investigation, according to **Figure 3.2**. UTAUT was considered the most complete model to predict information technology acceptance (Martins et al., 2014) until UTAUT2's appearance. Compared to its predecessor, UTAUT2 yields substantial improvement in the variance explained in behavioural intention and technology use (Venkatesh et al., 2012), and therefore is used in this work. Considering that the way people use information systems is affected by culture, as described in the literature review, Hofstede's moderators are also used in this study.

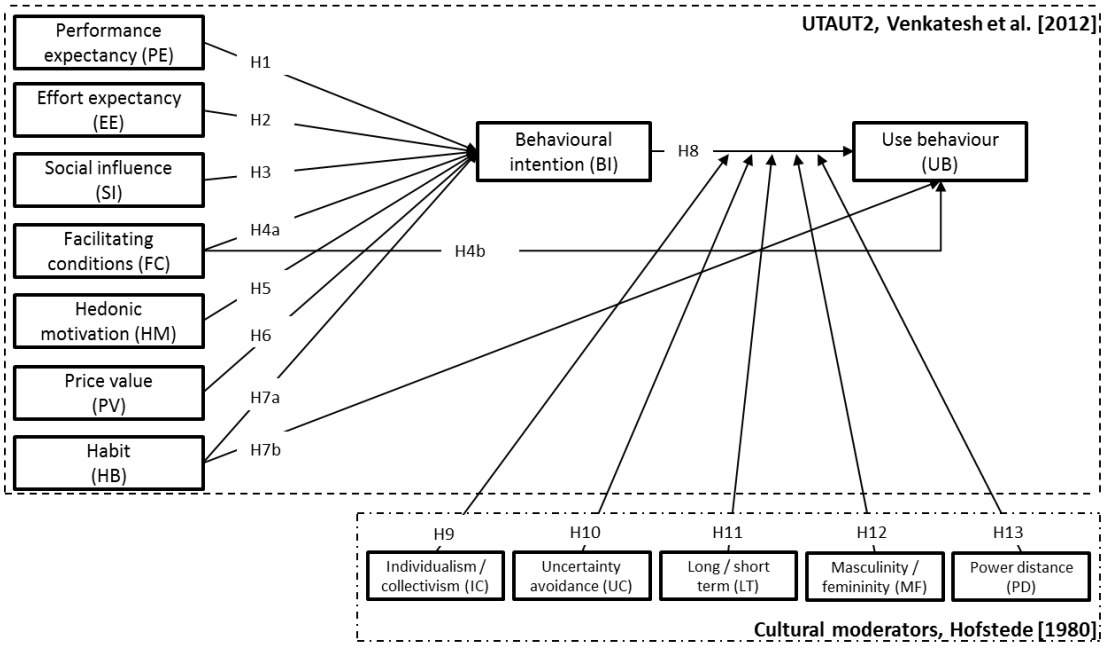


Figure 3.2 – Theoretical research model

Performance expectancy is the degree to which an individual believes that using mobile banking will provide benefits in performing banking activities (Venkatesh et al., 2003). It suggests that individuals will use computing technology if they believe it will have positive outcomes (Compeau & Higgins, 1995). It reflects the perception of improvement by using mobile banking measures such as speed of transactions (Yang, 2009), convenience or ubiquity, and immediacy (Zhou et al., 2010). Performance expectancy is expected to be one of the most important factors that directly influence the acceptance intention (Luo et al., 2010). Therefore, we hypothesize:

H1. The impact of performance expectancy (PE) on behavioural intention (BI) will be positive.

Effort expectancy is the degree of ease associated with the use of mobile banking (Venkatesh et al., 2003). In the context of mobile banking, some consumers are more mobile phone literate than others and, consequently, would expect to have fewer problems using the services and growing more accustomed to it quickly (Koenig-Lewis et al., 2010). If customers find mobile banking easy to use, they become more willing to use it to conduct banking transactions (Lin, 2011). Therefore, we hypothesize:

H2. The impact of effort expectancy (EE) on behavioural intention (BI) will be positive.

Social influence is the extent to which individuals perceive that others, especially friends and family, believe they should use mobile banking services (Venkatesh et al., 2003). Therefore, we hypothesize:

H3. The impact of social influence (SI) on behavioural intention (BI) will be positive.

Facilitating conditions refers to how people believe that technical infrastructures exist to help them to use the system whenever necessary (Venkatesh et al., 2003). Using mobile banking services requires some skills, such as using a mobile phone or a tablet, connecting to the Internet, installing native applications, as well as knowledge on mobile service carriers and security. A user who has access to a favourable set of facilitating conditions, such as mobile banking online tutorial, demos, or support chat, will have a greater intention to use. Facilitating conditions will influence both intention and use behaviour, and we therefore hypothesize:

H4a. The impact of facilitating conditions (FC) on behavioural intention (BI) will be positive.

H4b. The impact of facilitating conditions (FC) on use behaviour (UB) will be positive.

Hedonic motivation refers to the level of fun or pleasure derived from using mobile banking (Venkatesh et al., 2012) and is an important factor in user technology acceptance (Heijden, 2004); the greater entertainment value the mobile service brings, the greater acceptance intention customers will have (L. Zhang et al., 2012). Therefore, we hypothesize:

H5. The impact of hedonic motivation (HM) on behavioural intention (BI) will be positive.

Price value is the consumers' cognitive trade-off between the perceived benefits of using mobile banking services and the monetary cost of using it (Venkatesh et al., 2012), and includes factors such as data service carriers costs (mobile Internet), device cost, service costs, and transaction fees, where appropriate. The price value is positive when the benefits of using the mobile banking are perceived to be greater than the associated monetary cost. Therefore, we hypothesize:

H6. The impact of price value (PV) on behavioural intention (BI) will be positive.

Habit reflects the multiple results of previous experiences (Venkatesh et al., 2012) and the frequency of past behaviour is considered to be one of the principal determinants of present behaviour (Ajzen, 2002). Therefore, we hypothesize:

H7a. The impact of habit (HB) on behavioural intention (BI) will be positive.
H7b. The impact of habit (HB) on use behaviour (UB) will be positive.

Consistent with all models drawing upon psychological theories, which argue that individual behaviour is predictable and influenced by individual intention (Yu, 2012), UTAUT2 supports the belief that behavioural intention has a substantial influence on technology use (Venkatesh et al., 2003). Therefore, we hypothesize:

H8. The impact of behavioural intention (BI) on use behaviour (UB) will be positive.

People in individualist cultures are expected to be more concerned with themselves than with the group. People holding collectivist values are more concerned about maintaining group cohesiveness, and will show more interest in others' opinions about a technology

(Zakour, 2004). In collectivistic countries like Mozambique people is more likely to adopt a new technology or service (Hofstede, 1980). Therefore, we hypothesize:

H9. Individualism/collectivism (IC) moderates behaviour intention (BI) and use behaviour (UB), in such a way that the relationship will be stronger among people with collectivist cultural values.

Cultures with high levels of uncertainty avoidance are expected to have a low rate of mobile banking acceptance, because this medium is not well suited to uncertainty reduction compared to face-to-face conversations or other rich channels (Straub et al., 1997). Uncertainty-avoiding individuals are uncomfortable with ambiguity and uncertainty, and will be less inclined to use a technology (Zakour, 2004). In low uncertainty avoidance countries people are fairly relaxed and not averse to taking risks (Hofstede, 2014), and are consequently more likely to try something new or adopt an IT technology (Png & Tan, 2001). Therefore, we hypothesize:

H10. Uncertainty avoidance (UC) moderates behaviour intention (BI) and use behaviour (UB), in such a way that the relationship will be weaker among people with higher levels of uncertainty avoidance.

Long-term orientation encourages trust and behaviours such as thrift or perseverance toward future rewards (Yoon, 2009). East Asian countries score high in this dimension, suggesting a long-term orientation, especially regarding to savings, persistence, and adapting to changing circumstances. In the opposite position, African countries, such as Mozambique, are low scored, suggesting a short-term orientation (Hofstede & Bond, 1988), exhibiting great respect for traditions, a relatively small propensity to save for the future, and a focus on achieving quick results (Hofstede, 2014). Therefore, we hypothesize:

H11. Long/short term (LT) moderates behaviour intention (BI) and use behaviour (UB), in such a way that the relationship will be weaker amongst people with long-term cultural values.

People in the region of Africa analysed reveal feminine cultural values, striving for consensus, valuing equality, solidarity, and quality in their working lives, and incentives such as free time and flexibility (Hofstede, 2014). In masculine regions challenges, earnings,

assertiveness, ambition, and dealing with facts are the most valued factors (Minkov & Hofstede, 2010). Therefore, we hypothesize:

H12. Masculinity/femininity (MF) moderates behaviour intention (BI) and use behaviour (UB), in such a way that the relationship will be stronger amongst people with masculine cultural values.

In hierarchical societies, with high power distance values such as the one analysed, people are more concerned about complying with their superiors' opinions and fear disagreeing with them (Hofstede, 1980). Hierarchy is seen as reflecting inherent inequalities, centralisation is popular, and subordinates expect to be told what to do (Hofstede, 2014). If the hierarchy accepts mobile banking it is likely to be accepted by subordinates, too. Therefore, we hypothesize:

H13. Power distance (PD) moderates behaviour intention (BI) and use behaviour (UB), in such a way that the relationship will be stronger amongst people with higher power distance cultural values.

3.4. Data collection research methodology

The data collection was conducted in Mozambique, targeting the adult population that: (i) have one or more banking accounts in a local national bank that provides Internet and mobile banking services, (ii) own one or more mobile devices, such as mobile phone, smartphone, or tablet, with mobile internet access, and (iii) have one or more email addresses. In a consumer context the use of mobile banking services is a completely voluntary decision.

A questionnaire in English, based on the research model, was created and reviewed for content validity by a group of information systems academics. It contained three distinct sections: (i) UTAUT2 data constructs, (ii) cultural parameters, (iii) general information and demographic characteristics. The items and scales for the UTAUT2 constructs were adapted from Venkatesh et al. (2003) and Venkatesh et al. (2012), use behaviour from Martins et al. (2014), uncertainty avoidance and individualism/collectivism from Srite & Karahanna (2006), and long/short term from Hassan et al. (2011). Each item was measured with a seven-point Likert scale, ranging from "strongly disagree" (1) to "strongly agree" (7) (**Appendix A**). The

Martins et al. (2014) use behaviour was coded from 1 (never) to 11 (several times per day), according to effective mobile banking use. The questionnaire was translated into Portuguese, submitted to a local Mozambican academic in order to review it and correct whenever necessary according to local Portuguese speech characteristics, and translated back into English, by different people, in order to validate the translation and ensure consistency (Brislin, 1970).

Based on the fact that studies of technology acceptance have traditionally been conducted using survey research (Venkatesh et al., 2003), an on-line survey instrument was designed with the Portuguese version of the questionnaire, hosted on a popular web service provider for collecting data. The survey was pilot tested amongst a group of 50 Mozambican mobile banking users, who were not included in the final data. Preliminary evidence showed that scales were reliable and valid. An email list was collected from mobile Internet users of a major Mozambican telecom company, providing a solid base for the study data collection. 1200 email invitations to participate in the survey were sent in July 2014, using hyperlinks that could be used only once. Second and third follow up emails were sent in the following weeks reminding users to participate in the survey. After 12 weeks, in the end of September 2014, a total of 252 valid answers had been collected, achieving a final response rate of 21%. The sample distribution of the first and second respondent groups was compared using the Kolmogorov–Smirnov (K–S) test and verified that they do not differ statistically (Ryans, 1974), indicating that non-response bias was not present. The common method bias was also examined using the Harman's test (Podsakoff et al., 2003), confirming no significant common method bias in the data.

Almost 71% of respondents were men, 75% aged over 35 years old, and 43% with a Bachelor's degree. Detailed descriptive statistics on the respondents' characteristics are shown in **Table 3.1**.

Table 3.1– Descriptive statistics of respondents' characteristics

Measure	Value	Frequency	%
Gender	Male	178	70.6%
	Female	74	29.4%
Age	Below 35	65	25.8%
	Between 36 and 55	147	58.3%

Measure	Value	Frequency	%
	Over 56	40	15.9%
Education	Lower than Bachelor	90	35.7%
	Bachelor	109	43.3%
	Master or higher	53	21.0%
Income (annual)	Less than 4,688 (EUR) *	80	31.7%
	Between 4,689 and 14.063 (EUR) *	62	24.6%
	More than 14,064 (EUR) *	56	22.2%
	I prefer not to answer	54	21.4%
Locale of residence	Less than 500,000 habitants	43	17.1%
	More than 500,000 habitants	159	63.1%
	Don't know / I prefer not to answer	50	19.8%

Note: *Euro values considering 14/06/2014 exchange rate (1EUR = 42.6639 MT) (Freecurrencyrates, 2014)

3.5. Data analysis and results

Structural equation modelling (SEM) is a general term that has been used to describe a large number of statistical models used to evaluate the validity of substantive theories with empirical data (Ringle et al., 2005). Two techniques prevail: covariance-based and variance-based. The theoretical research model was tested using variance-based techniques, i.e., partial least square (PLS), with Smart PLS 2.0 M3 software (Ringle et al., 2005). This is a convenient and powerful statistical technique considered appropriate for many research situations (Henseler et al., 2009), suitable for studying complex models with numerous constructs (Chin, 1998). The dimension of the sample is more than 10 times greater than the maximum number of paths directed to a construct (Gefen & Straub, 2005), and therefore PLS can be considered adequate for estimation. This technique is known to have minimal restrictions in terms of residual distributions and sample sizes when compared to other SEM such as covariance-based techniques (Chin, 1998). Analysis was done in two steps, following Anderson & Gerbing's (1988) guidelines; we started with the reliability and validity assessment of the measurement model, followed by the structural model assessment and hypotheses testing. These two steps are presented below.

3.5.1. Measurement model

The measurement model was assessed for (i) construct reliability, (ii) indicator reliability, (iii) convergence validity, and (iv) discriminant validity. **Table 3.2** lists the average variance extracted (AVE), composite reliability (CR), Cronbach's alpha values, loading and t-values. As shown in the table, all the constructs have composite reliability and Cronbach's alpha is greater than 0.7, suggesting the constructs' reliability (Straub, 1989). The indicator reliability was evaluated based on the criteria that loading should be higher than 0.7 and that every loading below 0.4 should be eliminated (Churchill, 1979). Two items, UC3 and UC4, were dropped due to low factor loading. The remaining loadings are higher than 0.7 and statistically significant at 0.05, confirming a good indicator reliability of the instrument. The convergence validity was tested with AVE, and all constructs compared positively against the minimum acceptable value of 0.50 (Fornell & Larcker, 1981; Henseler et al., 2009), as seen in **Table 3.2**.

Table 3.2 – Quality criteria and factor loadings

Construct	AVE	Composite reliability	Cronbach's Alpha	Item	Loadings	t-value
Performance expectancy (PE)	0.788	0.937	0.910	PE1	0.899	47.172
				PE2	0.851	34.799
				PE3	0.905	47.095
				PE4	0.896	50.002
Effort expectancy (EE)	0.844	0.956	0.939	EE1	0.903	48.180
				EE2	0.913	32.051
				EE3	0.931	85.032
				EE4	0.929	77.693
Social influence (SI)	0.766	0.907	0.845	SI1	0.922	61.641
				SI2	0.917	58.399
				SI3	0.781	21.966
Facilitating conditions (FC)	0.631	0.837	0.707	FC1	0.776	12.807
				FC2	0.794	16.279
				FC3	0.812	19.872
Hedonic motivation (HM)	0.634	0.835	0.736	HM1	0.857	32.737
				HM2	0.889	66.129
				HM3	0.614	10.479

Construct	AVE	Composite reliability	Cronbach's Alpha	Item	Loadings	t-value
Price value (PV)	0.807	0.944	0.920	PV1	0.893	51.082
				PV2	0.867	43.946
				PV3	0.913	63.247
				PV4	0.919	57.651
Habit (HB)	0.781	0.914	0.858	HB1	0.906	61.647
				HB3	0.792	19.777
				HB4	0.946	141.615
Behavioural intention (BI)	0.777	0.913	0.858	BI1	0.856	21.621
				BI2	0.891	41.903
				BI3	0.897	52.954
Individualism/collectivism (IC)	0.634	0.870	0.827	IC1	0.739	2.467
				IC2	0.888	3.711
				IC3	0.936	3.580
				IC4	0.573	2.078
Uncertainty avoidance (UC)	0.871	0.931	0.855	UC1	0.917	32.585
				UC2	0.950	17.470
Long/short term (LT)	0.566	0.838	0.752	LT1	0.764	3.375
				LT2	0.808	3.605
				LT3	0.772	3.529
				LT4	0.656	2.686
Masculinity/femininity (MF)	0.735	0.917	0.894	MF1	0.860	4.468
				MF2	0.930	4.486
				MF3	0.898	4.265
				MF4	0.727	3.619
Power distance (PD)	0.795	0.885	0.795	PD1	0.792	3.863
				PD2	0.981	4.888

Discriminant validity was analysed using (i) Fornell-Larcker and (ii) cross-loadings criteria. **Table 3.3** contains the square root of the AVE in bold along the diagonal, verifying the condition of being greater than the correlation between constructs (Fornell & Larcker, 1981). As shown in **Appendix B**, each item presents a higher loading on its corresponding factor than

the cross-loading on other factors (Chin, 1998). To ensure the cross-loading criteria, four items had to be excluded, namely FC4, HB2, PD3 and PD4. At the end, both criteria were satisfied, providing evidence of discriminant validity of the scales.

Table 3.3 – Square root of AVE (in bold on diagonal) and factor correlation coefficients

	Mean	SD	PE	EE	SI	FC	HM	PV	HB	BI	IC	UC	LT	MF	PD	UB
PE	5.803	1.544	**0.888**													
EE	5.745	1.520	0.552	**0.919**												
SI	4.308	2.051	0.453	0.236	**0.875**											
FC	6.104	1.362	0.534	0.620	0.304	**0.794**										
HM	3.938	2.084	0.558	0.418	0.576	0.334	**0.796**									
PV	5.009	1.788	0.546	0.369	0.263	0.465	0.506	**0.898**								
HB	4.778	2.047	0.651	0.470	0.426	0.339	0.607	0.372	**0.884**							
BI	5.802	1.624	0.734	0.511	0.429	0.435	0.621	0.415	0.753	**0.882**						
IC	4.583	1.906	0.043	0.069	0.231	0.153	0.215	-0.077	0.034	0.061	**0.796**					
UC	4.891	2.210	0.436	0.340	0.225	0.468	0.256	0.266	0.270	0.432	0.148	**0.933**				
LT	5.250	1.651	0.290	0.257	0.323	0.336	0.305	0.198	0.192	0.194	0.189	0.269	**0.752**			
MF	2.365	1.862	-0.022	0.015	0.281	0.058	0.220	0.108	0.059	0.068	0.366	-0.096	0.132	**0.857**		
PD	2.121	1.627	-0.145	-0.173	0.052	-0.128	0.025	-0.004	-0.028	-0.099	0.126	-0.406	0.043	0.520	**0.892**	
UB	6.718	2.524	0.507	0.571	0.171	0.310	0.365	0.184	0.667	0.558	-0.064	0.244	0.127	-0.126	-0.141	**1.000**

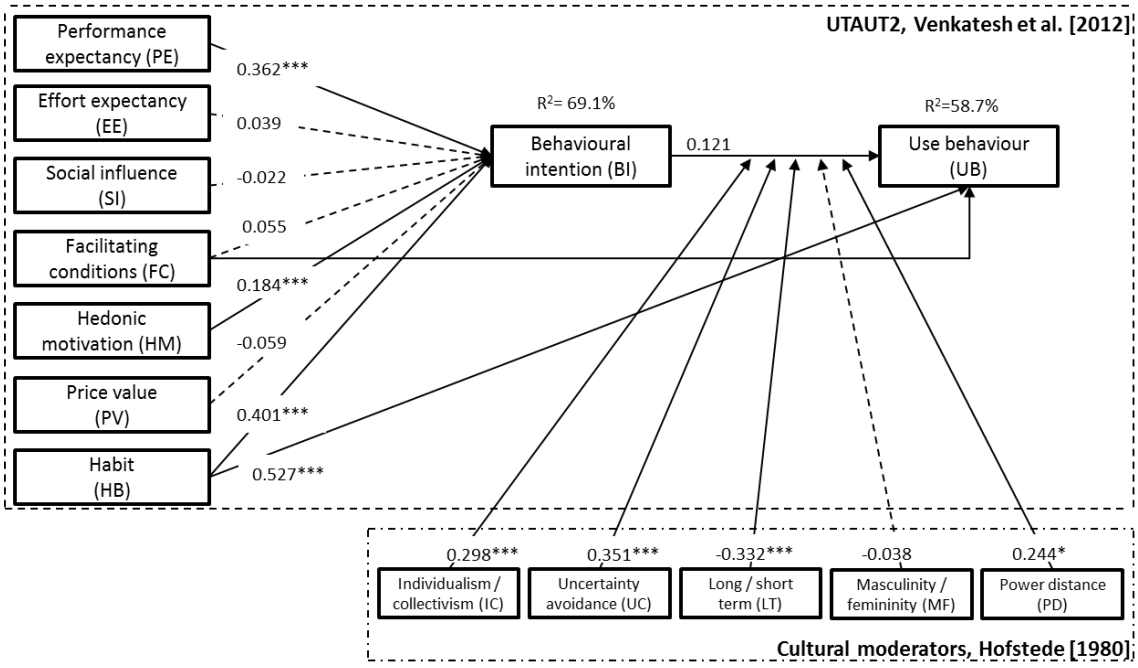
Note: PE: performance expectancy; EE: effort expectancy; SI: social influence; FC: Facilitating conditions; HM: hedonic motivation; PV: price value; HB: Habit; BI: behavioural intention; IC: individualism/collectivism; UC: uncertainty avoidance; LT: long/short term; MF: masculinity/femininity; PD: power distance; UB: use behaviour.

The measurement model results indicate that the model has good construct reliability, indicator reliability, convergence validity, and discriminant validity, ensuring that the constructs are statistically distinct and can be used to test the structural model.

3.5.2. Structural model and hypotheses testing

The analysis of hypotheses and constructs' relationships were based on the examination of standardized paths. The path significance levels were estimated using the

bootstrap resampling method (Henseler et al., 2009), with 500 iterations of resampling (Chin, 1998). The results are summarized in **Figure 3.3**.



Note: (*p<0.10; **p<0.05; ***p<0.01)

Figure 3.3 – Structural model results

The model explains a 69.1% of variation in behavioural intention and 58.7% in use behaviour. Performance expectancy, hedonic motivation, and habit were found to be statistically significant in explaining behavioural intention, in the same way as habit over use behaviour, both with p<0.01, thus supporting hypotheses **H1**, **H5**, **H7a,** and **H7b**. In the opposite situation are effort expectancy, social influence, and price value, which are not statistically significant, not supporting hypotheses **H2**, **H3**, **H4a**, **H4b,** and **H6**. The effect of behaviour intention on use behaviour was not found to be statistically significant, thus not supporting hypothesis **H8**. Individualism/collectivism, long/short term, and uncertainty avoidance, with p<0.01, and power distance, with p<0.10, were found to be statistically significant, supporting the moderating effect on behavioural intention and use behaviour and hypotheses **H9**, **H10, H11,** and **H13**. The moderating effect of masculinity/femininity was found to be not statistically significant, not supporting hypothesis **H12**.

Overall, of the fifteen hypotheses formulated, seven were supported by data collected and one, uncertainty avoidance, had a sign that was unexpected. The model was also tested

with the inclusion of two of Venkatesh et al.'s (2012) moderators, age and sex, but accepting the resulting complexity introduced into the model is not justified by the small incremental improvement (the variance in behavioural intention rose from 69.1 to 71.5 and in use behaviour from 58.7 to 61.7), and so we decided to withdraw these two from further analysis. All cultural moderators were temporarily removed to better identify and quantify their impact in the behavioural use construct (decrease from 58.7 to 45.6) and then re-introduced. The result of this exercise shows the importance of cultural moderators in improving the explanation of use behaviour in the UTAUT2 model. Both results are available from authors on request.

3.6. Discussion

The theoretical model presented is unique, combining the extended unified theory of acceptance and use of technology (UTAUT2), of Venkatesh et al. (2012), with cultural moderators from Hofstede (1980), to explain mobile banking acceptance.

3.6.1. Main findings

The research model explains 58.7% of variation in use behaviour of mobile banking. The factors that positively influence acceptance are performance expectation (explains the BI), hedonic motivation (explains the BI), and habit (explains both the BI and UB). Cultural moderators were found to have significant influence on behavioural intention over use, namely individualism/collectivism, uncertainty avoidance, long/short term and power distance. The effect of behaviour Intention on use behaviour was found to be not significant, contradicting earlier research (Venkatesh et al., 2003, 2012), indicating that new constructs, such as trust or risk, should be added to the model. These and other findings are described below.

3.6.1.1. Supported findings

The research model validated three relationships of behavioural intention, namely with performance expectancy, hedonic motivation, and habit, and one of use behaviour, with habit. The performance expectancy relationship finding is consistent with earlier research

(Oliveira et al., 2014; Zhou et al., 2010). Respondents considered performance expectancy as one of the most important antecedents of behaviour intention. The hedonic motivation relationship finding is also consistent with earlier research (Raman & Don, 2013; Venkatesh et al., 2012). Nevertheless, the pure utilitarian or transactional orientation of most of current mobile banking services respondents considerer it to be enjoyable, creating a positive emotion, a feeling of personal satisfaction, and a shared sense of purpose, contributing positively to the intention to adopt mobile banking. Some earlier research reports customer habit to be a major predictor of intention (Liao et al, 2006). The research model validates both relationships between habit and behavioural intention and use behaviour, in line with earlier research (Luo et al., 2010; Zhou et al., 2010). It is important to note that habit is seen by the respondents as the most important antecedent factor of use behaviour.

The research model validated the influence of four of Hofstede's cultural moderators on behaviour intention over use behaviour. Individualism/collectivism had a strong and positive moderating effect in line with expectations (Hofstede, 1980), even though some earlier studies have not supported it (Srite & Karahanna, 2006; Yoon, 2009). Uncertainty avoidance had a significant moderating effect, aligned with earlier research, but with a positive influencing signal, contradicting earlier research on this factor (Hofstede, 1980; Lee et al., 2007). This fact is counterintuitive and may be a study artefact or a direct result of the sample's own characteristics, aligned with the Mozambican uncertainty avoidance factor index, which classifies the country as a very low uncertainty region (Hofstede, 2014). People with this cultural characteristics are fairly relaxed, not averse to taking risks, normally make several improvisations, and have a greater acceptance of new ideas, products, and services. Whether it pertains to mobile banking, technology or business practices, it can be considered a movement able to produce positive feelings over a characteristic that normally is negative in other cultures. Long/short term had a strong and negative moderating effect, in line with earlier research (Hassan et al., 2011; Hofstede & Bond, 1988). Power distance was also statistically significant, with a positive sign on the influence of intention over use, in line with earlier research (Hofstede, 1980; Sriwindono & Yahya, 2012). Our results for cultural factors moderating effects are aligned with Hofstede's cultural classification index for Mozambique as a collectivist, low uncertainty avoidance, high power distance, and short term region. These moderators, in addition to masculinity/femininity, significantly increase the behavioural use explanation from 45.9 to 58.7, confirming the fact that studies using cultural values as

moderators are analytically superior (Kirkman et al., 2006), and that these values should therefore be included.

3.6.1.2. Additional findings

Our results did not confirm the significance of four UTAUT2 constructs on behavioural intention, namely effort expectancy, social influence, facilitating conditions, and price value. The effort expectancy finding is consistent with some earlier research (Faria, 2012; Zhou et al., 2010), but contradicts the findings of Venkatesh et al. (2012) and others, namely (Carlsson et al., 2006; Im et al., 2011). This is probably a result of the high level of mobile phone usage in Mozambique; users find mobile banking easy to use, expect few problems, and grow accustomed to it very quickly. The social influence finding is consistent with some earlier studies (Kim et al., 2009; Wang & Yi, 2012), but the results failed to support cultural influence, namely the collectivism and power distance ones. In a collectivist society like Mozambique it was expected that social influence could play a significant job over the intention, as collectivist societies are normally more concerning about others opinions (Putit & Arnott, 2007). In the same manner, it was expected that social influence could be stronger in a high power distance society like Mozambique, as people take in greater account of significant referents and social influences (Choi & Geistfeld, 2004). Facilitating conditions was found to have no significant effect in either the behavioural intention or the use behaviour. This is consistent with what was reported in some earlier studies (Im et al., 2011) but contradicts many others (Miltgen et al., 2013; Yu, 2012; Zhou et al., 2010). We believe that people in this African region do not expect to have strong institutional support to help them use mobile banking services and therefore do not give it much importance. Price value was also found to be not significant over behavioural intention, essentially due to the fact that mobile banking service is actually seen as free of charges by users, without special fees, and with lower costs than other means or financial channels. These findings are consistent with some earlier research (Koenig-Lewis et al., 2010; Yang et al., 2012) but contradicts others (Luarn & Lin, 2005; Venkatesh et al., 2012).

Masculinity/femininity was found to be not significant in behaviour intention over use behaviour moderation, in line with some earlier studies that were unable to support it (Sriwindono & Yahya, 2012), but contradicting others that did find it to be significant (Hofstede, 1980; Yoon, 2009). According to Hofstede's cultural classification index for Mozambique, people with this cultural characteristic value equality, solidarity, quality of life

in society, and caring for others. The low significance of the relationship is probably a result of mobile banking not being considered as an important service or as a way to achieve this way of living.

3.7. Implications for research and practice

Different groups' and countries' cultural differences affect acceptance and use of services such as mobile banking. In a movement toward globalisation the value of more cross cultural research is clear. The results of this study have implications for researchers and practitioners. For researchers this study provides a basis for further refinement of individual models of acceptance, as a starting point for future research. For practitioners, understanding the key constructs in the proposed research model is crucial to design, refine, and implement mobile banking services that yield high consumer acceptance. By understanding the main factors affecting user acceptance and use of mobile banking services, constraints, and particularities (namely those concerned with performance expectancy, habit, hedonic motivation, individualism/collectivism, uncertainty avoidance, power distance, and long term/short term cultural aspects) international and local banks in Africa will be able to evolve, aligning functionalities with real customers' needs and cultural differences, adapting marketing strategies, service development, design and technology-based educational content, to leverage benefits, to raise acceptance, and to reinforce use and channel penetration. For educational practice the study suggests that acceptance and Hofstede's culture dimensions are an appropriate starting point when dealing with cultural diversity in technology-based environments.

Mobile banking service providers in Africa should continue informing consumers about the usefulness, convenience, and more immediate advantages of the service (short term), improving whenever possible channel enjoyment, fun, and user experience over usability, even though effort expectancy was found to be not significant in the sample of the country used to test the theoretical model. If consumers value their mobility or lack alternatives, as is the case for many people in African countries (especially those who do not live in a major city), we might expect them to bypass the PC era and go directly to the mobile one, reinforcing the need for tailored target acceptance campaigns.

3.8. Limitations and future research

There are several limitations to this study requiring further examination and additional research. Even though Hofstede's model is generally accepted as the most comprehensive framework of national culture values, its validity and its limitations have been criticized by some researchers. Cultural values can vary within, as well as between, countries. Using a single score for each country ignores the within-country variance (Kirkman et al., 2006). Using other cultural dimensions, such as willingness to share (Lee et al., 2005), may also become an interesting future research area. Since beliefs and values are not necessarily static, longitudinal studies that examine how the impact of cultural value evolves with respect to mobile banking acceptance would provide additional insights. In our study we examined the moderating effect of each cultural dimension separately. However, cultural values may interact with each other and with other UTAUT2 constructs. Future research may examine the interplay between different levels of culture and formulate specific hypotheses linking the different levels together. Research needs to be replicated if possible in order to confirm our main findings, including the non-significant effect of behaviour intention on use behaviour, across a wider range of individuals in different countries, different environments, cultural groups, and technologies.

For mobile banking service providers, coexistence in the same geographical region can be favourable for knowledge and local cultural sharing, facilitating interaction and synergies resulting in a facilitating collective learning (Zhao & de Pablos, 2011), positively contributing to reinforce the acceptance over time. Understanding how it evolves can be an interesting field of research. As an Internet-dependent service, future research could also study the impact of mobile carriers' service quality on mobile banking behavioural intention and use. Modifying the research model in order to include new moderators such as experience, income, residence area (city vs rural), religion, or education can also be of great interest. Two last suggestions for future studies can be made: (i) the impact of the new legislation introduced by some African governments for financial sector development on acceptance and financial inclusion, and (ii) software technology, considering that it can play a critical role towards the evolution and the innovation of the mobile banking state of art approaches (Lytras & de Pablos, 2011).

3.9. Conclusions

The potential for mobile banking use in African countries is enormous. Reinforcing use might be the easiest way to provide access to finance in problematic and remote African zones. Based on earlier mobile banking acceptance studies, our research used an innovative model combining UTAUT2 with Hofstede's cultural moderators, identifying relevant factors to extend it. Our results indicate convergences and divergences with earlier findings, confirming the unique characteristics of the African region on which this study focused. Performance expectancy, hedonic motivation, and habit were found to be the most significant antecedents of behaviour intention. To explain the mobile banking use behaviour the habit and culture moderator effects on behaviour intention over use behaviour were the most important drivers. Collectivism, uncertainty avoidance, short term, and power distance were found to be the most significant cultural moderators. In terms of work's objectives they were fully accomplish, contributing to knowledge advancement; UTAUT2 combined with cultural moderators was tested in an African country, Mozambique, presenting a comprehensive way to understand the main impacts of local culture in the mobile banking acceptance and use. By incorporating cultural moderators in the proposed research model we also added stronger determinants to predict intention to use mobile banking, and thus provided more predictive power to existing UTAUT2. For researchers this study provides a basis for further refinement of individual models of acceptance for future research. For practitioners, understanding the key constructs is crucial to design, refine, and implement mobile banking services that achieve high consumer acceptance and notability. Mobile banking is already being successfully used in some African countries, remaining ones should learn with the goods examples already in place, capitalising to new levels of acceptance and population financial coverage, evolving in line with mobile carriers' service increase quality, known to be still problematic in some African regions.

Chapter 4 – Mobile Payment: Understanding the determinants of customer adoption and intention to recommend the technology

4.1. Introduction

Advances in technology have enabled a broad range of new functionalities for mobile devices, supporting several mobile financial services, such as bill payment, account transfers, person to person transfers, proximity payments at the point of sale, remote payments to purchase goods and services, as well as other kind of services such as location based, mobile marketing, ticketing, discounts, or coupons. Short-range contactless technologies, such as Near Field Communication (NFC), are now integrated in many mobile phones and portable devices. Assuming that standardized, interconnected and widely accepted procedures are a key for mobile payment acceptance (Zhong, 2009), we can expect potential reinforce of mobile payment adoption. The widespread use of mobile devices and its perpetual proximity to the users make them suitable for mobile payment scenarios without the need for a physical wallet (Mallat, 2007), enabling smartphones true commercial value over mobile payment (O'Reilly et al., 2012). Mobile payments allowed consumers to eliminated the need to use cash (Pham & Ho, 2015), offering convenience and speed (Teo et al., 2015), performance and transfer of secure information between devices, from single or individual transactions to environment with high volume of payments, such as restaurants or large retailers (Leong et al. 2013). Both traders and consumers benefit from considerable operation time decrease, with clear productivity gains. Mobile payment is experiencing a rapid grow in many markets (Merritt, 2011) as more and more commercial entities realize the potential of it (Duane et al., 2011). According to the survey conducted by the Statista Corporation (2015), the revenue for the global mobile payment is anticipated to reach USD721 billion in 2017, thus becoming one of the most important means of conducting mobile transactions.

The contribution of this study is twofold. First, we investigated the direct and indirect effects of the determinants on mobile payment adoption using an innovative and integrated research model, seeking to complement the findings of earlier mobile payment studies, increasing our understanding on the determinants of mobile payment adoption. For that reason, we developed a conceptual model that combines the extended unified theory of acceptance and use of technology (UTAUT2)(Venkatesh et al., 2012), underused in the mobile payment adoption literature (Dahlberg et al., 2015), the innovation characteristics of DOI theory (Rogers, 2003), with the perceived technology security construct (Cheng et al., 2006),

able to reinforce the significance and predictably of the results. As mobile payment involves financial information that is personal and sensitive, security concerns can become a barrier to technology adoption (Duane et al., 2014), and therefore security was also included in our model, providing a better understanding of one of the most important resistance factors that could explain actual mobile payments low usage, capturing in the same work positive and negative factors towards adoption. Second, a component of intention to recommend was also included in order to evaluate the success of the mobile payment within social networks, filling a gap in literature on this matter, that can be of great commercial interest (Moe & Schweidel, 2012). Recommending a technology to others is a post-adoption behavior that has often been neglected by researchers due to an overwhelming emphasis on use (Miltgen et al., 2013). Considering that previous studies failed to introduce innovative approaches or constructs (Dahlberg et al., 2015), this research includes intention to recommend as a second key dependent variable. This is the first time, to our knowledge, that intention to recommend is studied in the mobile payment field. This construct is of great interest to stakeholders such as merchants, issuers, acquirers, NFC device owners, and mobile application developers, because users are evermore increasingly contributing with their opinions about products, services or technologies to social networks, web sites, and forums; content that can influence the success or failure of a technology as mobile payment. By this way, we recognize today that mobile payment technology acceptance have more than individual significance, as social networks provide new routes for influential dissemination of attitudes and even behaviors (Miltgen et al., 2013).

This chapter is structured as follows. In the next section we describe the concept of mobile payment, current theories that explain customers' acceptance of technology, and earlier research on this topic. The research model, methodology, and results are presented, followed by the discussion of the results, theoretical contributions and managerial implications. We conclude the study by suggesting avenues for future research.

4.2. Theoretical background

4.2.1. Mobile payment

Ghezzi et al. (2010) summarize the concept of mobile payment as *"a process in which at least one phase of the transaction is conducted using a mobile device (such as mobile phone, smartphone, PDA, or any wireless enabled device) capable of securely processing a financial*

transaction over a mobile network, or via various wireless technologies (NFC, Bluetooth, RFID, etc.)". Dahlberg et al. (2008) describes mobile payment as *"payment for goods, services, and bills with a mobile device such as mobile phone, smart-phone, or personal digital assistant by taking advantage of wireless and other communication technologies"*, and Liu et al. (2015) extended it to "*other forms of economic exchange*". Although some authors refers to mobile payments and mobile banking as being equivalent (Donner & Tellez, 2008), or that some of their characteristics overlap (Slade et al., 2013), they are quite distinctive systems in terms of the number of players involved; the mobile banking is a simple direct consumer-bank relation while mobile payment is a three party process between costumer, merchant and bank. Our work focus is exclusively on mobile payment, according to previous definitions and distinctions presented.

4.2.2. Prior research on mobile payment

Mobile payment is a relatively new area of research, under explored when compared to related areas of research such as commerce, Internet banking or mobile banking, where research have been widely conducted. Some authors still consider that mobile payment adoption research is in its infancy (Slade et al., 2013), even if the number of studies increased in the last couple of years (Dahlberg et al., 2015). NFC has been regarded by some authors as the future of mobile payment services (Ondrus & Pigneur, 2007). Technology supporting the mobile payment systems has evolved dramatically in the last few years, following the appearance and diffusion of a full new set of mobile and smart devices, some of them already using technology like NFC. Only few studies, published in top tier Journals, have analyzed the adoption of mobile payment in the last years (Leong et al. 2013; Slade et al. 2014; Tan et al. 2014). These previous studies have indicated the need for better understanding the determinants of mobile payment adoption. Leong et al. (2013) used constructs from psychological science, trust-based, behavioral control, and parsimonious technology acceptance model - TAM (Davis, 1989) to study the intention to use mobile payment. Slade et al. (2014) suggested further exploring construct such as trust and perceived risk; this last one dimension was more recently explored by Yang et al. (2015). The importance of mobile payment is highlighted by several authors; they say it allow to create a distinctive value to both consumers and merchants (Lai & Chuah, 2010), that it is one of the most critical drivers of the success of mobile commerce (Yang et al., 2012), that is changing the payment market (Hedman & Henningsson, 2015), or that is receiving growing attention globally (Chen, 2008),

foreseeing its bright future (Au & Kauffman, 2008). Others consider that the widespread adoption of mobile payment services by both consumers and merchants is largely dependent on a secure and reliable payment system so that it is convenient and easy to use (Chang et al., 2009), clearly identifying the importance of security on adoption.

4.2.3. Adoption models

4.2.3.1. Extended unified theory of acceptance and use of technology (UTAUT2)

Venkatesh et al. (2003) provided a comprehensive examination of eight prominent models and developed the unified theory of acceptance and use of technology (UTAUT). This model postulates that four constructs are determinants of behavioral intentions and use behavior: (i) performance expectancy, (ii) effort expectancy, (iii) social influence, and facilitating conditions. Since its inception in 2003, researchers have increasingly turned to testing UTAUT to explain technology adoption, primarily in organizational contexts (Venkatesh et al., 2012). It was later extended to study acceptance and use of technology in a consumer context (Venkatesh et al., 2012), adding three constructs to the original model, namely hedonic motivation, price value, and habit, altered some existing relationships in the original conceptualization of UTAUT, and introduced new relationships. Individual differences (age, gender, and experience) were hypothesized to moderate the effects of constructs on behavioral intention and technology use. The UTAUT2 model is shown on **Figure 4.1**.

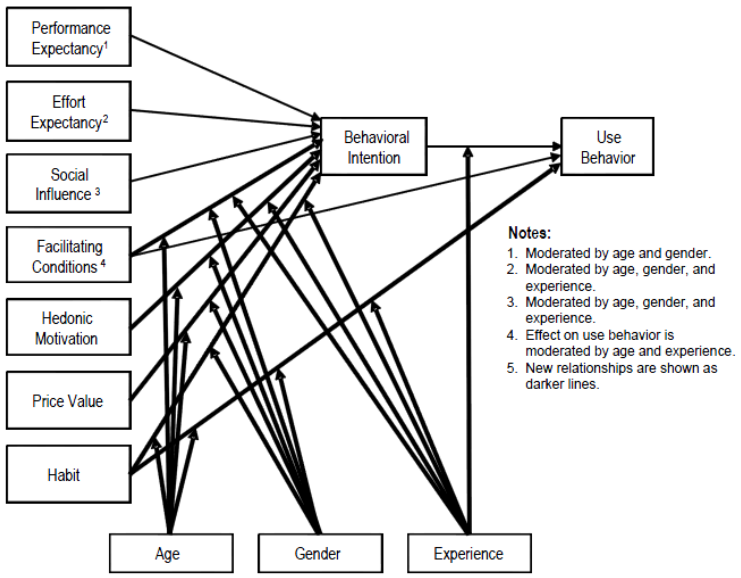


Figure 4.1 – UTAUT2 model

4.2.3.2. Diffusion of innovation (DOI)

Diffusion of innovation (DOI) theory contributes by examining innovations and the success of their dissemination through a more precise indicator of consumer behavior (Rogers, 2003). Research on innovation diffusion suggests that innovation is a vital element (Zhao & de Pablos, 2011), and that personal innovativeness is also an important variable in determining outcomes of technology adoption (Yi et al., 2006). Personal innovativeness, as defined by Yi et al. (2006, p. 351) is, *"the willingness of an individual to try out any new IT, plays an important role in determining the outcomes of user acceptance of technology"*. It was initially proposed as a moderator, but later re-conceptualized as a direct determinant of perceived usefulness and perceived ease of use.

4.2.3.3. Perceived technology security

Perceived technology security analyzes the potential feelings of uncertainty in using a technology (Cheng et al., 2006). Information security concerns are defined as the buyer's perception about a seller's inability and unwillingness to safeguard monetary information (Salisbury et al., 2001). Information security concerns make buyers skeptical (George, 2002), has been viewed as a major barrier to e-commerce adoption (Hoffman et al. 1999; Khoo & Straub 1999), and a major barrier to the broad adoption and use of mobile payments (T. Chang, 2014). Earlier studies have concluded that security concerns are an inhibitor to the intention to adopt technologies where monetary information is managed (Cheng et al., 2006; Pavlou et al., 2007; Salisbury et al., 2001).

4.3. Research model

The research model is shown in **Figure 4.2**. The model combines UTAUT2 with the innovation characteristics of DOI theory, the perceived technology security, and intention to recommend constructs, for better understanding of the mobile payment phenomena. This combination of theories is made assuming that: (i) consumer acceptance of a new technology is a complicate phenomenon that requires more than a single model (Shen et al. 2010), (ii) an integrative perspective provides a more complete account of the causal mechanisms underlying the relationships as well as unique insights that cannot be obtained with a single

theory driven model (Jackson et al. 2013) (iii) it will reinforce the significance and predictably of the results.

From UTAUT2 model we included six drivers (performance expectancy, effort expectancy, social influence, facilitating conditions, hedonic motivations, and price value). The habit construct was not included in the research model since mobile payment is a relatively new technology that has not yet gained sufficiently widespread use among consumers to generate a habit.

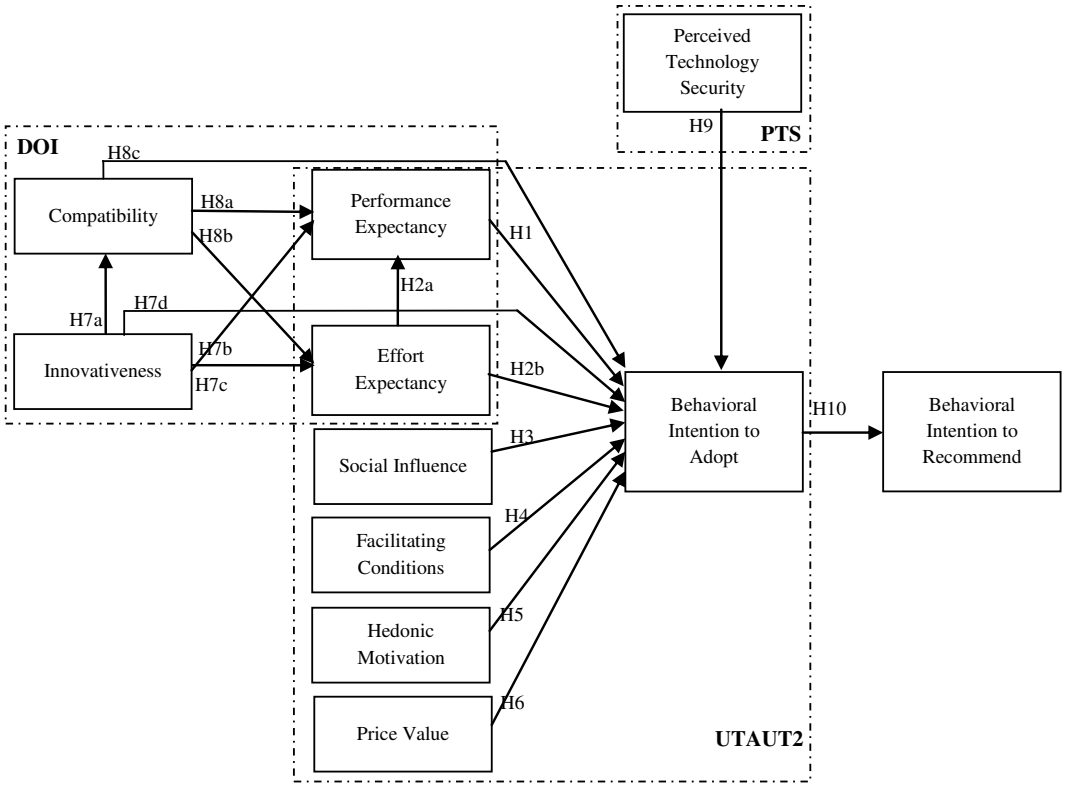


Figure 4.2 – Research model

Considering mobile payment as a disruptive technology, innovation factors play an important role in the behavioral intention leading to its adoption. Earlier studies have established the role of DOI constructs in predicting intentions to adopt new IT systems (Koenig-Lewis et al., 2010). We included the DOI constructs in the research model to determine their influence on the adoption of mobile payment. As mobile payment involves financial information that is personal and sensitive, security concerns can become a barrier to technology adoption (Duane et al., 2014), perceived technology security was included in our research model. Recommending technology to others is of great commercial interest (Moe &

Schweidel, 2012), however, researchers often neglected this construct due to the overwhelming emphasis on technology use (Miltgen et al., 2013). Technology adoption in today's world is more than just an individual choice. For instance, technology providers now routinely rely on social networks for the dissemination of behavior influencing messages. We therefore included intention to recommend (Miltgen et al., 2013) as a second key dependent variable in the research model.

4.3.1. UTAUT2 variables

Performance expectancy is the degree to which using a technology will provide benefits to consumers in performing certain activities (Venkatesh et al. 2012). The individual's perception that using mobile payment will help to attain gains in performing payment tasks may thus influence the behavioral intention to adopt mobile payment.

H1. Performance expectancy positively influences the behavioral intention to adopt mobile payment.

Effort expectancy is the degree of ease associated with consumers' use of technology (Venkatesh et al. 2012). According to Miltgen et al. (2013) it contributes to a precise prediction of intention to adopt a new technology. When users feel that mobile payment is easy to use and does not require much effort, they have higher expectations toward acquiring the desired performance (Venkatesh et al., 2003).

H2. Effort expectancy positively influences (**a**) performance expectancy, and (**b**) behavioral intention.

Social influence is the extent to which consumers perceive that important others (e.g., family and friends) believe they should use a particular technology (Venkatesh et al. 2012). It reflects the effect of environmental factors such as opinions of a user's friends, relatives, and superiors on behavior (Venkatesh et al., 2003), when they are positive it may encourage the user to adopt mobile payment services.

H3. Social influence positively influences the behavioral intention to adopt mobile payment.

Facilitating conditions (FC) refers to consumers' perceptions of the resources and support available to perform a behavior (Venkatesh et al. 2012). If an operational infrastructure exists and supports the use of mobile payment, the behavioral intention to adopt mobile payment will increase.

H4. Facilitating conditions positively influence the behavioral intention to adopt mobile payment.

Hedonic motivation (HM) is defined as the fun or pleasure derived from using a technology. In the consumer context hedonic motivation has been found to be an important determinant of technology adoption and use (Venkatesh et al., 2012). As the enabler of a new form of conducting financial transactions, mobile payment is enjoyable to users, leading to its adoption.

H5. Hedonic motivation positively influences the behavioral intention to adopt mobile payment.

Venkatesh et al. (2012) define price value as the consumer's cognitive trade-off between the perceived benefits of the technologies and the monetary cost of using them. The perceived benefits of using a technology are greater when the price value is more, and the perceived monetary cost is less. Price value therefore has a positive impact on the intention to adopt mobile payment.

H6. Price value positively influences the behavioral intention to adopt mobile payment.

4.3.2. DOI variables

Innovativeness has been shown not only a significant direct predictor of behavioral intention to adopt a new technology Yi et al. (2006), but also an antecedent of compatibility, performance expectancy, and effort expectancy. The higher the innovativeness level of a user, the greater the propensity to feel compatible with the technology, and recognize the benefits of the technology.

H7. Consumers with higher innovativeness levels have higher (**a**) compatibility, (**b**) performance expectancy, (**c**) effort expectancy, and (**d**) intention to adopt mobile payment.

Compatibility has been shown as a direct predictor of the behavioral intention to adopt a new technology, and as an antecedent of performance expectancy and effort expectancy (Kuo & Yen 2009). Customers may perceive mobile payment to be more compatible if they see benefits in using mobile payment to perform certain activities. Compatibility therefore reinforces performance expectancy, effort expectancy, and the intention to adopt mobile payment.

H8. Consumers with higher compatibility levels have higher (**a**) performance expectancy, (**b**) effort expectancy, and (**c**) the intention to adopt mobile payment.

4.3.3. Perceived technology security

Feeling secure in conducting financial transactions with mobile technologies is important to minimize concerns regarding the use of technology to make mobile payment (Salisbury et al., 2001). Therefore, perceived technology security has a positive influence on the customer's intention to adopt mobile payment.

H9. Perceived technology security positively influences the behavioral intention to adopt mobile payment.

4.3.4. Users' intention to recommend mobile payment technology

Consumers with a higher intention to adopt a new technology are more likely to become adopters (Leong, et al. 2013), and to recommend the technology to others (Miltgen et al., 2013). Social networks are bringing several challenges and opportunities to companies (Zhang et al., 2015) as they represent a mean of communication that allows users to express their opinion and experience about mobile payment services, products, and technologies.

H10. Behavioral intention to adopt mobile payment positively influences behavioral intention to recommend mobile payment technology to others.

4.4. Methods

4.4.1. Measurement

To test the theoretical constructs, a survey was conducted in Portugal. A questionnaire was developed for the survey using constructs and items from literature (refer **Appendix C**). Measurement items for performance expectancy, effort expectancy, social influence, facilitating conditions, hedonic motivation, price value, and behavioral intention are adapted from Venkatesh et al. (2012) and Bélanger & Carter (2008); items for innovativeness and compatibility are adapted from (Miltgen et al., 2013); items for perceived technology security are from Cheng et al. (2006); and items for the recommendation construct were self-developed. Each item was measured on a seven-point Likert scale, ranging from 1 (totally disagree) to 7 (totally agree). Two demographic questions (age and gender) were also included. Age was measured in years and gender was represented using a dummy variable where 0 represented women.

The questionnaire was created and administrated in English, and reviewed for content validity by language experts from a university. Because the questionnaire was administered in Portugal, the English version of the instrument was translated into Portuguese by a professional translator. The questionnaire was then reverse translated into English to confirm translation equivalence. To test the instrument and correct any errors, the questionnaire was pilot tested with a sample of 30 subjects in April of 2014. The results confirm that the scales were reliable and valid. In order to avoid skewing the results, the data from the pilot test were not used in the second phase of data collection.

4.4.2. Data

Seven hundred and eighty-nine (789) students and alumni from universities in Portugal were contacted by e-mail in May of 2014. A hyperlink to the online survey was included in the email. 203 valid responses were received initially. A follow-up e-mail was sent to those who had not responded after four weeks, from which additional 98 completed responses were received, for a combined total of 301 valid responses for data analysis. The overall response rate was 38%, which is reasonable for studies of this scale. 60% of the subjects were females. The age ranged from 18 to 66 years, and the mean age was 29 years (see **Appendix D** for the demographic profile of the sample data). Individuals with a university

degree accounted for 78% of the data. The sample is an indicative group to test the instrument because university students have high potential to adopt new mobile technologies such as mobile payment (Sohn & Kim 2008). Additionally, contacting students across the country allow for a generalization of the findings to represent the overall Portuguese context. To test for non-response bias, the sample distribution of the first and second respondents groups was compared using the Kolmogorov–Smirnov (K–S) test (Ryans, 1974). The sample distributions of the two groups do not differ statistically (Ryans, 1974) indicating that non-response bias was not present. The common method bias was examined using the Harman's test (Podsakoff et al., 2003). No significant common method bias was found in the data.

4.5. Data analysis and results

Structural equation modeling (SEM) is a technique for estimating causal relations applying a combination of statistical data and qualitative causal hypothesis. Earlier researchers have recognized the potential of SEM in distinguishing measurement and structural models, and taking measurement error into consideration (Henseler et al., 2009). There are two types of SEM techniques: (i) covariance-based techniques and (ii) variance-based techniques. The variance-based technique, using partial least squares (PLS), is suitable for this study because: (i) not all items in our data are distributed normally ($p<0.01$) based on Kolmogorov-Smirnov test; (ii) the research model has not been tested in earlier literature; (iii) the research model is considered as complex. Smart PLS 2.0 M3 software is used to estimate the research model (Ringle et al. 2005). The measurement model is first analyzed to assess reliability and validity, and the structural model is then tested.

4.5.1. Measurement model

The measurement model was assessed for construct reliability, indicator reliability, convergent validity, and discriminant validity. Construct reliability was tested using the composite reliability and Cronbach's alpha. As shown in **Table 4.1**, all the constructs have composite reliability and Cronbach's alpha is above 0.7 in all cases, which suggests that the constructs are reliable (Straub, 1989). The indicator reliability was evaluated based on the criteria that the loadings should be greater than 0.70, and that every loading less than 0.4 should be eliminated (Henseler et al., 2009). One item for innovativeness (I3) was dropped

due to low factor loading. This item was also excluded in earlier research (Yi et al., 2006). The remaining loadings are greater than 0.7, and all the items are statistically significant at 0.01. Overall, the instrument presents good indicator reliability. Average variance extracted (AVE) was used as the criterion to test convergent validity. The AVE should be higher than 0.5, so that the latent variable explains more than half of the variance of its indicators (Fornell & Larcker, 1981; Hair et al., 2012; Henseler et al., 2009). As shown in **Table 4.1**, all constructs have an AVE higher than 0.5, meeting this criterion.

Table 4.1 – Quality Criterion (AVE, Composite Reliability, Alpha) and Factor Loadings

Construct	Item	AVE	Composite Reliability	Cronbach's Alpha	Loading	t-value
Performance expectancy	PE1	0.87	0.96	0.95	0.91	66.45***
	PE2				0.94	93.73***
	PE3				0.95	100.56***
	PE4				0.94	107.35***
Effort expectancy	EE1	0.82	0.95	0.93	0.90	61.75***
	EE2				0.92	70.63***
	EE3				0.91	51.7***
	EE4				0.90	49.81***
Social influence	SI1	0.95	0.98	0.97	0.97	121.92***
	SI2				0.98	254.24***
	SI3				0.98	239.39***
Facilitating conditions	FC1	0.76	0.90	0.84	0.85	37.85***
	FC2				0.85	35.76***
	FC3				0.92	71.64***
Hedonic motivation	HM1	0.86	0.95	0.92	0.90	52.21***
	HM2				0.95	139.88***
	HM3				0.92	65.55***
Price value	PV1	0.91	0.97	0.95	0.97	143.86***
	PV2				0.97	127.79***
	PV3				0.92	43.15***
Innovativeness	I1	0.79	0.92	0.87	0.91	81.53***
	I2				0.87	48.8***

Construct	Item	AVE	Composite Reliability	Cronbach's Alpha	Loading	t-value
	I4				0.89	47.75***
Compatibility	C1	0.89	0.97	0.96	0.93	62.99***
	C2				0.95	129.34***
	C3				0.93	78.87***
	C4				0.96	121.01***
Perceived technology security	PTS1	0.92	0.98	0.97	0.95	94.64***
	PTS2				0.96	163.47***
	PTS3				0.96	159.92***
	PTS4				0.96	114.46***
Behavioral intention	BI1	0.97	0.99	0.98	0.98	220***
	BI2				0.98	181.43***
	BI3				0.99	392.52***
Intention to recommend	REC1	0.82	0.90	0.79	0.94	184.49***
	REC2				0.88	43.96***
*** - $p < 0.01$						

Discriminant validity of the constructs was evaluated using two criteria: Fornell-Larcker criteria and cross-loadings criteria. Fornell-Larcker indicates that the square root of AVE should be greater than all correlations between each pair of constructs (Chin, 1998). As seen in **Table 4.2**, all diagonal values (square root of AVE) are greater than off-diagonal values (correlations between the construct). The cross-loadings criterion suggests that the loading of each indicator should be higher than all cross-loadings (Fornell & Larcker, 1981). All the loadings are greater than the correspondent cross-loadings. Thus, both criteria are satisfied providing evidence of discriminant validity of the scales.

The measurement model results indicate that the construct reliability, indicator reliability, convergent validity, and discriminant validity of the constructs are satisfactory. The constructs can be used to test the structural model.

Table 4.2 – Fornell-Lacker Criterion: Matrix of correlation constructs and the square root of AVE (in bold)

Constructs	PE	EE	SI	FC	HM	PV	I	C	PTS	BI	REC
Performance expectancy (PE)	**0.93**										
Effort expectancy (EE)	0.65	**0.91**									
Social influence (SI)	0.51	0.41	**0.98**								
Facilitating Conditions (FC)	0.51	0.72	0.35	**0.87**							
Hedonic Motivation (HM)	0.72	0.60	0.52	0.52	**0.93**						
Price value (PV)	0.46	0.39	0.31	0.36	0.51	**0.95**					
Innovativeness (I)	0.42	0.52	0.33	0.53	0.45	0.29	**0.89**				
Compatibility (C)	0.70	0.65	0.52	0.59	0.66	0.44	0.62	**0.94**			
Perceived technology security (PTS)	0.56	0.49	0.46	0.43	0.61	0.49	0.42	0.67	**0.96**		
Behavioral intention (BI)	0.71	0.61	0.54	0.49	0.67	0.46	0.57	0.77	0.69	**0.98**	
Intention to recommend (REC)	0.67	0.58	0.49	0.49	0.72	0.46	0.50	0.73	0.61	0.78	**0.91**

4.5.2. Structural model

Figure 4.3 shows the PLS estimation results. The model explains 71.8% of behavioral intention to adopt mobile payment. Hypotheses related to behavioral intention - H1, H3, H7d, H8c, and H9 are confirmed, and hypotheses H2b, H4, H5, H6 are not confirmed. The model explains 38.5% of variation in compatibility, and validates the hypothesis (H7a) that consumers with higher innovativeness are more compatible with mobile payment. This model explains 55.4% of variation in performance expectancy, and confirms hypotheses between the determinants performance expectancy, compatibility, and effort expectancy (H8a, H2a). H7b is not confirmed. This model explains 44.9% of variation in effort expectancy. The results also confirm the hypotheses between effort expectancy, innovativeness, and compatibility (H7c and H8b). This model explains 61.3% of variation in the recommendation of mobile payment and confirms the hypothesis that behavioral intention influences the intention to recommend the technology to others (H10).

Note: Paths coefficients that are not statistically significant are in dashed arrows.

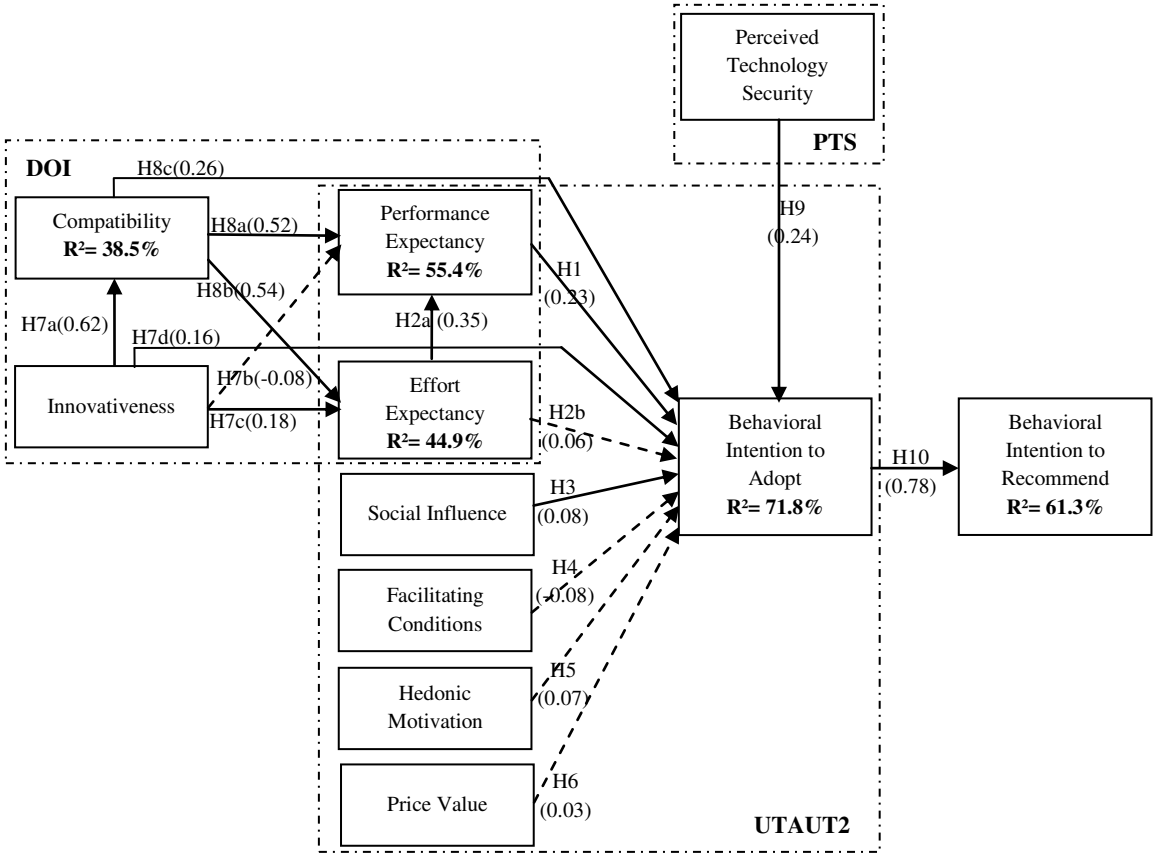


Figure 4.3 – Structural model results

Among the constructs that are significant in explaining the behavioral intention to adopt mobile payment, compatibility is the most important construct ($\hat{\beta}$ =0.26; p<0.01), followed by perceived technology security ($\hat{\beta}$ =0.24; p<0.01), performance expectancy ($\hat{\beta}$ =0.23; p<0.01), innovativeness ($\hat{\beta}$ =0.16; p<0.01), and social influence ($\hat{\beta}$ =0.08; p<0.10). The structural model confirms 11 of the 16 hypotheses formulated. The results of this model were analyzed without the two moderator factors from the UTAUT2 model (age and gender), and then tested by including them. However, the complexity of the results exceeds the minimal gain in R^2 (from 72% to 74%). These analysis results are therefore not included (the detailed analysis results are available from authors on request). The next step in the analysis was to evaluate the total effect of the independent variables. Since the recommendation construct has only one direct effect, the total effect becomes beneficial to gain insight into the indirect effects of the other constructs. Besides the direct effect of behavioral intention on recommendation, the total effect of compatibility ($\hat{\beta}$ =0.356; p<0.01), innovativeness ($\hat{\beta}$ =0.352; p<0.01), perceived technology security ($\hat{\beta}$ =0.185; p<0.01), performance expectancy

($\hat{\beta}$ =0.181; p<0.01), effort expectancy ($\hat{\beta}$ =0.114; p<0.05), and social influence ($\hat{\beta}$ = 0.065; p<0.10) are significant in explaining the behavioral intention of the user to recommend mobile payment technology to others.

4.6. Discussion

Previous research on mobile payment has not fully understood the various factors that influence the behavioral intention to adopt and the intention to recommend mobile payment technology. To fill this research gap, this study uses a unique and innovative model that combines the strengths and constructs from two well-known theoretical models, namely UTAUT2 and DOI, with perceived technology security and intention to recommend constructs, to explain mobile payment acceptance. The findings reveal that performance expectancy is significant for the behavioral intention to adopt mobile payment (H1), consistence with previous research (Morosan & DeFranco, 2016). This implies that, the extent to which mobile payment provides benefits in performing payment tasks is significant to the adoption of mobile payment. Similarly, effort expectancy is found to be significant in the performance expectancy (H2a) of mobile payment, but not significant in explaining the behavioral intention to adopt mobile payment. The results suggest that lower effort in using mobile payment may result in higher expectations of attaining gains in performing payment tasks, but not necessarily the adoption of mobile payment technology. The findings are consistent with Cheng et al. (2006) , Slade et al. (2014), and Zhou (2014). The study results also show that effort expectancy (H2b), facilitating conditions (H4), hedonic motivation (H5), and price value (H6) are not significant predictors of the behavioral intention to adopt mobile payment. However, the findings confirm the significance of social influence (H3) on the intention to adopt mobile payment. This may suggest that the opinion and recommendation of those who are influential and important may in fact drive the adoption of technologies designed for the mobile platform, in line with some previous studies that stated that users are highly influenced by the opinions in their social environment (Liébana-Cabanillas et al., 2014). We may also conclude that the newer constructs of UTAUT2 - hedonic motivation and price value - are not found to be relevant to the context of mobile payment adoption.

The results indicate that the influence of the innovativeness construct on compatibility (H7a), effort expectancy (H7c), and behavioral intention (H7d) is validated, but do not validate its effect on performance expectancy (H7b). As suggested by Agarwal & Prasad

(1998), the findings confirm the importance of this construct in the adoption of user centric technologies. The results suggests that regardless of the effort expectancy, if the user does not see the qualities and advantages associated with mobile payment (compatibility), the person may not be willing to try the new technology. The more innovative the user, the more predisposed the person may be towards new technologies such as mobile payment. The analysis shows a significant finding with regard to compatibility. The results indicate that performance expectancy (H8a), effort expectancy (H8b), and behavioral intention (H8c) are higher when the customer perceives the technology to be compatible. These findings are similar to (Miltgen et al., 2013; Schierz et al., 2010), who have suggested the importance of compatibility in technology adoption. The results of our study therefore indicate that the behavioral intention to use technologies such as mobile payment may be higher when it fits the customer's life style. Another finding highlighted by the results is the importance of perceived technology security on the behavioral intention to adopt mobile payment (H9). The results indicate that for technologies involving sensitive and personal data, the security capability to secure transactions is relevant, and a direct determinant of the customer's intention to adopt the technology. The findings are similar to those in Cheng et al.'s (2006) study on internet banking adoption. The combination of DOI with UTAUT2 and the perceived technology security construct significantly increase the behavioral intention to adopt explanation from 60.5% to 69.1% (with DOI, 8.6% of increase), and to 71.8% (with DOI and security, 2.7% of increase), supporting their inclusion in the theoretical model. These findings are also supported by the adjusted R^{2}' results that increased from 59.7% to 68.3% (with DOI), and to 70.9% (with DOI and security).

The customer's intention to recommend mobile payment technology was also evaluated. Our model explains 61% of the variance in recommendation, and the findings validate the influence of behavioral intention variable over it (H10). This is an important contribution of our work that has often been neglected in previous adoption studies (Moe & Schweidel, 2012), and that is studied for the first time in the mobile payment field (Dahlberg et al., 2015). The significant value obtained confirms the users' propensity to recommend the mobile payment technology in social networks and other means of communication, and the importance and relevance of including the recommendation construct in this and in future studies on the adoption of new technologies, aligned with the findings of some previous studies (Miltgen et al., 2013).

4.6.1. Practical implications

The study identifies three areas that may influence mobile payment users' adoption according to the results obtained: (1) customer specific characteristics, (2) technology specific characteristics, and (3) environmental characteristics. The first area involves the innovativeness characteristics of mobile payment users. The study found innovativeness to be an important factor in explaining mobile payment adoption. As well-informed customers are more likely to adopt mobile payment, showcasing the technology benefits combined with security features through advertising or other means considered adequate may produce positive results towards adoption. Target marketing that emphasizes compatibility of mobile payment technology with the user's life styles may also serve to engage the innovativeness characteristics of prospective customers. NFC is often combined with new and innovative smartphone devices, state of the art in the market. Combining it in marketing campaign may reinforce even more acceptance.

The second area involves technology specific factors such as compatibility, perceived security, and performance expectancy. The study draws attention to the importance of investing in and have in place resources to ensure the most possible secure environment for carrying out mobile payment transactions. Promotional campaigns that emphasize the usefulness of mobile payment, namely faster shopping, productivity gains, secure transactions, and improved performance, anywhere, anytime, may capture users' attention, reinforcing the acceptance and use of the technology. Thus financial institutions, and developers of mobile commerce applications should consider technology security and users awareness as a priority in the mobile payment environment. A sense of insecurity may turn into an inhibitor for the adoption of applications that utilize mobile payment.

The third area involves environmental factors that include social influence. To attain wide adoption of mobile payment, merchants, issuers, and application developers should consider approaches that capitalize on the social influence among customers. In this realm, the influence of the intention to recommend is a significant factor that may benefit service providers. Social network marketing, and opinions shared by friends, relatives and superiors are powerful ways to help in the recognition, promotion, and successful adoption of mobile payment technology. It is critical that marketers understand who is contributing with their opinions to social networks, web sites, and forums, their motives for doing so, and what influences their behavior, in order to improve adoption.

4.6.2. Theoretical implications

With the increase popularity of smart devices and mobile applications, mobile payment is expectably set to gain rapid prominence. To understand the facilitators and inhibitors of mobile payment and how users will respond to mobile payment, we developed an innovative research model that combines two well-known theoretical models, UTAUT2 and DOI, with perceived technology security and intention to recommend constructs. Our results revealed that the proposed model has good explanatory power in predicting consumer intention to adopt mobile payment and their intention to recommend the technology. Compared with other investigations exploring intention to recommend construct, our study with 61.3% presents a stronger predictive power than similar studies, such as Miltgen et al. (2013) with 42%. For researchers this study provides a basis for further refinement of individual models of acceptance, as a starting point for future research. Whenever possible the model should be tested in different countries, age groups, and technologies, identifying relevant factors to extend it. Direct and indirect effect of the determinants influencing mobile payment acceptance were analyzed, and the most important ones identified, namely compatibility, perceived technology security, performance expectations, innovativeness, and social influence. Hedonic motivation and price value were considered not relevant in our context. In terms of the customer's intention to recommend, the findings confirms the users' propensity to recommend the mobile payment technology in social networks and other means of communication, and the importance and relevance of this construct, supporting the recommendation to include it in social marketing campaigns and in new technologies adoption future studies.

4.6.3. Limitations and future research

The study has limitations that provide the impetus for further research in this field of investigation. One limiting factor that impacts this research is the fact that it did not include some factors that some may consider important to the adoption of mobile payment, such as trust (Liébana-Cabanillas et al., 2013) and risk (Slade et al., 2015). As mobile payment gains a wider foothold, experience moderator and habit construct from the UTAUT2 should be included in the research model. Measuring the effects of these constructs and comparing results would be a fruitful path forward. Another limitation of this research concerns the age and location of the questionnaire respondents; more than 88% were aged 45 years or less and

all live in Portugal. We therefore recommend caution in interpreting the findings of this study, challenging future research to address age and cultural differences.

This study focused on the intention to adopt mobile payment, but the activities of end-users related to mobile payment are not considered. Future research can target: (1) the usability of this technology (for e.g., assessing the significance of usage pattern in activities related to shopping, dining, etc.); (2) whether or not the use of the technology enables productivity gains for businesses and customers; (3) outcome measures (for e.g., pattern of usage with or without PIN, volume of usage, time saved, comparison with credit card use, etc). As mobile payment technology such as NFC is still at the infancy stage (Tan et al. 2014) and can evolve over time, a longitudinal study may be more appropriate to capture the details to understand the phenomenon. In many practical cases, mobile payment is being marketed with different services and products (Miao & Jayakar, 2016), such as mobile marketing, ticketing, commerce, or coupons. Understanding how these kinds of activities are contributing to the acceptance of mobile payments can be another area of interest in future work. In other cases, mobile payment is completely integrated in the mobile banking services, being harder to distinguish one from another. This is particularly used in developing countries, like Kenya or Mozambique (Baptista & Oliveira, 2015). Understanding how mobile payments is related with mobile banking in these countries can be another interesting area to explore. As the development of mobile payment vary from country to country in terms of maturity and usage (Guo & Bouwman, 2015), studies across multiple countries could also provide additional insights (Dennehy & Sammon, 2015). One last future research direction is security. Being such a complex issue, it goes beyond technology, incorporating the trustworthiness of counter parties, location of data stored (device versus cloud/Internet), data ownership, the prevalent regulatory and enforcement culture including privacy legislation. Exploring these issues, together or separately, can be worth to pursue.

4.7. Conclusions

Mobile payment is receiving growing attention globally, from consumers to merchants, as an alternative to using cash, check, or credit cards. The factors influencing the adoption and intention to future recommend this technology have not yet been comprehensively assessed. To fill this research gap we formulate an innovative and integrated research model combining constructs from two well-known theories, namely DOI and

UTAUT2, with perceived security and intention to recommend constructs. In terms of work's objectives they were fully accomplish, the research model was tested with data from a European country, Portugal, the most important adoption antecedents identified, complementing knowledge on this subject, and the intention to recommend construct was studied for the first time in the mobile payment field. Our results revealed that the proposed model has good explanatory power, confirming its robustness in predicting consumer intention to adopt mobile payment and their intentions to recommend the technology. Convergences and divergences with earlier findings were found, confirming that compatibility, perceived technology security, performance expectations, innovativeness, and social influence have significant direct and indirect effects over the adoption of mobile payment and the intention to recommend this technology. The relevance of customer's intention to recommend mobile payment technology in social networks, blogs, web sites and in other means of communication was also confirmed, supporting the recommendations to capitalize social influence among customers through social marketing campaigns, and to include it in future technology adoption studies. For researchers this study provides a basis for further refinement of individual models of acceptance. For practitioners, understanding the key constructs is crucial to design, refine, and implement mobile payment services, applications, products, and functionalities that achieve high consumer acceptance, value, and high rates of positive recommendations in social networks.

Chapter 5 – Gamification impact in the acceptance of mobile banking services

5.1. Introduction

In recent years there has been explosive growth in the use of mobile devices. These devices have grown from simple voice and messaging platforms into highly flexible and multifunctional devices that can be used almost anytime and anywhere for a wide range of purposes, from utilitarian to fully hedonic (Negahban & Chung, 2014), with a full range of applications installed, tailored to the owner's needs and wishes. During several years mobile banking has been considered a good example of an almost completely utilitarian service, related to functional, economic, rational, and practical functionalities (Martínez-López et al., 2014), providing a means to an end: pay bills, transfer money, manage savings, etc. Most of the mobile banking services were not fun at all, were about purely simple transactional services. Applying game mechanics to motivate and drive engagement in this nongame context might very well change mobile banking users' behaviour, improving service acceptance and use.

In the last few years we have witness an accelerated and consistent grow of banks and financial institutions that decided to apply game mechanics and game design techniques to their systems and services. Successful examples such as Banco Bilbao Vizcaya Argentaria Game (allows customers to earn points by using the bank's transactional site and redeem them for products and services), Saveup.com (allows users to perform financial activities, earn credits and money prizes), Punch the pig (allows users to transfer money to a growth account by punching a pig whenever it pops up), 56 sage street from Barclays (interactive virtual city, where players learn money management skills), or Mint.com (quest for money, game for earning and saving money) have encouraged others financial institution to do the same. Besides finance, game techniques are being used in a broad range of industries and domains, and subjects (Pedreira et al., 2015), such as retail, health, energy, utilities, military, government, and education, at individual and collective levels, to attract participation, encourage creativity, and to help establish a path to collaborative work and common objectives. Gamification is expected to more easily capture and sustain the interest of millennials (25 to 35 years old), the people who were raised on games (Zichermann & Linder, 2013), even though games enjoy unprecedented popularity among all generations. Providing a fun and enjoyable environment can favourably increase users' perceptions toward acceptance of a technology (Venkatesh et al., 2012). So, why most of mobile banking services

remains so serious? Why users can't have an excellent costumer experience, fun and enjoyment in their interaction with banks?

This work provides several contributions for research, contributing to the advancement of knowledge, exploring and discussing direct implications for mobile banking managers, financial institutions, and users. The main contributions of this study are twofold. First, we investigate the direct effects of the mobile banking acceptance determinants using an integrated model, following Venkatesh et al. 's (2012) suggestion to test their extended unified theory of acceptance and use of technology theory (UTAUT2) in different countries, age groups and technologies, identifying at the same time factors to extend it. Second, a gamification construct was included in the model in order to evaluate the impact of game mechanics and design technics on mobile banking intention to use. The globalisation of business and systems is fuelling the need to acquire a deeper understand on the impact of gamification in technology acceptance and use within the financial industry. Earlier research on mobile banking acceptance and potential gamification impact analysis is very limited, not following the accelerated and consistent grow of banks and financial institutions that decided to apply it on their systems and services, registered worldwide over the last few years; a gap that we try hereby to reduce. This is the first time to our knowledge that Venkatesh et al.'s (2012) UTAUT2 theory and a gamification construct are combined in a mobile banking acceptance work, supported by data from a South American country, Brazil. Assuming that service acceptance rate is still lower than it could be, lower than expected (Yu, 2012; Zhou et al., 2010), and that new constructs can reinforce results' significance and predictability, gamification impact was added, aiming to further our understanding of individual and situational characteristics in mobile banking acceptance and use, providing new insights into how game technics influences individual behaviour.

This chapter is organized as follows. The theoretical background overview is presented next, starting with Venkatesh et al. 's (2012) UTAUT2 model description, followed by the gamification concept and antecedents. The work continues with the research model and hypotheses presentation, data collection methodology description, results, managerial implications, and limitations, ending with possible directions for future research.

5.2. Theoretical background

Mobile banking can be defined as a type of execution of financial services in the course of which, within an electronic procedure, the customer uses mobile communication techniques in conjunction with mobile devices (Pousttchi & Schurig, 2004), or as the ability to bank virtually anytime and anywhere (Kiesnoski, 2000). Earlier research has sought to envision mobile banking acceptance as a technical innovation (Al-Jabri & Sohail, 2012), and several different acceptance models have been proposed in the academic literature. One of the most widely accepted is the unified theory of acceptance and use of technology (UTAUT), proposed by Venkatesh et al. (2003). Since its appearance, the UTAUT model has gradually drawn the attention of researchers who have recently applied it to explore user acceptance of mobile technologies (Yu, 2012). A brief summary of this model and gamification background are presented as follow.

5.2.1. UTAUT acceptance model

The unified theory of acceptance and use of technology (Venkatesh et al., 2003), commonly referred to as UTAUT, was built on eight prominent and preceding theories: the theory of reasoned action (Fishbein & Ajzen, 1975), the technology acceptance model (Davis, 1989), the motivational model (Davis et al., 1992), the theory of planned behaviour (Ajzen, 1991), the PC utilization model (Thompson et al., 1991), the innovation diffusion theory (Rogers, 1995), the social cognitive theory (Compeau & Higgins, 1995), and an integrated model of technology acceptance and planned behaviour (Taylor & Todd, 1995). The model evolved in 2012 to seven constructs, adding hedonic motivation, price value, and habit to the previous version of model and, more important, extending and adapting it to the individual context (Venkatesh et al., 2012). Performance expectancy is now seen by Venkatesh et al. (2012) as the degree to which a technology will provide benefits to consumers in performing certain activities, effort expectancy as the degree of ease associated with consumers' use of technology, social influence as the extent to which a consumer perceives that friends and family believe they should use a particular technology, facilitating conditions as consumers' perceptions of resources and support available to perform a behaviour, hedonic motivation as fun or pleasure derived from using a technology, price value as consumers' cognitive trade-off between the perceived benefits and the monetary cost for using it. Habit is seen as the automatic behaviours performed due to learning (Limayem et al., 2007). A direct relationship

between facilitating conditions and behavioural intention was added, and the moderating variables that influence the constructs are now age, gender, and experience, dropping voluntariness from the previous UTAUT.

5.2.2. Gamification

Gamification can be defined as the use of game mechanics and game design techniques in nongame contexts to design behaviours, develop skills, or to engage people in innovation (Burke, 2012a), or as a technique of influencing the motivation or engagement of people to solve complex problems, to perform certain actions, or to just have fun (Mishra, 2013). Some consider it as a new way of thinking, designing, and implementing solutions (Rodrigues et al., 2013b). Technology has historically been associated with business and work, helping to complete tasks faster, but it also has the potential to fulfil ludic purposes. The idea that people like fun in their lives inspired gamification. Game principles, processes, and systems normally used to influence, engage, and motivate individuals, groups, or communities are now being used to drive behaviours and produce desired effect and results (Rodrigues et al., 2014), transforming customers' everyday interactions into meaningful and measurable business purposes (Zichermann & Linder, 2010), reducing at the same time perceived barriers to systems use such as low usability, security breaches, or difficulty of use (Yoon, 2009), and providing real positive business impact (Morschheuser et al., 2015).

Play is a universal language characterized by enjoyment, established rules, and tangible and clear goals (Boinodiris, 2012), or as a behaviour reflecting the basic desire for relaxation and entertainment (Kuo & Chuang, 2016). Either played by individual or by teams, gamification can be applied to generate a broad range of innovative or enhanced business applications; it can help visualize and explain complex tasks or functionalities, engaging participants through competition, teamwork, intrigue, curiosity, and problem-solving (Boinodiris, 2012), helping in infusing a feel of ownership of performance and results (Sarangi & Shah, 2015). Points for actions, badges for rewards and leader board for competition, cash prizes, discounts, and other free perks are introduced and used to encourage service engagement (Burke, 2012b), to give positive feedback and reinforce loyalty (Teng & Chen, 2014), to increase mutual cooperation (Al-Dhanhani et al., 2014), to promote specific user behaviours (Mekler et al., 2013) or financial education (DeCos, 2015), to increase financial involvement (Rodrigues et al., 2013b), fidelity (Marlow et al., 2016), and productivity (Hamari

& Koivisto, 2015a). There are strongly divided opinions about gamification; some argue that points, badges, and levels are mere gestures that provide structure and measure progress within a system or game (Bogost, 2011), that gamification is ineffective (Montola et al., 2009), or that mixing a game into business like banking that should be taken very seriously just won´t be widely accepted by clients, or even that it might undermine banks reputation of being a thoughtful and earnest partner (Wilson, 2014). Other studies show that the results of the gamification may not be long-term, but just the result of a novelty effect (Hamari, 2013). Nevertheless, almost all scholars agree that gamification techniques may produce a variety of benefits (Hanus & Fox, 2015) with positive effects, but that these greatly depend on the context in which it is being implemented, as well as on the individuals using it (Hamari et al., 2014).

Most current mobile banking services were not designed to be fun or entertaining, just transactional, confirming the salience of the utilitarian values (Kim & Han, 2011) in the early stages of these services. It is expected that applying game techniques in a nongame context such as mobile banking may have a significant impact, perhaps even a transformational one, as it happens in some fields (Burke, 2012a). It can produce enjoyment, satisfaction (Hung et al., 2015), positive emotion, strong social relationship, a sense of accomplishment, and a chance to build a shared sense of purpose (McGonigal, 2011). At the same time helps to make the banking activities more exciting, more interesting, and more enjoyable, increasing customer engagement, satisfaction (Financialbrand.com, 2014), improving performance (Pedreira et al., 2015), and expectably generating more profit to banks (Graham, 2014). Gamification can be viewed as an attempt to convert utilitarian services into more hedonically oriented ones (Hamari, 2013).

5.2.3. Research model and hypotheses

A combination of the unified theory of acceptance and use of technology (UTAUT2) constructs with a new gamification impact construct is used as the theoretical support model for the investigation, according to **Figure 5.1**. UTAUT has been empirically tested and proven to be superior to other prevailing models (Park et al., 2007), and is therefore used herein, in its latest version, UTAUT2. The inclusion of a gamification construct in the research model allows us to reach a better understanding of the impact of this factor, which we believe can became one of the most important enhancers or boosters of mobile banking levels of

acceptance in the coming years. As gender and age may have a considerable influence on users' acceptance of mobile banking, both are also considered (Wang et al., 2003).

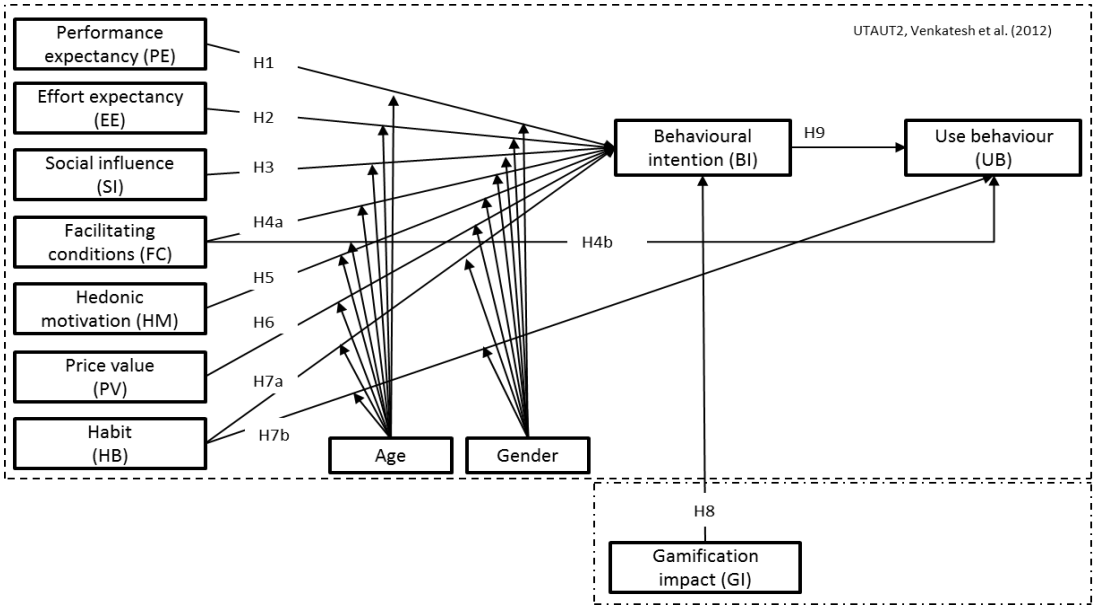


Figure 5.1 – Research model

The definition of performance expectancy suggests that individuals will use mobile banking if they believe that it will have positive outcomes (Compeau & Higgins, 1995). In terms of effort expectancy, consumers who find mobile banking easier to use become more willing to conduct banking transactions (Lin, 2011). Social influence reflects the notion that individual behaviour is influenced by the way peers, friends, or family members value the use of mobile banking. It is common for gamification services to include strong social features (Hamari & Koivisto, 2015a). In terms of facilitating conditions, a favourable set of conditions such as on-line tutorials or demos, contribute to a greater likelihood to accept the mobile banking. Therefore, we hypothesize:

H1. Performance expectancy will positively affect behavioural intention moderated by age and gender.

H2. Effort expectancy will positively affect behavioural intention moderated by age and gender.

H3. Social influence will positively affect behavioural intention moderated by age and gender.

H4a. Facilitating conditions will positively affect behavioural intention moderated by age and gender.

H4b. Facilitating conditions will positively affect use behaviour moderated by age and gender.

Hedonic motivation refers to the level of fun or pleasure derived from using mobile banking services (Venkatesh et al., 2012), historically have been linked to the classical motivation principles that people seek pleasure and avoid pain (Higgins, 2006). Price value is the consumers' cognitive trade-off between the perceived benefits of mobile banking and the monetary cost for using it (Venkatesh et al., 2012); some factors are likely to inhibit acceptance, such as initial service setup costs, transaction fees, or mobile internet costs. Habit reflects the multiple results of previous experiences (Venkatesh et al., 2012) and the frequency of past behaviour is considered to be one of the principal determinants of present behaviour (Ajzen, 2002). If the users find their mobile devices useful, they tend to embed them into their tasks and routines (Negahban & Chung, 2014).Therefore, we hypothesize:

H5. Hedonic motivation will positively affect behavioural intention moderated by age and gender.

H6. Price value will positively affect behavioural intention moderated by age and gender.

H7a. Habit will positively affect behavioural intention moderated by age and gender.

H7b. Habit will positively affect use behaviour moderated by age and gender.

Gamification uses social capital, self-esteem, and fun to overtake extrinsic rewards such as motivations for improved performance (Burke, 2012a), engaging by infusing vigour, making users dedicated and enabling them to be absorbed in their tasks (Sarangi & Shah, 2015). It is our believe that applying game techniques in a nongame context such as mobile banking will have a significant impact, increasing service acceptance rates; the greater entertainment the mobile service can provide, the greater will be the acceptance intention of customers (Zhang et al., 2012), even playing a pivotal role in increasing acceptance (Heijden, 2004). Therefore, we hypothesize:

H8. Gamification impact will positively affect behavioural intention.

Behavioural intention has a strong influence on technology use (Venkatesh et al., 2003), it is predictable and influenced by individual intention (Yu, 2012). Given that, the ultimate goal of businesses (i.e., banks) is to attract consumers to adopt their services rather than the intention to adopt services, we hypothesize:

H9. Behavioural intention will positively affect use behaviour.

5.3. Data collection research methodology

Based on the research model, an English-language questionnaire was created and reviewed for content validity by a group of information systems academics. The questionnaire contains three sections: (i) UTAUT2 data constructs, (ii) gamification questions, (iii) general information and demographic characteristics. The items and scales for the UTAUT2 constructs were adapted from Venkatesh et al. (2003) and Venkatesh et al. (2012), the use behaviour from Martins et al. (2014), and gamification impact from the authors. Each item was measured on a seven point Likert scale whose answer choice ranges from "strongly disagree" (1) to "strongly agree" (7) (**Appendix E**). The Martins et al. (2014) use behaviour was coded from 1 (never) to 11 (several times per day), according to effective mobile banking use. Age was measured in years, and gender was coded using a 0 (women) or 1 (men). As the data were collected in Brazil, the questionnaire was then translated to Portuguese, submitted to a local Brazilian academic in order to review it and correct whenever necessary according to local speech characteristics, and translated back again to English, by others, in order to validate the translation and ensure consistency (Brislin, 1970). An on-line survey instrument was designed with the revised Portuguese version of the questionnaire, hosted on a popular web service provider for collecting data, based on the fact that studies of technology acceptance have traditionally been successfully conducted using survey research (Venkatesh et al., 2003).

The study sample size needed was defined before delivering the survey instrument. The overall target number was defined according to the research theoretical model and based on a minimum expected rate of answers of 15%, and all the time and costs involved in the respondents' follow up were initially included. The target population comprised individual adults that: (i) have one or more banking accounts on a local national bank that provide Internet and mobile banking services, (ii) own one or more mobile devices, such as mobile phone, smartphone or tablet, with mobile internet access, (iii) have one or more email

addresses. For consumers the use of mobile banking services is a completely voluntary decision. According to target population, an email list of clients from a Brazilian local bank was collected, providing a solid base for the data collection.

The survey was pilot tested among a group of 50 Brazilian customers from the target population who were not included in the final sample. Preliminary evidence showed that scales were reliable and valid. A total of 1350 emails invitations to participate in the survey were then sent in September 2014 using hyperlinks that could be used only once. Second and third follow up reminders were sent over the following weeks inviting users to participate in the survey, according to some of the technics identified by Lynn (2008) for managing non-responses. From the total sample used, 314 users didn't even open or read none of the emails invitations sent, 56 answered that didn't want to participate in the study and 149 didn't conclude the answers and therefore weren't considered as valid. After the period of 12 weeks 326 valid answers were collected, above the recommended level of 200 (Bagozzi & Yi, 2012), achieving a final response rate of 24%; value considered adequate assuming that mail surveys have a tendency to produce low response rates (Fraenkel & Wallen, 2009). Non-response bias was assessed by comparing the early and the late respondents, respectively 215 and 111 customers, according to Armstrong & Overton (1977) recommendation, using the Kolmogorov–Smirnov (K–S) test. The sample distributions of the two groups did not differ statistically ($p>0.10$) indicating the absence of nonresponse bias (Ryans, 1974). Common method bias was examined using three different methods: (i) the Harman's one-factor test (Podsakoff et al., 2003), confirming that none of factors individually explain the majority of the variance, (ii) a marker-variable technique (Lindell & Whitney, 2001), adding a theoretically irrelevant marker variable in the research model, obtaining 0.015 (1.5%) as the maximum shared variance with other variables; a value that can be considered as low (Johnson et al., 2011), and (iii) correlation matrix analysis, with all the variables below the maximum correlation threshold ($r < 0.9$) (Bagozzi et al., 1991).

More than 78% of respondents were men, more than 55% are aged between 35 and 55, and more than 41% have a master or higher degree. Detailed descriptive statistics on the respondents' characteristics can be seen in **Appendix F**. All datasets used in the study are available from authors, on demand.

5.4. Analysis and results

Structural equation modelling (SEM) is a term that has been used to describe a range of statistical models used to evaluate the validity of substantive theories with empirical data (Ringle et al., 2005), for testing measurement, functional, predictive, and causal hypotheses (Bagozzi & Yi, 2012). This approach support that each explanatory and dependent variable is associated with measurement error in contrast to OLS regression, for example, that is based on the assumption that variables are measured perfectly (Bollen, 1989). The research model was tested using partial least square (PLS), a variance-based technique, with Smart PLS 2.0 M3 software (Ringle et al., 2005). This technique is known to have minimal restrictions in terms of residual distributions and sample sizes when compared to other SEM such as covariance-based techniques (Chin, 1998). PLS was considered convenient and appropriate for our research situation according to Henseler et al. (2009), because: (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 (Hair et al., 2011), (iii) it is supported by a complex model with numerous constructs (Chin, 1998), and (iv) the dimension of our sample is 10 times larger than the maximum number of paths directed to a construct (Gefen & Straub, 2005). All constructs were modelled using reflective indicators. Following Anderson & Gerbing's (1988) guidelines, our analysis was done in two different steps, (i) reliability and validity assessment of the measurement model and (ii) structural model assessment and hypotheses testing. These two steps are described next.

5.4.1. Measurement model

Our statistical analysis included the calculation of construct reliability, indicator reliability, convergence validity, and discriminant validity of the measurement model. All of these steps are described as follow.

All the constructs have composite reliability and Cronbach's alpha greater than 0.7, as seen in **Table 5.1**, confirming the constructs' reliability (Straub, 1989). The indicator reliability was evaluated based on the criterion that loading should be higher than 0.7 and that every loading below 0.4 should be eliminated (Churchill, 1979). All of the loadings were higher than 0.7 and statistically significant at 0.01, confirming a good indicator reliability of the instrument. The convergence validity was then tested with average variance extracted (AVE),

all constructs compared positively against the minimal acceptable value of 0.50 (Fornell & Larcker, 1981; Henseler et al., 2009).

Table 5.1 – Quality criteria and factor loadings

Construct	AVE	Composite Reliability	Cronbach's Alpha	Item	Loadings	t-value
Performance expectancy (PE)	0.844	0.956	0.938	PE1	0.931	100.421
				PE2	0.937	96.151
				PE3	0.925	67.364
				PE4	0.880	47.815
Effort expectancy (EE)	0.776	0.933	0.905	EE1	0.880	31.180
				EE2	0.890	42.063
				EE3	0.908	44.764
				EE4	0.844	25.082
Social influence (SI)	0.811	0.928	0.881	SI1	0.940	72.275
				SI2	0.946	96.362
				SI3	0.809	30.520
Facilitating conditions (FC)	0.734	0.892	0.819	FC1	0.881	38.485
				FC2	0.834	21.128
				FC3	0.854	30.286
Hedonic motivation (HM)	0.782	0.915	0.868	HM1	0.921	81.815
				HM2	0.907	111.391
				HM3	0.822	33.443
Price value (PV)	0.897	0.972	0.962	PV1	0.939	81.072
				PV2	0.945	83.606
				PV3	0.947	78.473
				PV4	0.957	117.774
Habit (HB)	0.929	0.963	0.923	HB1	0.963	168.568
				HB4	0.965	187.194
Gamification impact (GI)	0.725	0.888	0.816	GI1	0.854	34.949
				GI2	0.814	34.799
				GI3	0.884	42.560
	0.860	0.948	0.919	BI1	0.917	63.816

Construct	AVE	Composite Reliability	Cronbach's Alpha	Item	Loadings	t-value
Behavioural intention (BI)				BI2	0.931	77.832
				BI3	0.933	78.374

Fornell-Larcker and cross-loadings criteria were used to analyse discriminant validity. As seen in **Table 5.2**, the condition of the square root of AVE being greater than the correlation between constructs (Fornell & Larcker, 1981) is verified. The next step taken was to ensure that each item presents a higher loading on its corresponding factor than the cross-loading on other factors (Chin, 1998). Three items (FC4, HB2, and HB3) failed the test and were excluded. At the end, both criteria were satisfied providing evidence of discriminant validity of the scales. Cross-loadings results are available from authors on request.

Table 5.2 – Correlation matrix with mean and standard deviation values

	Mean	SD	PE	EE	SI	FC	HM	PV	HB	GI	BI	UB	Age	Gender
Performance expectancy (PE)	5.472	1.910	**0.918**											
Effort expectancy (EE)	6.053	1.456	0.597	**0.881**										
Social influence (SI)	3.569	2.113	0.397	0.228	**0.901**									
Facilitating conditions (FC)	5.826	1.808	0.530	0.679	0.149	**0.856**								
Hedonic motivation (HM)	3.483	2.078	0.504	0.440	0.562	0.291	**0.884**							
Price value (PV)	5.112	1.936	0.576	0.507	0.349	0.433	0.434	**0.947**						
Habit (HB)	3.885	2.393	0.757	0.578	0.395	0.432	0.558	0.567	**0.964**					
Gamification impact (GI)	4.075	2.379	0.308	0.223	0.417	0.103	0.528	0.228	0.333	**0.851**				
Behavioural intention (BI)	5.387	2.025	0.691	0.551	0.401	0.389	0.499	0.527	0.788	0.453	**0.927**			
Use behaviour (UB)	6.368	3.068	0.689	0.501	0.280	0.428	0.413	0.491	0.794	0.237	0.669	**NA**		
Age	46.534	12.227	-0.238	-0.208	-0.072	-0.180	-0.158	-0.256	-0.288	-0.284	-0.260	-0.176	**NA**	
Gender	0.785	0.411	-0.024	0.007	0.067	-0.028	0.032	0.038	0.056	-0.007	0.070	0.114	0.155	**NA**

Note: Square root of AVE (in bold on diagonal) and factor correlation coefficients, SD - standard deviation

The measurement model results indicate that the model has good construct reliability, indicator reliability, convergence validity, and discriminant validity, ensuring that the constructs are statistically distinct and can be used to test the structural model.

5.4.2. Structural model and hypotheses testing

To further test for multicollinearity, normally considered as threat to experimental model design (Farrar & Glauber, 1967), we computed the variance inflation factor (VIF) confirming that it doesn't exist; all variance inflation factors obtained were lower than 5 (Rogerson, 2001). The analysis of hypotheses and constructs' relationships were based on the examination of standardized paths. The path significance levels were estimated using the bootstrap resampling method (Henseler et al., 2009), with 500 iterations of resampling (Chin, 1998). The results are summarized and presented in **Figure 5.2**.

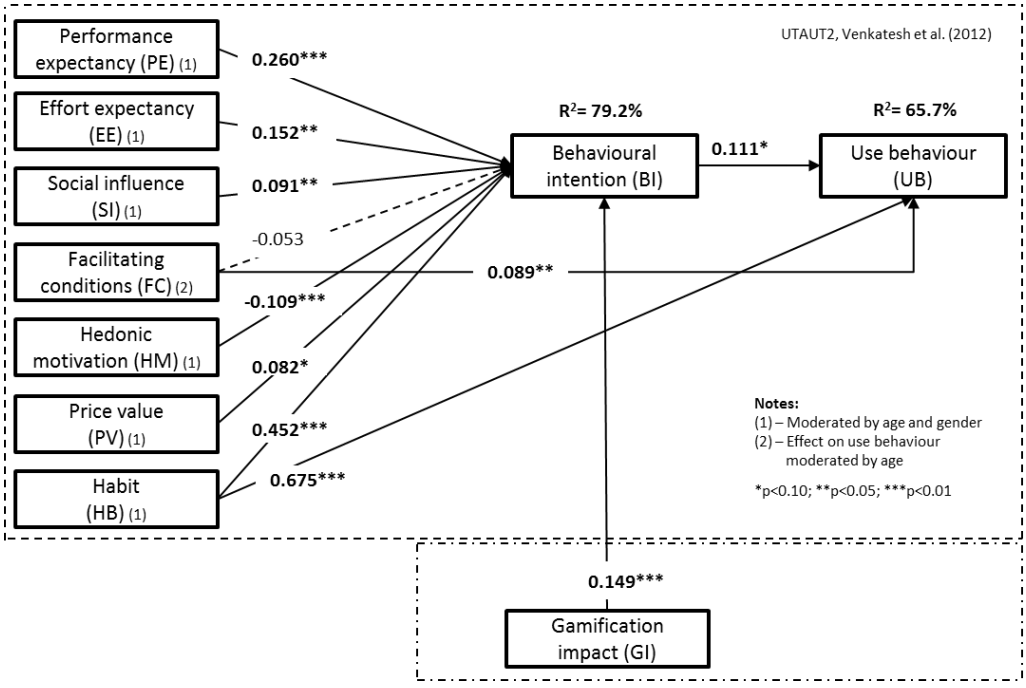


Figure 5.2 – Structural model results

The model explains 79.2% of variation in behavioural intention and 65.7% in use behaviour. Performance expectancy ($\hat{\beta}$=0.260; p<0.01), effort expectancy ($\hat{\beta}$=0.152; p<0.05), social influence ($\hat{\beta}$=0.091; p<0.05), price value ($\hat{\beta}$=0.082; p<0.10), habit ($\hat{\beta}$=0.452; p<0.01),

and gamification impact ($\hat{\beta}$ =0.149; p<0.01) were found to be statistically significant in explaining behavioural intention. Hedonic motivation's relationship with behavioural intention was also statistically significant ($\hat{\beta}$ =-0.109; p<0.10), but the sign was negative, contrary to what was expected. In terms of use behaviour, the statistically significant constructs were facilitating conditions ($\hat{\beta}$ =-0.089; p<0.05), habit ($\hat{\beta}$ =-0.675; p<0.01), and behavioural intention ($\hat{\beta}$ =0.111; p>0.10). The influence of facilitating conditions over behavioural intention was found not statistically significant.

Some of the interaction path coefficients were statistically significant over behavioural intention, as seen in **Table 5.3**, namely PE*Age ($\hat{\beta}$ =-0.181; p<0.05), PE*AgexGender ($\hat{\beta}$=0.195; p<0.05), SI*Age ($\hat{\beta}$=0.204; p<0.01), SI*Gender ($\hat{\beta}$=0.164; p<0.01), SI*AgexGender ($\hat{\beta}$ =0.124; p<0.10), HM*Age ($\hat{\beta}$ =-0.080; p<0.10), HM*Gender ($\hat{\beta}$ =-0.121; p<0.10) , PV*Gender ($\hat{\beta}$ =-0.089; p<0.10), and Age*Gender ($\hat{\beta}$ =-0.101; p<0.05). The only interaction over use behaviour found to be significant was gender ($\hat{\beta}$=0.077; p<0.05).

Table 5.3 – Structural model with path coefficients with direct and interaction effects

	Construct		**x Age**		**x Gender**		**x Age x Gender**	
Behavioural intention	PE	**0.260*** **	**PE * Age**	**-0.181****	PE * Gender	0.072	**PE * AgexGender**	**0.195****
	EE	**0.152****	EE * Age	0.011	EE * Gender	-0.047	EE * Gender	-0.047
	SI	**0.091****	**SI * Age**	**0.204*** **	**SI * Gender**	**0.164*** **	**SI * AgexGender**	**0.124***
	FC	-0.053	FC * Age	0.044	FC * Gender	0.017	FC * AgexGender	-0.073
	HM	**-0.109*** **	**HM * Age**	**-0.080***	**HM * Gender**	**-0.121***	HM*AgexGender	-0.070
	PV	**0.082***	PV * Age	0.007	**PV * Gender**	**-0.089***	PV * AgexGender	0.015
	HB	**0.452*** **	HB * Age	0.064	HB * Gender	-0.013	HB * AgexGender	-0.071
	GI	**0.149*** **						
			Age	-0.003	Gender	0.016	**AgexGender**	**-0.101****
Use behaviour	FC	**0.089****	FC * Age	0.030				
	HB	**0.675*** **	HB * Age	0.032	HB * Gender	0.028	HB * AgexGender	-0.042
	BI	**0.111***						
			Age	0.058	**Gender**	**0.077****	AgexGender	0.033

Note: *p<0.10; **p<0.05; ***p<0.01; PE: performance expectancy; EE: effort expectancy; SI: social influence; FC: Facilitating conditions; HM: hedonic motivation; PV: price value; HB: Habit; GI: gamification impact; BI: behavioural intention.

5.5. Discussion

Our research model is unique, combining the extended unified theory of acceptance and use of technology (UTAUT2), from Venkatesh et al. (2012), with a new gamification construct, to explain mobile banking acceptance and the impact of gamification on intention to use this service. The research model explains 65.7% of variation in use behaviour of mobile banking. **Table 5.4** shows the outcomes of hypotheses tested. The effect of behaviour intention on use behaviour was found to be significant, as well the influence of habit and facilitating conditions. Gamification impact positively and significantly influences behavioural intention, confirming the importance that the use of game mechanics and game design techniques can have on the intention to use mobile banking services. This a clear sign that banks and financial institutions should study, design and implement gamification technics in their mobile systems, services, and applications. The other factors influencing behavioural intention are performance expectation, effort expectancy, social influence, hedonic motivation, price value, and habit. Earlier research on mobile banking acceptance and potential gamification impact is very limited, not following the accelerated and consistence grow of banks and financial institutions that already decided to apply it, registered worldwide in the last few years; a gap we try hereby to reduce. This is the first time to our knowledge that UTAUT2 and a gamification construct are combined in a mobile banking acceptance work, supported by data from a South American country, Brazil, providing new insights, new implications for research and practice as presented in the following sections.

Table 5.4 – Hypotheses outcomes

Hyp	Construct	BI	UB	Age	Gender	Finding	Conclusions
H1	PE	☑		☑	☑	Positive and statistically significant ($\hat{\beta}$ =0.260; p<0.01). Effect significant with age moderator	Partially supported
H2	EE	☑		☑	☑	Positive and statistically significant ($\hat{\beta}$ =0.152; p<0.05). Effect not significant with moderators	Partially supported
H3	SI	☑		☑	☑	Positive and statistically significant ($\hat{\beta}$ =0.091; p<0.05). Effect significant with moderators, gender differs from expected	Partially supported
H4a	FC	☑		☑	☑	Not statistically significant	Not supported
H4b	FC		☑	☑		Positive and statistically significant ($\hat{\beta}$ =0.089; p<0.05). Effect not significant with moderators	Partially supported
H5	HM	☑		☑	☑	Negative and statistically significant ($\hat{\beta}$ =-0.109; p<0.01). Effect significant with moderators, gender differs from expected	Not supported
H6	PV	☑		☑	☑	Positive and statistically significant ($\hat{\beta}$ =0.082; p<0.10). Effect significant with gender moderator	Partially supported

Hyp	Construct	BI	UB	Age	Gender	Finding	Conclusions
H7a	HB	☑		☑	☑	Positive and statistically significant ($\hat{\beta}$ =0.452; p<0.01). Effect not significant with moderators	Partially supported
H7b	HB		☑	☑	☑	Positive and statistically significant ($\hat{\beta}$ =0.675; p<0.01). Effect not significant with moderators	Partially supported
H8	GI	☑				Positive and statistically significant ($\hat{\beta}$ =0.149; p<0.01)	Supported
H9	BI		☑			Positive and statistically significant ($\hat{\beta}$ =0.111; p<0.10)	Supported

Note: Hyp: Hypotheses; PE: performance expectancy; EE: effort expectancy; SI: social influence; FC: Facilitating conditions; HM: hedonic motivation; PV: price value; HB: Habit; GI: gamification impact; BI: behavioural intention; UB: use behaviour.

5.5.1. Behavioural intention, hedonic motivation, gamification impact and habit

As expected, the path coefficient of behaviour intention on use behaviour was found to be significant, consistent with earlier research (Venkatesh et al., 2003, 2012), indicating that users are more likely to use mobile banking if they have the intention to use it. Men were found to use mobile banking more than women. The research model validates the statistical relationship between hedonic motivation and behavioural intention, but with a negative sign, contradicting earlier research (Raman & Don, 2013; Venkatesh et al., 2012). Assuming the accuracy of the classic motivation principle that people seek pleasure and avoid pain (Higgins, 2006), this finding can be considered as counterintuitive, and may be an artefact of the study or a direct result of the sample's own characteristics. According to our respondents, current mobile banking services can be considered as unpleasant or boring, contributing negatively to intention, as a resistance factor. In line with the completely utilitarian orientation of most mobile banking services in Brazil, people intend to use the system whenever they have to some kind of money movement, such as paying bills or transferring money, but derive no pleasure, positive emotion, or personal satisfaction from the action. Nevertheless, when respondents are confronted with questions regarding the potential impact of gamification techniques such as points, rewards, or prizes (i.e. better interest rates, fees reductions, or credits for positive financial behaviour), they respond positively to possible future fun and enjoyment in a mobile banking environment, confirming the strong statistical relationship between gamification and behavioural intention. These findings are compatible with some earlier research (Graham, 2014; Kuo & Chuang, 2016; Yoon, 2009; Zichermann & Linder, 2010), but contradicts others (Bogost, 2011; Montola et al., 2009), where negative effects on the services provided were identified, at short and long term. Both moderators (age and

gender) influenced hedonic motivation impact over intention, such that it was a stronger inhibitor for older individuals and, contrary to what was expected, also a stronger inhibitor for men, which is another interesting peculiarity of the study, at odds with earlier research (Venkatesh et al., 2012).

The research model validates both habit relationships, between behavioural intention and use behaviour, consistent with earlier research (Luo et al., 2010; Zhou et al., 2010). Age and gender did not moderate habit, contradicting some earlier research (Venkatesh et al., 2012), but in line with others (Xu, 2014). Habit was seen by the respondents as the most important factor in mobile banking acceptance independently of the age and/or the gender.

5.5.2. Additional findings

In line with what has been suggested by earlier researchers (Luo et al., 2010; Oliveira et al., 2014; Zhou et al., 2010), our findings confirm that performance expectancy has a direct impact on the behavioural intention to use mobile banking and that these services deliver positive outcomes to users. The moderating influence of age on performance expectancy impact was confirmed and found to be stronger for younger individuals. Effort expectancy was also found to be significant over intention, confirming that users find mobile banking easy to use and to conduct banking transactions, in line with related research (Im et al., 2011; Venkatesh et al., 2012; Zhou et al., 2010). None of the moderator's path coefficient were found significant over effort expectancy, in line with some earlier studies (Martins et al., 2014).

Similar to the findings reported in some earlier studies (Riquelme & Rios, 2010; Venkatesh et al., 2003), social influence was found to be significant over behavioural intention, showing that our respondents are concerned about environmental factors such as the opinion or feelings of friends and family members. Providing features such as sharing functions, badges, and likes affords users to communicate or make visible their behaviours in their social network (Hamari & Koivisto, 2015b). Age and gender were found to be significant over social influence, such that it was stronger for older individuals and, contrary to what was expected, also stronger for men, contradicting earlier research (Venkatesh et al., 2003) in which women emerged as the stronger gender.

Facilitating conditions were found to have a mixed effect; significant over use behaviour and not significant over intention. Several studies have confirmed the impactful role of facilitating conditions on both intention and use (Raman & Don, 2013; Venkatesh et al., 2012; Zhou et al., 2010). Some studies did not obtain significant results over intention (Hsieh et al., 2014), and others over use (Martins et al., 2014). We believe that this finding may be due to the fact that people in the region where the study was conducted do not expect to have strong institutional support to help them, but this feeling disappears when they start using the mobile banking service and discover a whole set of facilitating conditions such as mobile banking tutorials, on-line demos, and chat or support lines. In some cases even the bank branches' employees encourage and teach customers how to use mobile services when they visit the bank branches. None of the moderator's path coefficient were found to be significant over facilitating conditions.

Price value was found to be significant over behavioural intention, consistent with some earlier research (Luarn & Lin, 2005; Venkatesh et al., 2012), but contradicting others (Yang et al., 2012). Gender moderator influence on price value impact was confirmed and found to be weaker for men.

5.6. Implications for research and practice

This study and its results have implications for researchers and practitioners. For researchers, it provides a basis for further refinement of individual models of acceptance, as a starting point for future research on acceptance and gamification. Being UTAUT2 one of the most important and complete theoretical model used in information systems research, identifying factors to extend it is always a noteworthy fact, even more if it help to reinforce the results significance and predictability. For practitioners, understanding the key constructs in the proposed research model is crucial to design, refine, and implement mobile banking services that yield high consumer acceptance. By understanding the main factors affecting user acceptance and use of mobile banking services, constraints, and particularities, namely those concerned with performance and effort expectancy, social influence, habit, hedonic motivation, and gamification impact, banks will be able to evolve, aligning functionalities with real customers' needs, adapting marketing strategies, service development, and service design.

Successful gamification involves the repetition of desired outcomes (Robson, et al., 2015). What gamification does incredibly well is induce voluntary change in behaviour, mind-set, or attitude in the desired direction; in other words, it enables transformation (Mishra, 2013) when it is well used and designed properly. As with any fad, when it's used clumsily and hastily it begins to lose its value and gain criticism (Smith, 2012). When well applied, it is expected that the use of game mechanics may have a transformational impact on mobile services (Burke, 2012a), and in the banking sector. Gamification is not a universal remedy that can be applied to all cases; each situation is unique, changes should be tailored to the technology, system, service, and target customers that they intend to serve. From social psychology and behavioural economics, we know that the most likely gamification will motivate some people, will demotivate other people, and for a third group there'll be no effect at all (Bergstein, 2011). Banks should gradually balance the right amount of utilitarian and hedonic dimensions in their systems, in order to leverage the most customer engagement possible and to reduce the risk or probability of side effects appearance such as lack of attention or over-trust, which should be avoided to maintain a safe, reliable and effective financial transactions environment. The mobile banking system must be designed in such a way that its effectiveness can be quantifiably measured (Boinodiris, 2012) and achievements tracked (Rodrigues et al., 2013a), allowing adjustments to outcomes until the desired level is reached. The application of gamification to mobile banking should be an interactive process, incorporating refinements responding to internal banking factors, i.e. stockholders, contents, goals, product campaigns, marketing, and user targets, and external factors, i.e. context, platform, barriers, and competition. Business managers must assess the impact of the longer-term changes that gamification will cause, positive and negative ones, and begin to position their organizations to capitalize on the trend. It is expected that over time gamification will gradually influence the evolution of actual users' feelings toward hedonic motivation, transforming them into a positive and significant effect on behavioural intention, playing at the same time a pivotal role to increase acceptance (Heijden, 2004), capture new customers, and reinforce channel penetration and loyalty.

Banks should continue educating consumers about the usefulness, convenience, and advantages of the service. Gamification can also be used to spread awareness and financial education to customers from all ages, as a recent study proved, it starts with children (DeCos, 2015). Mobile banking acceptance and use will probably increase during the coming years, whether from a direct effect on mobile and devices use habit, from applying game

mechanisms to improve user experience (Seaborn & Fels, 2015), or from any other movement. Banks and financial institutions should channel their time and money toward improving channel usability and user experience. Facilitating conditions and security awareness are other important features to pursue; if customers believe that banks, through their mobile banking service, are able to develop effective service delivery strategies, support and provide adequate protection from fraud and violation of privacy, then acceptance intention will increase (Lin, 2011). When people compare their gaming points, badges and rewards they are benchmarking themselves (Hamari, 2013). Mobile banking marketers can enhance peer and social influence through various channels (Chang et al., 2014). The importance of social influence is also expected to grow in direct proportion to the introduction of gamification into mobile banking, as customers receive recognition for their achievements and social interaction increases across social networking sites.

5.7. Limitations and future research

There are several limitations in this study that invite further examination and additional research. Starting with the sample used in this work, we can say it is biased toward users rather than non-users. The respondents were selected from only one Brazilian bank and it is therefore inadvisable to generalize findings to the entire banking industry. Research should be replicated to examine the work's findings across different environments, technologies, and individuals. Progress in user acceptance models can be made by introducing new constructs such as risk or trust, as a key predictor of consumer attitudes (Al-Debei et al., 2015), or including age, gender and others moderators in the gamification impact path coefficient towards behavioural intention, further reinforcing results' significance and predictability, as well as providing a better understanding of these two important factors for acceptance. Going a bit further, modifying the research model in order to include new moderators, such as experience, income, residence area (city vs. rural), education level, and religion could be interesting to explore. Online gaming was found to play a significant role in the development of internet addiction (Jiang, 2014). Understanding the impact of Internet addition in gamified mobile banking services usage could also be a fruitful direction for future research. Focusing on the nature of system use (whether utilitarian or hedonic), in a multi-channel environment as banking, is another suggestion that may provide new insights on acceptance, as understanding synergies between channels may help banks and financial institution to boost their business (Wu & Wu, 2015).

Culture can also influence the way hedonic and game techniques can be applied; it is necessary to understand what works in a particular culture and plan for the correct customer interactions (Plummer, 2012). Not everyone is motivated by the same techniques, each group will have its have own motivations, some more competitive, some more assertive, and others more passive (Olding, 2012). Given that beliefs and values are not necessarily static, longitudinal studies that examine how the mobile banking acceptance evolves aligned with the gamification implementation would provide additional insights. Some studies have showed that the results of the gamification may not be long lasting, as mentioned in the theoretical background section. It should therefore be interesting to understand the impact of continued use, confirming if this affirmation is true or not. Sporadic nature of usage may not be compatible with persistent game benefits, as the users might not spend enough time in the service to become interested in them, providing another interesting field of future research related with users' involvement measurement and respective impact. Many features in mobile devices depend on Internet access and the quality of service provided by mobile service carriers. Future research can also study the impact of mobile carriers' service quality on perceived behavioural intention and use.

5.8. Conclusions

The gamification in mobile banking services, when used and designed properly, can help make banking activities more exciting, more interesting, and more enjoyable, and in turn increase customer acceptance, engagement and satisfaction. Mobile banking for sure do not need to be so serious, in terms of user experience. Based on earlier mobile banking acceptance studies, this research conducted an analysis using an innovative model, extending UTAUT2 with a gamification impact construct. Findings reveal convergences and divergences with earlier findings, confirming the unique characteristics of the South American region where the study was conducted. A direct and strong relationship between gamification and intention was confirmed, and hedonic motivation and habit were found to be significant antecedents of behaviour intention. The results also confirmed the influence of habit and behavioural intention over use behaviour, and performance expectancy, effort expectancy, social influence, and price value over behavioural intention. Men were found to use mobile banking more than women. By including a new construct in the proposed research model we also added a stronger determinant to predict intention to use mobile banking, and thus provided more predictive power to existing UTAUT2. For researchers this study provides a

basis for further refinement of individual models of acceptance and for future research on acceptance and gamification impact. For practitioners, understanding the key constructs is crucial to design, refine, and implement mobile banking services that achieve high consumer acceptance and value, and with the right amount of game techniques in them.

Chapter 6 - What drives mobile banking acceptance? Insights from an intercontinental study

6.1. Introduction

Technological advancements in the area of telecommunications and information technology have revolutionized the banking industry. The deliverable of financial services has experienced major changes during the last five decades through the use of self-service technologies, beginning with the ATMs in the 1970s, moving to call-centres in the 1980s, Internet banking in the late 1990s, and finally to the mobile banking, in the last years. We are now on the second wave of mobile banking services, after the not very successful wap versions of the beginning of the century meanwhile almost abandoned or completely misused. The ever-increasing spread of Internet-enabled phones, smart phones and tablets, increasingly multifunctional, slimmer and sophisticated, combined with fast, good, reliable and affordable communications networks, have encourage banks to develop and provide owned self-service banking applications also for mobile devices, creating an all new subset of electronic banking services. Mobile has become the dominant means for consumers to interact with their banks (Bain&Company, 2014), expected to exceed 1.75 billion users by 2019, representing more than 32% of global adult population (Juniper, 2015). Even not considering the mobile banking as one of the recent mobile technological wonders (Shaikh & Karjaluoto, 2014), the phenomenon is so important that some have described it as one of the most promising and important development in the field of mobile commerce and in banking industry (Lin, 2011).

This work provides several contributions for research and practice, contributing to the advancement of knowledge, exploring and discussing direct implications for banks, financial institutions, mobile banking managers, IT and marketing departments, users, and researchers. The main contributions of this study are threefold. First, we investigate the direct effects of the mobile banking acceptance determinants using an integrated model, following Venkatesh et al.'s (2012) suggestion to test their extended unified theory of acceptance and use of technology theory (UTAUT2) in different countries, age groups and technologies, identifying at the same time factors to extend it. Second, built on the premise that mobile banking perceived risk may be higher than traditional branch services (Koenig-Lewis et al., 2010), due to the natural implicit uncertainty of the environment (Pavlou, 2003), and the fact that trust plays an important factor mitigating the inherent risks in transactions (Ehavior & Pavlou,

2002), we introduced Bélanger & Carter (2008) risk and trust model in this work. Combining it with UTAUT2 intends to reinforce even more results significance and predictability, capturing in the same work positive and negative factors towards acceptation. There is limited empirical work which simultaneously capture the success or positive and resistance or negative factors (Lee, 2009). This study fill in this gap in literature capturing both factors towards mobile banking acceptance. It is the first time, to our knowledge, that UTAUT2 and Bélanger & Carter trust and risk model are combined in a single mobile banking acceptance work, joining the strengths of these two well-known theories with data from three different countries, from three distinct continents, namely Portugal, Brazil, and Mozambique. This is important because of globalisation of business and systems, following a pressing need to understand differences and similitudes between consumers in different countries. Third, for the statistical analysis we use the consistent partial least square (PLSc) (Dijkstra & Henseler, 2015b), providing for the first time results of this innovative statistical method in the mobile banking industry, as far as we know not yet done until now. Supported in the fact that the PLSc introduce several improvements maintaining at the same time all PLS' strengths (Dijkstra & Henseler, 2015b), this work presents depth and reliable results, providing a solid base the for the practical and theoretical implications discussion.

This chapter is organized as follow. We will start with an overview of the theoretical background, introducing the mobile banking, the acceptance models most widely used, ending with UTAUT2, trust and risk models description. On the second part the research model and hypotheses that will be analysed are presented, followed by the data analysis, results, implications for research and practice, limitations, and ending with the work' conclusions.

6.2. Theoretical background

Mobile Banking is understood as a channel whereby the customer interacts with a bank through a mobile device (Singh et al., 2010), such as a mobile phone, tablets or smartwatch, to access banking services and perform financial transactions (Anderson, 2010). Some authors consider mobile banking as a natural evolution of electronic banking which empowered consumers to complete financial transactions via mobile or handheld devices (Pousttchi & Schurig, 2004), others see it as an instance of the mobile commerce (Kim et al., 2009; Ratten, 2012). People's inclination towards mobility is increasing, simply because the value of time

and distance barriers are getting more tangible, reducing and managing time-intensive banking affairs (Bidar et al., 2014), combined with the fact that mobile phones are now the predominant communication device that people and business globally use on a daily base (Ratten, 2012). It can offer unique value to consumers; it enables times and place independence (Laukkanen, 2007), convenience, flexibility, contextuality (Lee & Benbasat, 2003), ubiquity, and personalization (Duane et al., 2011). For banks and telecom service providers it can also increase revenue (Kim et al., 2009), foster stronger relationships with customers (Riquelme & Rios, 2010), and in some case can even help to obtain competitive advantages (Au & Kauffman, 2008).

6.2.1. Acceptance models

Several and distinct models have been proposal through the years; information technology acceptance literature provides a vast pool of them (Davis, 1989; Fishbein & Ajzen, 1975; Rogers, 1962; Venkatesh et al., 2003). The technology acceptance model (TAM), from Davis (1989), has been one of the theories most widely used to explain individual's acceptance of information systems (Surendran, 2012). It posits that usefulness and ease of use beliefs predict individual usage intention. Under the theory of reasoned action (TRA), from Fishbein & Ajzen (1975), the behaviour is determined by its intention to perform, which in turn is determined by the person's attitudes and his subjective norms towards the behaviour. The theory of planned behaviour (TPB), from Ajzen (1991), is an extension of TRA where the acceptance is guided by behavioural, normative, and control beliefs. IDT, innovation diffusion theory, posted by Rogers (1962), proposed five key attributes influencing acceptance behaviour: (i) relative advantage, (ii) complexity, (iii) compatibility, (iv) triability, and (v) observability.

More recently, Venkatesh et al. (2003) developed the unified theory of acceptance and use of technology (UTAUT), attempting to unify previously antecedents of technology acceptance (Kim & Kankanhalli, 2009), built on eight prominent theories, namely (i) TRA, (ii) TAM, (iii) motivational model (Davis et al., 1992), (iv) TPB, (v)PC utilization model (Thompson et al., 1991), (vi) IDT, (vii) social cognitive theory (Compeau & Higgins, 1995), and (viii) integrated model of technology acceptance and planned behaviour. Since their appearance, UTAUT model has gradually drawn researchers' attention (Yu, 2012), being incrementally tested and applied to several areas such as mobile payments, Internet and mobile banking,

mobile and electronic commerce, instant messaging, desktop computing, podcast, MP3, software as a service, or cloud computing (Chang et al., 2013; Im et al., 2011; Nguyen et al., 2014). To overcome some known limitations (Negahban & Chung, 2014), Venkatesh et al. developed UTAUT2 in 2012, extending and adapting the model to the individual context, and adding three new constructs; hedonic motivation, price value and habit (Venkatesh et al., 2012). The model has now seven constructs: (i) performance expectancy - degree to which a technology will provide benefits to consumers in performing certain activities, (ii) effort expectancy - degree of ease associated with consumers' use of technology, (iii) social influence - the extent to which a consumer perceive that friends and family believe he should use a particular technology, (iv) facilitating conditions - consumers' perception of resources and support available to perform a behaviour, (v) hedonic motivation - fun or pleasure derived from using a technology, (vi) price value - consumers' cognitive trade-off between the perceived benefits and the monetary cost for using it, and (vii) habit - perceptual construct that reflects the results of prior experiences (Venkatesh et al., 2012). The moderating variables in UTAUT2 are now age, gender and experience.

6.2.2. Trust and risk

Trust and risk are interrelated concepts (Hanafizadeh et al., 2014). When a new innovative service is introduced, customers may feel fearful about using it (Luarn & Lin, 2005). Literature suggest that trust will contribute to shape the acceptance of end-user (Kim et al., 2009; Oliveira et al., 2014), helping reduce fears, potential risks and facilitating business transactions (Corritore et al., 2003). On the other side, perceived risk sentiments towards mobile banking services are influenced by perceptions of risk and uncertainties regarding security, transactions, and data transfers (Duane et al., 2011). Consumers find it substantially more difficult to judge the trustworthiness of an institution in an mobile electronic setting than in the conventional business face-to-face context (Gefen et al., 2003; Mohammadi, 2015).

Intensive research on trust have been made in a diversity of fields such as anthropology, economics, organizational, managerial, psychology, sociology, social, and privacy (Cho et al., 2007; Corbitt et al., 2003; Kim et al., 2008). Different trust definitions have been presented through the years, from willingness to depend (Pavlou et al., 2007), trusting beliefs dealing with benevolence, competence, honesty, and predictability that lead to a

trusting intention (Mcknight & Chervany, 2001), to the belief which user accept that the technology will perform task according to their confident expectations (Hernández-Ortega, 2011). Trust is expected to be driven by past experience, long-term orientation, positive trusting stance, and feeling of control (Jarvenpaa & Tractinsky, 1999). It is considered as a mobile banking acceptance facilitator (Zhou, 2012b), essential for adoption and usage (Malaquias & Hwang, 2016), a prerequisite for successful commerce (Kim et al., 2005), with a significant effects on the decision to buy a product or service (Chau et al., 2007).

In the information technology field the literature predominantly has addressed the notion of perceived risk (Pavlou, 2003), since risk is difficult to measure objectively (Bélanger & Carter, 2008), positing it as a prominent barrier to consumer acceptance (Kim et al., 2008; Lee, 2009), or as an important acceptance inhibitor (Luo et al., 2010). Since the time that online transactions became popular, that perceived risk scope have been evolving; primarily regarded as fraud or lack of product quality (Wu & Wang, 2005), now have a more complete definition being often considered as certain types of financial, product performance, social, psychological, physical, or time risks when consumers make transactions online (Forsythe & Shi, 2003). This definition is aligned with the seven risk factors identified by Featherman & Pavlou (2003) who added privacy, and overall risk to the previous list, and eliminated the physical risk. Others consider it as a kind of subjective loss (Peter & Ryan, 1976), or as the possible loss when pursuing a desired outcome (Cunningham, 1967; Featherman & Pavlou, 2003).

Bélanger & Carter (2008) identified four fundamental constructs that impact intention to use electronic services, combining trust and risk constructs, according to **Figure 6.1**. The model is supported by the popular theory of reasoned action (TRA), from Fishbein & Ajzen (1975).

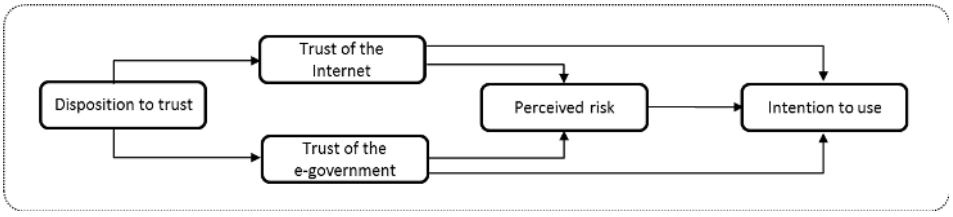


Figure 6.1 – Trust and risk model (Bélanger & Carter, 2008)

Trust is here understood as an expectancy that the promise of an individual or group can be relied upon (Rotter, 1971). Having the premise that trust have two different targets: (i) the entity providing the service and (ii) the mechanism through which it is provided (Tan & Thoen, 2001). Trust is therefore composed by the traditional view of a specific entity, in the original model e-Government, as well as the reliability of the enabling technology, Internet (Carter & Bélanger, 2005). This can be considered equivalent to the knowledge-based trust definition; a function of individual perceptions of the competence, benevolence and integrity of a product, service, or person (Mayer et al., 1995). In the mobile banking services context, the customer will form knowledge-based trust concerning whether or not banks, financial institutions and telecoms have all the conditions to provide the banking services properly, securely and with integrity (Lin, 2011). Disposition to trust is understood as the individual propensity to trust others (Mcknight & Chervany, 2001), or as the one's general tendency to believe or not in others (Mayer et al., 1995).

6.3. Research model, hypothesis, and data collection

A combination of the extended unified theory of acceptance and use of technology (UTAUT2), from Venkatesh et al. (2012), with trust and risk model, from Bélanger & Carter (2008), is used as the theoretical model supporting the investigation, according to the **Figure 6.2**, assuming that consumer acceptance of a new technologies is a complicate phenomenon that requires more than a single model (Shen et al., 2010). UTAUT was considered the most complete model to predict information technology acceptance (Martins et al., 2014), and this new model version even produce a substantial improvement in the variance explained in behavioural intention and use (Venkatesh et al., 2012); therefore it was used in this work. The open nature of the mobile Internet as a transaction infrastructure and its global nature create uncertainty around transactions, making trust and risk crucial elements (Hoffman et al., 1999) in acceptance studies, therefore we also introduced Bélanger & Carter (2008) risk and trust models in this study. It is the first time, to our knowledge, that UTAUT2 and Bélanger & Carter trust and risk model are combined in a single mobile banking acceptance work, joining the strengths of these two well-known theories with data from three different countries, from three distinct continents, reinforcing even more the results significance and predictability expected.

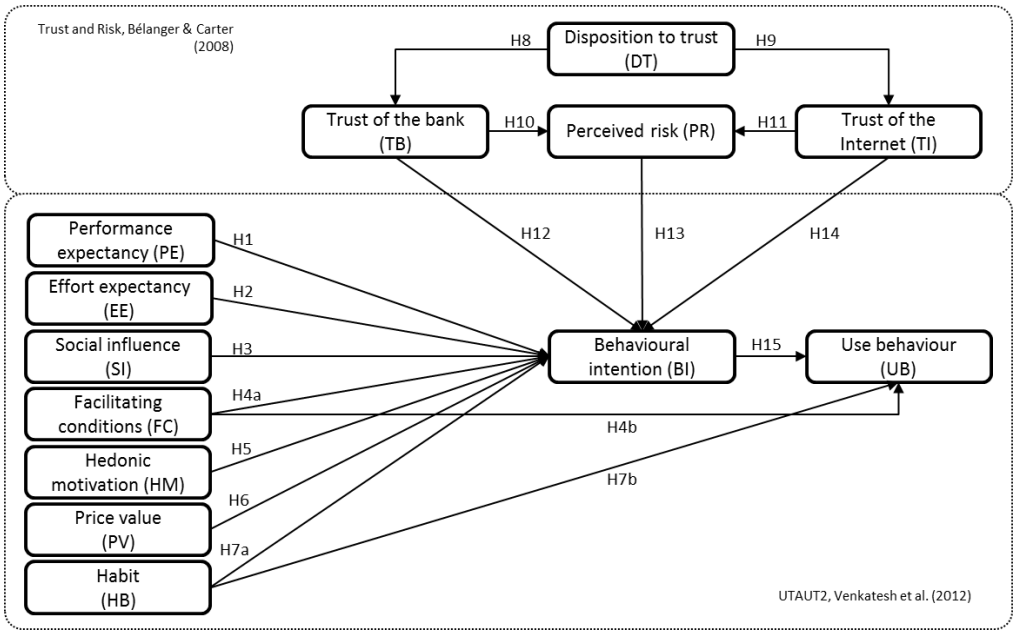


Figure 6.2 – Research model

The theoretical model has (i) seven UTAUT2 direct determinants of behavioural intention, namely performance expectancy, effort expectancy, social influence, facilitating conditions, hedonic motivation, price value, and habit, (ii) three UTAUT2 direct determinants of usage behaviour, namely facilitating conditions, habit and behavioural intention, (iii) three trust and risk model direct determinants of behavioural intention, namely trust of the bank, trust of the Internet, and perceived risk, and (iv) one indirect determinant of trust, namely disposition to trust. The intention to use construct from trust and risk model is considered equivalent to the UTAUT2 behavioural intention, acting as the joining point between both models. According to the entity providing the mobile banking service, the construct of trust was adapted to trust of the bank. All the constructs used in both models have been consistently proved individually valid in information technology field and particularly in mobile banking acceptance subject.

6.3.1. Model hypothesis

As per the theoretical foundations in the previous section, we developed hypotheses relating our model constructs, as presented in **Figure 6.2**.

Performance expectancy reflects the perception of improvements and benefits in their banking activities, such as speed, convenience, ubiquity or immediacy (Shen et al., 2010; Yang, 2009; Zhou et al., 2010). If mobile banking is considered easy to use, customer will become more willing to use them to conduct banking transactions (Lin, 2011); the degree of ease associated to it (Venkatesh et al., 2003) will define the effort expectancy. Social influence refers to the degree to which individuals perceive that others, in particular friends and family, believe he should use mobile banking services (Venkatesh et al., 2003); when they are positive it may encourage customer intention to use it. If people believe that a favourable set of facilitating conditions exists, such as tutorial or technical support, helping them using the mobile banking service, intention to use will expectably increase. Therefore, we hypothesize:

H1. The impact of performance expectancy on behavioural intention will be positive.
H2. The impact of effort expectancy on behavioural intention will be positive.
H3. The impact of social influence on behavioural intention will be positive.
H4a. The impact of facilitating conditions on behavioural intention will be positive.
H4b. The impact of facilitating conditions on use behaviour will be positive.

Hedonic aspects of an information system are important in the user acceptance and use of a technology (Heijden, 2004), assuming that the greater entertainment the greater acceptance intention customers will have (Zhang et al., 2012). Price value balance the perceived benefits of using mobile banking services with its monetary cost (Venkatesh et al., 2012), considering for example data service carriers costs, device cost, service costs and transaction fees. In previous research customer habit was verified to be a major predictor of intention (Liao et al., 2006), showing a strong correlation with use (Baptista & Oliveira, 2015). Therefore, we hypothesize:

H5. The impact of hedonic motivation on behavioural intention will be positive.
H6. The impact of price value on behavioural intention will be negative.
H7a. The impact of habit on behavioural intention will be positive.
H7b. The impact of habit on use behaviour will be positive.

Trust is an important element which affects consumer decisions to accept a technology (Chong et al., 2012). Assuming that perceived risk decreases when trust is present (Featherman & Pavlou, 2003), or that trust reduce risk perceptions (Salam et al., 2003), we hypothesize:

H8. The impact of disposition to trust on trust of the bank will be positive.

H9. The impact of disposition to trust on trust of the Internet will be positive.

H10. Higher trust of the bank will reduce the perceived risk.

H11. Higher trust of the Internet will reduce perceived risk.

As mobile banking operate in a distant and impersonal environment (Koenig-Lewis et al., 2010), consumers will perceive potential risks (Cho et al., 2007). Trust helps reduce fears of potential risks and facilitate business transactions (Corritore et al., 2003). The perceived risk by users influence negatively the intention to adopt or use the mobile banking services (Featherman & Pavlou, 2003). Therefore, we hypothesize:

H12. Trust of the bank will positively influence the behavioural intention.

H13. Perceived risk will negatively influence the behavioural intention.

H14. Trust of the Internet will positively influence the behavioural intention.

Considering that behaviour is predictable and influenced by individual intention (Yu, 2012), behavioural intention will expectably have a significant influence on technology usage (Venkatesh et al., 2003). Therefore, we hypothesize:

H15. The impact of behavioural intention on use behaviour will be positive.

6.3.2. Data collection research methodology

Considering that studies of technology acceptance have traditionally been conducted using survey research (Venkatesh et al., 2003), a questionnaire was developed based on the research model, using English (UK) language. Three distinct sections were considered: (i) general information and demographic characteristics, (ii) mobile banking usage, (iii) perceived risk. The items and scales were adapted from Venkatesh et al. (2003) and Venkatesh et al. (2012), for the UTAUT2 constructs, and from Bélanger & Carter (2008) and Featherman & Pavlou (2003), for the trust and risk constructs, as seen in **Appendix G**. Use behaviour is a formative index of seven questions, according to different mobile banking functionalities usage. Each item was measured with a seven point Likert scale, whose answer choice range from “strongly disagree” (1) to “strongly agree” (7). The survey was then translated to Portuguese and adapted according to local Portuguese particularities of each country under

study, creating three slightly different versions of it. Each version was then submitted to local academics, native spoken, one in each countries involved, in order to review it and correct whenever necessary, and from that translated back to English again, by different people. At the end the results of the three English translations were compared with the initial one, validating each of the translations and confirming consistency (Brislin, 1970). Three different on-line survey instruments were specifically designed for collecting data on mobile banking users' patterns, one for each country.

The data collection was conducted in Portugal, Brazil, and Mozambique, from actual Internet and/or mobile banking customers, namely from a Portuguese bank, a Brazilian bank, and a Mozambican Telecom company, providing a solid base for data collection for the study. The target population were individuals' adults with one or more accounts on a local national bank or Telecom that provide Internet and/or mobile banking services. Each of the three survey were individually pilot tested among a group of users, 60 in Portugal, 50 in Brazil, and 50 in Mozambique, that were not included in final sample. Preliminary evidence showed that scales were reliable and valid. A total of 4,850 email invitations to participate in the surveys were sent using hyperlinks that could be used only once; 2,300 for the Portuguese, 1,350 for the Brazilian, and 1,200 for the Mozambican one. A Second and third follow up emails were sent in the following weeks reminding users to participate in the survey, in line with some of the technics identified by Lynn (2008) for managing non-responses. After a period of twelve weeks a total of 1211 valid answers were collected; 633 from Portugal, 326 from Brazil, and 252 from Mozambique, achieving a final response rate respectively of 28%, 24%, and 21%. Considering that responses rates in email surveys have a tendency to produce low response rates (Fraenkel & Wallen, 2009), and that the values obtained are equivalent to several studies published in top-tier Journals, we consider that the final rate obtained in our work is adequate. Non-response bias was assessed by comparing the early and the late respondents in each country using the Kolmogorov–Smirnov (K–S) test, verifying that they do not differ statistically (Ryans, 1974) in none of the countries involved, and that significant non-response bias was not present. The inexistence of common method bias in the samples was tested and confirmed using two different methods: (i) Harman's test (Podsakoff et al., 2003); none of factors individually explain the majority of the variance, and (ii) through the marker-variable technique (Lindell & Whitney, 2001), obtaining 0.023 (2.3%) in Portugal, 0.040 (4.0%) in Brazil, and 0.053 (5.3%) in Mozambique, as the maximum shared variance with other variables, values that can be considered low (Johnson et al., 2011). Detailed descriptive statistics on the

respondents' characteristics of each country can be seen in **Appendix H**. All datasets used in the study are available from authors, on demand.

6.4. Data analysis and results

Structural equation modeling (SEM) has become the tool of the trade in survey-based research (Dijkstra & Henseler, 2015a). Partial least square (PLS) method was considered adequate for our research situation (Henseler et al., 2009) because of four main reason: (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 yet been tested in the literature (Hair et al., 2011), (iii) it is supported by a complex model with numerous constructs (Chin, 1998), and (iv) the minimum dimension of our sample used in each country is 10 times larger than the maximum number of paths directed to a construct (Gefen & Straub, 2005).

Working to solve some known PLS problems, Dijkstra & Henseler (2015b) proposed the consistent partial least square (PLSc) method, introducing several improvements while maintaining all PLS' strengths, and therefore we used it in our work. Two key improvements were introduced, namely: (i) path coefficients, parameters of simultaneous equations, construct correlations, and indicator loadings are now estimated consistently, and (ii) the global goodness-of-fit of the structural model can now be assessed, which makes PLSc suitable for confirmatory research (Dijkstra & Henseler, 2015a). The theoretical research model was tested using PLSc with Smart PLS 3.2.1 software (Ringle et al., 2015). Analysis was done in two steps, following Anderson & Gerbing's (1988) guidelines, starting with the reliability and validity assessment of the measurement model, followed by the structural model assessment and hypotheses testing. For PLSc, the correction for attenuation and the consistence coefficients were also calculated, following Dijkstra & Henseler (2015b) guidelines. All constructs, with the exception of behavioural use, were modelled using reflective indicators (Venkatesh et al., 2012).

6.4.1. Assessment of Measurement model

We started evaluating the measurement model for the reflective constructs examining the internal consistency (composite reliability), indicator reliability, convergent validity, and discriminant validity. Internal consistency was evaluated based on composite

reliability (CR). In the **Table 6.1** we can verify that all constructs in all countries have CR above 0.7, which suggest that constructs have internal consistency (Straub, 1989). The indicator reliability was evaluated based on the criteria that loadings should be greater than 0.7 (Hair et al., 2011). Four items that didn't reach this value were eliminated (FC4, HB2, HB3, and DT1) in the three countries for further analysis. The convergent validity, was assessed based on average variance extracted (AVE). **Table 6.1** present all constructs AVE above the recommended level of 0.50 (Fornell & Larcker, 1981; Hair et al., 2011).

Table 6.1 – Assessment of the measurement model, discriminant validity (inter-correlations) of variable constructs

		AVE	CR	PE	EE	SI	FC	HM	PV	HB	DT	TB	TI	PR	BI	UB
PORTUGAL	PE	0.801	0.942	**0.895**												
	EE	0.842	0.955	0.630	**0.918**											
	SI	0.731	0.887	0.492	0.308	**0.855**										
	FC	0.684	0.865	0.550	0.728	0.253	**0.827**									
	HM	0.614	0.803	0.539	0.393	0.558	0.307	**0.784**								
	PV	0.904	0.974	0.575	0.558	0.344	0.464	0.421	**0.951**							
	HB	0.874	0.933	0.791	0.611	0.458	0.512	0.536	0.544	**0.935**						
	DT	0.693	0.871	0.220	0.212	0.142	0.190	0.234	0.235	0.201	**0.832**					
	TB	0.764	0.927	0.394	0.342	0.299	0.274	0.419	0.428	0.421	0.412	**0.874**				
	TI	0.905	0.966	0.520	0.454	0.351	0.389	0.432	0.471	0.578	0.406	0.619	**0.951**			
	PR	0.693	0.897	-0.249	-0.206	-0.132	-0.196	-0.144	-0.205	-0.297	-0.062	-0.266	-0.448	**0.832**		
	BI	0.839	0.940	0.816	0.622	0.448	0.523	0.502	0.562	0.854	0.206	0.438	0.577	-0.295	**0.916**	
	UB	1.000	1.000	0.662	0.441	0.378	0.365	0.419	0.400	0.698	0.167	0.330	0.460	-0.208	0.669	**1.000**
BRAZIL	PE	0.793	0.939	**0.891**												
	EE	0.702	0.902	0.597	**0.838**											
	SI	0.724	0.887	0.397	0.228	**0.851**										
	FC	0.604	0.820	0.529	0.681	0.148	**0.777**									
	HM	0.704	0.869	0.504	0.440	0.562	0.291	**0.839**								
	PV	0.862	0.962	0.576	0.507	0.349	0.434	0.434	**0.928**							
	HB	0.857	0.923	0.757	0.578	0.396	0.431	0.558	0.566	**0.926**						
	DT	0.712	0.879	0.115	0.272	-0.005	0.156	0.163	0.117	0.148	**0.844**					
	TB	0.761	0.926	0.381	0.367	0.282	0.319	0.375	0.476	0.454	0.307	**0.872**				
	TI	0.928	0.975	0.553	0.461	0.275	0.408	0.450	0.528	0.625	0.242	0.656	**0.963**			
	PR	0.672	0.889	-0.337	-0.231	0.068	-0.235	-0.123	-0.315	-0.333	-0.117	-0.336	-0.536	**0.820**		

		AVE	CR	PE	EE	SI	FC	HM	PV	HB	DT	TB	TI	PR	BI	UB
	BI	0.793	0.920	0.692	0.551	0.401	0.389	0.500	0.528	0.790	0.165	0.429	0.577	-0.300	**0.891**	
	UB	1.000	1.000	0.548	0.393	0.351	0.328	0.449	0.428	0.696	0.095	0.328	0.517	-0.283	0.618	**1.000**
MOZAMBIQUE	PE	0.718	0.91	**0.847**												
	EE	0.794	0.938	0.552	**0.891**											
	SI	0.654	0.850	0.453	0.236	**0.809**										
	FC	0.506	0.707	0.532	0.625	0.303	**0.711**									
	HM	0.529	0.744	0.558	0.419	0.576	0.331	**0.727**								
	PV	0.741	0.919	0.546	0.369	0.263	0.459	0.506	**0.861**							
	HB	0.826	0.905	0.613	0.470	0.389	0.300	0.562	0.342	**0.909**						
	DT	0.608	0.823	0.288	0.284	0.210	0.237	0.231	0.365	0.246	**0.780**					
	TB	0.787	0.935	0.377	0.373	0.314	0.337	0.509	0.413	0.325	0.397	**0.887**				
	TI	0.763	0.906	0.391	0.453	0.296	0.437	0.481	0.386	0.348	0.316	0.609	**0.873**			
	PR	0.617	0.860	-0.044	-0.148	-0.094	-0.030	-0.104	-0.029	-0.037	-0.021	-0.173	-0.465	**0.785**		
	BI	0.672	0.859	0.732	0.509	0.427	0.433	0.619	0.414	0.733	0.223	0.419	0.470	-0.133	**0.820**	
	UB	1.000	1.000	0.261	0.333	0.122	0.249	0.291	0.162	0.485	0.071	0.211	0.352	-0.092	0.352	**1.000**

Notes: Square root of AVE (in bold in diagonal); AVE: average variance extracted; CR: composite reliability, PE: performance expectancy; EE: effort expectancy; SI: social influence; FC: Facilitating conditions; HM: hedonic motivation; PV: price value; HB: Habit; DT: disposition to trust; TB: trust of the bank; TI: trust of the Internet; PR: perceived risk; BI: behavioural intention, UB: use behaviour.

Discriminant validity was evaluated using three criteria: (i) Fornell-Larcker (Fornell & Larcker, 1981), (ii) cross-loadings, and (iii) HTMT – heterotrait-monotrait ratio of correlations. For the first criteria, the square root of AVE should be greater than the correlation between the constructs. In **Table 6.1** we can see that all square roots of the AVEs are greater than the correlations between every pair of constructs, supporting the discriminant validity of our scales (Fornell & Larcker, 1981). The second criterion was also achieved, i.e., all loadings are greater than cross-loadings. Following Henseler et al. (2015) guidelines we compared each of the HTMT' countries values with a threshold of .90 (Gold et al., 2001), considering that this value is adequate to use with the technology acceptance model to assess discriminant validity (Henseler et al., 2015). In Portugal all HTMT values were between 0.064 and 0.897, in Brazil between 0.085 and 0.852, and in Mozambique between 0.059 and 0.82. Inference criterion was also tested in all countries, using bootstrapping results to validate that all HTMT values were significant different from one (1). The maximum value for the up confidence interval for Portugal was 0.932, for Brazil 0.896, and for Mozambique 0.897, establishing the discriminant validity between all construct measures, achieving the third criterion. All loadings, cross-loadings, and HTMT tables are available from authors upon request.

The evaluation of internal consistency, indicator reliability, convergent validity, and discriminant validity of the constructs were adequate, indicating that the reflective constructs can be used to test the conceptual model.

For the formative construct, use behaviour, a measurement model was conducted to assess the multicollinearity, the significance weights, and outer loadings of the results in each country. To evaluate the multicollinearity we performed the variance inflation factor (VIF) statistic test. The UB2 item was removed in the three countries due to high VIF (>5), and the test executed again. All the retained items are below the threshold of 5, indicating the absence of multicollinearity among the variables (Hair et al., 2013), and they are statistically significant or have the outer loading greater than 0.5. Consequently, the formative construct can also be used to test the structural model.

6.4.2. Assessment of structural model and hypotheses testing

The analysis of hypotheses and constructs' relationships were based on the examination of standardized paths. The path significance levels were estimated using the consistence bootstrap resampling method (Dijkstra & Henseler, 2015b), with 1,000 iterations of resampling (Hair et al., 2011) each. The **Table 6.2** show the PLSc' results as well as the associated t-values of the path coefficient in each country. The model account for 86.9% of the variation in behavioural intention to use mobile banking in Portugal, 74.9% in Brazil, and 85.2% in Mozambique. In terms of use behaviour it reach a value of 52.9% in Portugal, 52.8% in Brazil, and 30.3% in Mozambique.

Table 6.2 – Results of the structural model

(PLSc)	PORTUGAL	BRAZIL	MOZAMBIQUE
Path	Coeffic./t-value	Coeffic./t-value	Coeffic./t-value
R^2 (BI)	0.869	0.749	0.852
PE→BI	**0.324/5.272*** **	0.112/0.977	**0.433/1.707***
EE→BI	0.043/1.000	0.156/1.391	-0.148/0.151
SI→BI	0.002/0.066	0.093/1.406	-0.121/0.201
FC→BI	-0.011/0.237	-0.106/1.053	0.204/0.156
HM→BI	-0.047/1.592	-0.051/0.827	0.250/0.318

(PLSc)	PORTUGAL	BRAZIL	MOZAMBIQUE
Path	**Coeffic./t-value**	**Coeffic./t-value**	**Coeffic./t-value**
PV→BI	0.020/0.693	0.013/0.227	-0.160/0.325
HB→BI	**0.589/10.908*** **	**0.647/5.577*** **	**0.461/2.826*** **
TB→BI	0.039/1.265	0.014/0.255	0.036/0.261
TI→BI	0.036/0.985	0.064/0.853	0.030/0.100
PR→BI	-0.009/0.405	-0.008/0.167	-0.094/0.390
R^2 (TB)	0.206	0.112	0.201
DT→TB	**0.454/10.789*** **	**0.334/5.281*** **	**0.448/7.654*** **
R^2 (TI)	0.195	0.067	0.133
DT→TI	**0.441/10.230*** **	**0.259/4.123*** **	**0.365/5.259*** **
R^2 (PR)	0.224	0.326	0.305
TB→PR	0.038/0.692	0.05/0.766	**0.263/2.466** **
TI→PR	**-0.496/10.457*** **	**-0.604/10.287*** **	**-0.687/7.547*** **
R^2 (UB)	0.529	0.527	0.293
R^2 (UB) Adjusted	0.527	0.522	0.284
FC→UB	-0.047/1.306	0.001/0.021	**0.202/1.667***
HB→UB	**0.568/5.447*** **	**0.650/6.556*** **	**0.670/3.130*** **
BI→UB	**0.199/1.873***	0.087/0.877	-0.287/1.046

Notes: Coeffic: Coefficient; PE: performance expectancy; EE: effort expectancy; SI: social influence; FC: Facilitating conditions; HM: hedonic motivation; PV: price value; HB: Habit; DT: disposition to trust; TB: trust of the bank; TI: trust of the Internet; PR: perceived risk; BI: behavioural intention; UB: use behaviour. *p<0.10; **p<0.05; ***p<0.01

Going on with the analysis, we found that the statistically significant paths to behavioural intention to use mobile banking are: (i) performance expectancy, in Portugal ($\hat{\beta}$ =0.324; p<0.01) and Mozambique ($\hat{\beta}$ =0.433; p<0.10), and (ii) habit, in Portugal ($\hat{\beta}$ =0.589; p<0.01), Brazil($\hat{\beta}$ =0.647; p<0.01), and Mozambique($\hat{\beta}$ =0.461; p<0.01). In terms of use behaviour, the statistically significant paths are the ones from: (i) facilitating conditions in Mozambique ($\hat{\beta}$ =0.202; p<0.10), (ii) habit, in Portugal ($\hat{\beta}$ =0.568; p<0.01), Brazil ($\hat{\beta}$ =0.650; p<0.01), and Mozambique ($\hat{\beta}$ =0.670; p<0.01), and (iii) behavioural intention in Portugal ($\hat{\beta}$ =0.199; p<0.10).

Disposition to trust construct have statistically significant paths to trust of the bank and trust of the Internet in all three countries, namely in Portugal (respectively $\hat{\beta}$=0.454; p<0.01 and $\hat{\beta}$=0.441; p<0.01), Brazil (respectively $\hat{\beta}$=0.334; p<0.01 and $\hat{\beta}$=0.259; p<0.01), and Mozambique (respectively $\hat{\beta}$=0.448; p<0.01 and $\hat{\beta}$=0.365; p<0.01).

In terms of trust towards the perceived risk: (i) trust of the bank is statistically significant in Mozambique ($\hat{\beta}$=0.263; p<0.05), and (ii) trust of the Internet is statistically significant in the three countries; Portugal ($\hat{\beta}$=-0.496; p<0.01), Brazil ($\hat{\beta}$=-0.604; p<0.01), and Mozambique ($\hat{\beta}$=-0.687; p<0.01). The **Table 6.3** shows the results of the structural model in terms of hypotheses testing.

Table 6.3 – hypotheses testing

Path	Hypotheses	Portugal	Brazil	Mozambique
PE -> BI	H1	**Supported**	Not Supp.	**Supported**
EE -> BI	H2	Not Supp.	Not Supp.	Not Supp.
SI -> BI	H3	Not Supp.	Not Supp.	Not Supp.
FC -> BI	H4a	Not Supp.	Not Supp.	Not Supp.
HM -> BI	H5	Not Supp.	Not Supp.	Not Supp.
PV -> BI	H6	Not Supp.	Not Supp.	Not Supp.
HB -> BI	H7a	**Supported**	**Supported**	**Supported**
TB -> BI	H12	Not Supp.	Not Supp.	Not Supp.
TI -> BI	H14	Not Supp.	Not Supp.	Not Supp.
PR -> BI	H13	Not Supp.	Not Supp.	Not Supp.
DT -> TB	H8	**Supported**	**Supported**	**Supported**
DT -> TI	H9	**Supported**	**Supported**	**Supported**
TB -> PR	H10	Not Supp.	Not Supp.	**Supported**
TI -> PR	H11	**Supported**	**Supported**	**Supported**
FC -> UB	H4b	Not Supp.	Not Supp.	**Supported**
HB -> UB	H7b	**Supported**	**Supported**	**Supported**
BI -> UB	H15	**Supported**	Not Supp.	Not Supp.

Notes: PE: performance expectancy; EE: effort expectancy; SI: social influence; FC: Facilitating conditions; HM: hedonic motivation; PV: price value; HB: Habit; DT: disposition to trust; TB: trust of the bank; TI: trust of the Internet; PR: perceived risk; BI: behavioural intention; UB: use behaviour.

To deepen the analysis, we produced a multi-group analysis testing the differences between the path coefficients across the three countries subsamples, two countries at each time, based on Keil et al. (2000) formula shown in **Figure 6.3**. The results are presented in the **Table 6.4**.

$$t = \frac{\beta_{(1)} - \beta_{(2)}}{\sqrt{\frac{(n_{(1)}-1)^2}{n_{(1)}+n_{(2)}-2} \cdot se^2_{\beta_{(1)}} + \frac{(n_{(2)}-1)^2}{n_{(1)}+n_{(2)}-2} \cdot se^2_{\beta_{(2)}}} \cdot \sqrt{\frac{1}{n_{(1)}} + \frac{1}{n_{(2)}}}}$$

Figure 6.3 – Multi-group analysis

Table 6.4 – Multi-group analysis results

	PT-MZ		PT-BR		BR-MZ	
	Diff	**t-value**	**Diff**	**t-value**	**Diff**	**t-value**
PE→BI	0.109	0.478	0.212	**1.756***	0.321	1.166
EE→BI	0.191	0.307	0.113	1.054	0.304	0.474
SI→BI	0.123	0.322	0.091	1.442	0.214	0.544
FC→BI	0.215	0.260	0.095	0.999	0.310	0.370
HM→BI	0.297	**2.351****	0.004	0.065	0.301	**1.970***
PV→BI	0.180	**2.113****	0.007	0.121	0.173	1.516
HB→BI	0.128	0.958	0.058	0.516	0.189	0.884
TB→BI	0.003	0.030	0.025	0.411	0.022	0.175
TI→BI	0.006	0.031	0.028	0.372	0.034	0.154
PR→BI	0.085	0.546	0.001	0.022	0.086	0.511
DT→TB	0.006	0.079	0.120	1.549	0.114	1.071
DT→TI	0.076	0.941	0.182	**2.309****	0.106	0.974
TB→PR	0.225	**2.067****	0.012	0.126	0.213	**1.713***
TI→PR	0.191	**2.034****	0.108	1.298	0.083	0.757
FC→UB	0.249	**2.618*****	0.048	0.754	0.201	**1.927***
HB→UB	0.102	0.479	0.082	0.466	0.020	0.097
BI→UB	0.486	**2.295****	0.112	0.625	0.374	**1.842***

Notes: Diff: difference between path coefficients; PT: Portugal, MZ: Mozambique; BR: Brazil; PE: performance expectancy; EE: effort expectancy; SI: social influence; FC: Facilitating conditions; HM: hedonic motivation; PV: price value; HB: Habit; DT: disposition to trust; TB: trust of the bank; TI: trust of the Internet; PR: perceived risk; BI: behavioural intention; UB: use behaviour. *p<0.10; **p<0.05; ***p<0.01

Effort expectancy, social influence, facilitating conditions, habit, trust of the bank, trust of the Internet, and perceived risk are not statistically significant different (p>0.10), being equally important for the three countries. Performance expectancy is a more important factor (p<0.1) for Portuguese ($\hat{\beta}$=0.324) than Brazilian ($\hat{\beta}$=0.112) users. Hedonic motivation is a more important factor (respectively p<0.05 and p<0.1) for Mozambican users ($\hat{\beta}$=0.250) than Portuguese ($\hat{\beta}$=-0.047) or Brazilian ($\hat{\beta}$=-0.051) ones. Price value is significant (p<0.05) and more important for Mozambican ($\hat{\beta}$=-0.160) than Portuguese ($\hat{\beta}$=0.020) users. No other statistically significant differences between the countries, related with behavioural intention, were found.

Disposition to trust towards trust of the bank didn't not show a statistically significant difference (p>0.10) between the three countries. Disposition to trust towards the trust of the Internet is a more important factor (p<0.05) for Portuguese ($\hat{\beta}$=0.441) than Brazilian users ($\hat{\beta}$=0.259), but there are no statistically significant differences between Portugal and Mozambique, neither between Brazil and Mozambique.

In terms of the perceived risk, trust of the bank is a more important factor (respectively p<0.05 and p<0.1) for Mozambican users ($\hat{\beta}$=0.263) than Portuguese ($\hat{\beta}$=0.038) or Brazilian ($\hat{\beta}$=0.050) ones. Trust of the Internet is a more important factor (p<0.05) for Mozambican ($\hat{\beta}$=-0.687) than Portuguese ($\hat{\beta}$=-0.496) users. No other statistically significant differences between the countries, related with perceived risk, were found.

For the use behaviour, behavioural intention is a more important factor (respectively p<0.05 and p<0.10) for Mozambican ($\hat{\beta}$=-0.287) than Portuguese ($\hat{\beta}$=0.199) or Brazilian ($\hat{\beta}$=0.087) users, and there are no significant differences between Portugal and Brazil. Habit and is not statistically significant different (p>0.10), being equally important for the three countries. The facilitating conditions is a more important factor (respectively p<0.01 and p<0.1) for Mozambican ($\hat{\beta}$=0.202) than Portuguese ($\hat{\beta}$=-0.047) or Brazilian ($\hat{\beta}$=0.001) users, but there are no statistically significant differences between Portugal and Brazil.

6.5. Discussion and implications for research and practice

The research model combines the strength of two well-known and stablished theories; UTAUT2 from Venkatesh et al. (2012) and trust and risk from Bélanger & Carter (2008), with data from three different countries, namely Portugal, Brazil, and Mozambique. Supported in the fact that the PLSc introduce several improvements maintaining at the same time all PLS' strengths (Dijkstra & Henseler, 2015b), we use PLSc results to present the work main findings, as described in the following sections.

6.5.1. Main findings

The research model explains 52.9% of variation in use behaviour of mobile banking in Portugal, 52.7% in Brazil, and 29.3% in Mozambique. The effect of behaviour Intention on usage behaviour was found statistically significant in Portugal, but not in Brazil neither in Mozambique, partially contradicting some previous research that found it significant (Brown & Venkatesh, 2005; Oliveira et al., 2014; Raman & Don, 2013; Venkatesh et al., 2003, 2012; Yu, 2012).

Performance expectancy was found statistically significant over behavioural intention in Portugal and Mozambique, in line with some previous research (Al-Gahtani et al., 2007; Baptista & Oliveira, 2015; Im et al., 2011), but contradicting others that didn't found it significant (Jairak et al., 2009). People in Portugal and Mozambique recognize that mobile banking brought improvements and benefits in their banking activities, valuating positively this construct. The effort expectancy was not found statistically significant in any of the three countries. This result is consistence with some earlier research (Baptista & Oliveira, 2015; Faria, 2012; Zhou et al., 2010), but contradicts others findings (Im et al., 2011; Venkatesh et al., 2012), in a movement that seems to be associated with the construct loss of importance in the same manner as people are becoming more skilled using mobile service an devices. The same happen with social influence that was not found statistically significant in any of the countries, consistent with some earlier studies (Baptista & Oliveira, 2015; Kim et al., 2009; Wang & Yi, 2012), but contradicting others (Im et al., 2011; Jairak et al., 2009). We believe that this is due to the fact that mobile banking is not yet seen as an enough social subject to talk to and discuss with friends or relatives, is seen as a private matter. Facilitating conditions was found to have no significant effect over the behavioural intention in any of the three

countries, in line with what was reported in some earlier studies (Hsieh et al., 2014; Im et al., 2011) but contradicting many others (Afshan & Sharif, 2016; Miltgen et al., 2013; Yu, 2012; Zhou et al., 2010). Facilitating conditions was found statistically significant over the use behaviour in Mozambique, but not in the other two countries. We believe that this finding may be due to the fact that people in these countries do not expect to have strong institutional support to help, but this feeling disappears when they start using the mobile banking service and discover that the supporting facilitating conditions exist, such as mobile banking tutorials, on-line demos, and support lines. As a direct result of what we think to be the completely utilitarian purpose of the majority of the actual mobile banking services, the hedonic motivation relationship was not found significant in any of the three countries contradicting earlier research (Baptista & Oliveira, 2015; Raman & Don, 2013; Venkatesh et al., 2012). Price value was also found to be not statistically significant over behavioural intention, confirming that mobile banking service is actually seen as free of charges by users. These findings are consistent with some earlier research (Koenig-Lewis et al., 2010; Yang et al., 2012) but contradicts others (Luarn & Lin, 2005; Venkatesh et al., 2012). The research model validates both relationships between habit and behavioural intention and use behaviour, in the three countries, in line with earlier research (Luo et al., 2010; Zhou et al., 2010), confirming it as a major predictor of intention (Liao et al., 2006) and use. Habit was seen by the respondents as the most important factor in mobile banking acceptance.

In what concerns to the risk and trust variables the research model explains: (i) 20.6% of variation in trust of the bank in Portugal, 11.2% in Brazil, and 20.1% in Mozambique, (ii) 19.5% of variation in trust of the Internet in Portugal, 6.7% in Brazil, and 13.3% in Mozambique, and (iii) 22.4% of variation in perceived risk in Portugal, 32.6% in Brazil, and 30.5% in Mozambique. These values can be considered relatively low but we believe that they are a direct result of the simplicity of the Bélanger & Carter (2008) trust and risk model; it as only one variable influencing trust of the Internet and of the bank (disposition to trust), which in turn influence the perceived risk. The research model validate the relationships between disposition to trust and the trust of the bank and the trust of the Internet in all the three countries, consistence with previous research (Bélanger & Carter, 2008; Carter & Bélanger, 2005). One of the interesting particularities of this study was that none of the trust and perceived risk variables were found statistically significant over the behavioural intention in any of the three countries, contradicting earlier research on trust (Bélanger & Carter, 2008; Carter & Bélanger, 2005; Tan & Thoen, 2001) and on risk (Liao et al., 2011; Martins et al., 2014;

Mortimer et al., 2015; Salam et al., 2003). This fact is counterintuitive and may indicate either the need to include in the theoretical model new constructs or new relationships to other variables, or it can be a direct result of a global phenomenon where these constructs lose importance towards intention, following the increasingly familiarity of users with mobile services and their increasingly relation with mobile banking use behaviour.

Having in mind some other earlier research that proved trust to be an important antecedent explaining the acceptation of mobile banking (Hanafizadeh et al., 2014), and on the fact that trust and risk have a strong impact on usage decision (Kim et al., 2008), we suggest that new relationships between the perceived risk, trust of the Internet, and trust of the bank with behavioural use should be added to the research theoretical model, in order to help improve the acceptance power of explanation. To confirm this important statement we temporary added these relationships to our model, obtaining the results presented in the **Table 6.5**, as follow.

Table 6.5 – test of use behaviour coefficient of determination with the temporary relationship

(PLSc) %	PT	BR	MZ
R^2 (UB)	53.2	53.6	34.7
R^2 (UB) adjusted	52.8	52.7	33.1

Notes: UB: use behaviour.

From the use behaviour perspective, adding the three new relationships increase the explanatory power of the model, from 52.9% to 53.2% in Portugal (up 0.3%), from 52.7% to 53.6% in Brazil (up 0.9%), and from 29.3% to 34.7% in Mozambique (up 5.4%), confirming the advantage to include them, in future works, in the theoretical model. These findings are also supported by the adjusted $R^{2'}$ results that increased from 52.7% to 52.8% in Portugal (up 0.1%), from 52.2% to 52.7% in Brazil (up 0.5%), and from 28.4% to 33.1% in Mozambique (up 4.7%).

6.5.2. Multi-group analysis findings

Users in each of the three countries involved in the study have several similarities, particularities and differences. Understanding what work in a country and not so well in

another, is increasingly important due to the globalisation of business and systems. A multi-group analysis helps to understand it.

In Portugal and Mozambique, in what concerns to the relations with behavioural intention, the performance expectancy, effort expectancy, social influence, facilitating conditions, habit, trust of the bank, trust of the Internet, and perceived risk are considered equally important for users, without differences between countries. Hedonic motivation and price value are considered more important for Mozambican users, as well as trust of the bank and trust of the Internet, in terms of the perceived risk. Over the use behaviour, the behavioural intention and the facilitating conditions are more important for Mozambican users, and the habit is considered equally important in both countries.

Between Portugal and Brazil, regarding to behavioural intention, it was identified that the performance expectation is a more important factor for Portuguese users, whereas the remaining construct' relations are considered equally important in both countries. The same happen with the relations from disposition to trust to trust of the bank, and from trust of the Internet and trust of the bank to perceived risk, with no significant differences between countries. In terms of trust of the Internet, disposition to trust is considered more important by the Portuguese users. Over the use behaviour, behaviour intention, habit, and facilitating conditions are equally important in both countries, without significant differences between them.

For Brazil and Mozambique, the only significant relation with behavioural intention is the hedonic motivation one that is considered more important by Mozambican users. The influence of trust of the bank over the perceived risk is significant and a more important factor also for Mozambican. In terms of use behaviour, the behavioural intention and the facilitating conditions are more important for Mozambican users, and the habit is considered equally important in both countries. There are no significant differences in all the remaining relations, being considered equally important for users in both countries.

6.5.3. Implications for research and practice

The results of this study shed light on some important issues related to customer acceptance and intention toward mobile banking that have not been addressed in earlier

studies, presenting several implications for researchers and for practitioners. For researchers several important theoretical contributions are identified. Researchers initiating future studies on technology acceptance will find this study beneficial, providing a basis for further refinement of individual models of acceptance. To the best of our knowledge, this is the first attempt toward a holistic and integrative approach combining the strengths of two well know and stablish acceptance models; UTAUT2 and trust and risk models. This is evidenced by the high explanatory power of our research model in all the three countries, indicating that they should be used together, and answering at the same time to the Venkatesh et al. (2012) challenge to identify factors to extend the UTAUT2 model. In terms of the statistical methods, we anticipate that PLCs have all the conditions to become the standard for future information technology SEM studies in the Academy, and therefore the sooner start using it the better. The study also emphasizes an often neglected, yet profound, tie between acceptation theory, trust, and risk literature, providing in the same work positive and negative aspects in the mobile banking acceptance. Comparing three countries in three different continents increase even more the study' importance and significance, aligned with the increasing globalisation of business and systems. One last theoretical contribution is made in the relation between trust and risk constructs with mobile banking use, suggesting new direct relationships between perceived risk and trust of the Internet with behavioural use, reinforcing by that way the explanatory power of the research model.

For practitioners, this research provides several significant practical implications to decision makers, IT departments, and marketing departments involved in the implementation, deployment, and maintenance of mobile banking services. Understanding the key constructs in the proposed research model is crucial to design, implement, and refine mobile banking services with high levels of acceptance. Since the final objective of developing any mobile banking is to ensure acceptance, it is essential that banks, financial institution, and service providers can translate the behavioural intention into real service usage. By identifying the differences between the three countries involved stockholders can understand in which areas should focus on, adapting strategies, systems, and the services to each region particularities and differences.

Due to the importance of risk in mobile banking acceptance, banks and financial institutions attention should focus their attention on risk mitigation strategies, lowering risk perception enough to encourage acceptance. Effective strategy to help consumers overcome risk perception of mobile banking is to educate them about security, increasing the awareness

about the technologies involved, and the safety features provided by their services. This could involve marketing campaigns, specific web pages, tutorial, or demos to educate consumers, creating or increasing awareness among them, assisting and inspiring higher levels of confidence in the customers. Combining these action with trust building mechanisms to maintain and attract customers, would reinforce even more acceptance. Some examples to consider: (i) infrastructure security considering important systems such as intrusion detection and prevention, firewalls, connections monitoring, transactions patterns analysis, higher level of encryption of digital certificates, (ii) performant transactions, considering fast functions and applications, servers, storage, and equipment with the right level of response, capacity, and scalability, and (iii) statement of guaranty, digital certificates description, increased familiarity thought advertising, partnership with well-known brands, long term customer service, and regular security information.

If customers believe the mobile banking firm is able to develop effective service delivery strategies and provide adequate protection from fraud and violation of privacy, then acceptation and use behaviour will increase (Hernández-Ortega, 2011). Assuming that consumer avoid risk remaining loyal to brands which they have been satisfied with (Dodds, 1996), banks and financial institution should create processes of measuring overall satisfaction. Good feedback mechanisms in place, in direct connection to the most known social networks, could also help to enhance trust level. As it is expected that the importance of social influence will grow in the following years to come, companies should also can focus on developing their marketing strategies in social networks, increasing the importance of social influence construct. The high levels of performance expectation in all three countries advise one last recommendation to service providers, to continue investing time and money to educate consumers about the usefulness, convenience, and advantages of the service, improving whenever possible channel usability and user experience.

6.6. Limitations, future research, and conclusions

6.6.1. Limitations and future research

This study have several limitations, requiring further examination and additional work. As any research, care should be taken when generalizing its results. Starting with the samples used, it was conducted with users from only one organization in each country

involved, and therefore it is limited to generalise the findings to the whole banking industry. Research needs to be replicated to examine these findings across a wider range of individuals in different samples, environments, countries and with different technologies. Since beliefs and values are not necessary static, longitudinal studies that examine how trust value evolves with respect to mobile banking acceptance would provide additional insights, providing more specific answers and measures to the positive outcomes of trust and the negative of risk in mobile banking. Another limitation is the fact that PLSc is still a relatively new method, if there is no doubt that it brings several advantages to the statistical estimation, it may have some unknown inconsistencies or problems, not yet explored, that may need further investigating. The HTMT criterion to assess discriminant validity is also a new approach whose findings are not yet generalized to PLSc (Henseler et al., 2015), and consequently should not be used alone, as the unique criterion. Due to some national rules on sensitive and private data protection we had a limitations on the information available to promote the surveys; we only had access to emails addresses, not being possible to use other information such as names, physical addresses or telephone numbers, limiting significantly our actions to personalize, to encourage the cooperation, to reinforce response rates, or to provide assistance to the respondents.

Building trust alone is a necessary, but not a sufficient, condition to generate a positive outcome (Ehavior & Pavlou, 2002) to bank and financial institutions. In addition to a good reputation other factors will affect mobile banking acceptance, therefore warring future theoretical investigations. Our analysis is based on the perceived reputation of both banks and mobile Internet service providers. However people may feel that they differ in their trustworthiness. Perception gaps should be analysed using additional questions / tests in which the trust variable could be assessed separately for banks and telecoms. As an Internet full dependent service, future research could also study the impact of mobile Internet service providers' quality on mobile banking acceptance. Considering that most customer have access to both Internet and mobile banking services, there is a belief that Internet banking can influence the intention and the continuous use of mobile banking. Future research could include then a comparison between Internet and mobile banking services trying to identify affinities and the main drivers of user retention in each channel. Studying cross-channel cognitive influences may be another field of future study.

Future studies could also consider using cultural constructs or moderators to evaluate the impact of culture on mobile banking use. Understanding the impact of culture on

technology acceptance and use is increasingly important due to the globalisation of business and systems (Straub et al., 1997). Including UTAUT moderators in the research model, namely age, gender, and experience, or even others such as experience, income, religion, or education can also be of great interest. Mobile banking is very popular in some rural areas (Matos & D'Aguiar, 2010), especially in Africa and in some developing countries. Future research could conduct a comparative study between the service acceptance in rural and urban areas. Last but not least, some authors considers that acceptance behaviour is associated with the market share of banks (Campbell & Frei, 2010). A comparison between financial institution market share, different service providers in different countries, with the level of intention and acceptance of mobile banking services could also be interesting matter to pursue.

6.6.2. Conclusions

This study formulated and empirically tested an innovative model to explain the mobile banking acceptance at an individual level, with data from three different countries from three different continents. The results from our study suggest that the proposed model possesses substantial explanatory power and is robust under several circumstances. Supported in the fact that the PLSc introduce several statistical improvements, the results from previous mobile banking studies should to be recalculated, or new studies should be done, in light of this new reality. We also suggest that future information technology SEM studies should use PLSc instead of simple PLS, as it increases reliability and model explanatory power. New relationships between trust and risk model constructs and use behaviour were analysed, and perceived risk and trust of the Internet suggested to be included, in future studies, in the theoretical model. In terms of results, performance expectancy was found to be a statistically significant antecedent of behaviour intention in Portugal and Mozambique, as well as habit in all the three countries involved. In terms of use behaviour habit was considered the most important driver explaining it in all the three countries, being the facilitating conditions also a statistically significant driver in Mozambique. Disposition to trust was found statistically significant in all the three countries, either towards the trust of the bank or trust of the Internet. Trust of the bank in Mozambique and trust of the Internet in all the three countries were also considered statistically significant antecedents of the perceived risk. According to the results found, there are convergences and divergences among earlier

literature findings, confirming the unique characteristics of the regions where the study was held.

The initial work's objectives were fully accomplish, contributing to knowledge advancement, the innovative model presented were tested in Portugal, Brazil, and Mozambique, and the direct effects of the mobile banking acceptance determinants investigated. Acceptance positive and negative factors were analysed and combined within the work, and PLSc used, as far as we know, for the first time in a mobile banking study. The study makes important theoretical contributions towards articulating differences in the determinants of mobile banking acceptance within the three regions involved, providing a basis for further refinement of individual models of acceptation, for future research. For practitioners, understanding the key constructs, differences and similarities in different countries, is crucial to design, to implement and continuously improve mobile banking services that may achieve increasingly consumer acceptance and notability rates.

Chapter 7 – Conclusions

Mobile business has been developing rapidly in the world (Poushter, 2016), providing ever-widening content and services (Baptista & Oliveira, 2016a), fostering stronger relationships than earlier ones between financial institutions and clients (Riquelme & Rios, 2010). Moving clients to electronic channels is an important issue for banks because it allows them to reduce operational costs (Afshan & Sharif, 2016), providing a more convenient means for customers to meet their banking needs with more complete and more timely information (Gerrard & Cunningham, 2003). Our work main findings, contributions, and limitations are presented as follow.

7.1. Summary of findings

Our work is supported in the fact that it is of most importance to understand the most important mobile banking and payment drivers of acceptance and use, as well as the post acceptance behaviour, namely the use behaviour and intention to recommend. Having that in mind, a total of five separate studies were developed and presented in the previous chapters; four in the mobile banking field and one in the mobile payment one. The complete list of the most significant predictors, as found in the weight and meta-analysis in chapter 2, and the list of the significant relationships, as found in the remaining chapters, are presented in the **Table 7.1**. According to Venkatesh et al. (2003), (i) perceived usefulness (TAM), (ii) relative advantage (DOI), and (iii) performance expectancy (UTAUT) are equivalent constructs, so they were all considered as just one construct; performance expectancy. For the same reasons, (i) compatibility (DOI), and (ii) facilitating conditions (UTAUT2), were both considered as facilitating conditions.

Table 7.1 – List of significant relationships

Independent	**Dependent**	**Chapter**						
		2	3	4	5	6 (PT)	6 (MZ)	6 (BR)
Attitude	Intention	x						
Effort expectancy					x			
Facilitating conditions		x		x				
Gamification					x			

Independent	**Dependent**	**Chapter**						
		2	3	4	5	6 (PT)	6 (MZ)	6 (BR)
Habit			x		x	x	x	x
Hedonic motivation			x		x			
Initial trust		x						
Innovativeness				x				
Perceived credibility		x						
Perceived risk		x						
Perceived security				x				
Performance expectancy		x	x	x	x	x	x	
Price value		x			x			
Social Influence				x	x			
Intention	Intention recommend			x				
Trust of the bank	Perceived risk						x	
Trust of the Internet						x	x	x
Disposition to trust	Trust of the bank					x	x	x
Disposition to trust	Trust of the Internet					x	x	x
Collectivism	Use		x					
Facilitating conditions							x	
Habit			x		x	x	x	x
Intention		x			x			
Performance expectancy		x						
Short term			x					
Uncertainty avoidance			x					

Notes: PT: Portugal; MZ: Mozambique; BR: Brazil.

From **Table 7.1** we can identify the relationships that were considered as significant in the majority of the studies; in relation to intention (i) habit was found significant in three studies and five datasets, (ii) performance expectancy was found significant in all five studies and in six datasets, and in relation to use (iii) habit was found significant in three studies and five datasets, (iv) intention was found significant in two studies. All the main studies results are presented as follow.

We started in the second chapter with the mobile banking acceptance literature weight and meta-analysis, even if it was the last study to be temporally developed. The best predictors of the intention to use the mobile banking services found in literature were: (i) perceived usefulness, (ii) attitude, (iii) perceived risk, (iv) compatibility, (v) performance expectancy, (vi) initial trust, (vii) perceived credibility, and (viii) perceived cost. In terms of use of mobile banking the best predictors identified were: (i) Intention, and (ii) perceived usefulness. A theoretical model based in these constructs was also presented, supporting further and future studies in this area.

In the third chapter mobile banking acceptance was analysed combining culture with UTAUT2. Performance expectancy, hedonic motivation, and habit were found to be the most significant antecedents of behaviour intention. To explain the mobile banking use behaviour the habit and culture moderator effects on behaviour intention over use behaviour were the most important drivers. Collectivism, uncertainty avoidance, short term, and power distance were found to be the most significant cultural moderators. By incorporating cultural moderators in the proposed research model we also added stronger determinants to predict intention to use mobile banking, and thus provided more predictive power to existing UTAUT2.

In the fourth chapter we analysed the mobile payment adoption combining UTAUT2, DOI, with the perceived security and intention to recommend constructs. We found compatibility, perceived technology security, performance expectancy, innovativeness, and social influence to have significant direct and indirect effects over the adoption of mobile payment and the intention to recommend this technology. The relevance of customer's intention to recommend mobile payment technology in social networks and other means of communication was also confirmed, supporting the recommendation to include it in social marketing campaigns and in future technology adoption studies.

In the fifth chapter we analysed mobile banking acceptance combining UTAUT2 with a gamification impact construct. A direct and strong relationship between gamification and intention was confirmed, and hedonic motivation and habit were found to be significant antecedents of behaviour intention. The results also confirmed the influence of habit and behavioural intention over use behaviour, and performance expectancy, effort expectancy, social influence, and price value over behavioural intention. Men were found to use mobile banking more than women. By including a new construct in the proposed research model we

also added a stronger determinant to predict intention to use mobile banking, and thus provided more predictive power to existing UTAUT2.

In the sixth chapter we analysed acceptance in three different countries, namely Portugal, Mozambique, and Brazil, combining UTAUT 2 with trust and risk. Performance expectancy was found to be a statistically significant antecedent of behaviour intention in Portugal and Mozambique, as well as habit in all the three countries involved. In terms of use behaviour habit was considered the most important driver explaining it in all the three countries, being the facilitating conditions also a statistically significant driver in Mozambique. Disposition to trust was found statistically significant in all the three countries, either towards the trust of the bank or trust of the Internet. Trust of the bank in Mozambique and trust of the Internet in all the three countries were also considered statistically significant antecedents of the perceived risk. From the multi-group analysis additional results and differences between countries were found. For the intention to use mobile banking, performance expectancy is a more important factor ($p<0.1$) for Portuguese ($\hat{\beta}$=0.324) than Brazilian ($\hat{\beta}$=0.112) users. Hedonic motivation is a more important factor (respectively $p<0.05$ and $p<0.1$) for Mozambican users ($\hat{\beta}$=0.250) than Portuguese ($\hat{\beta}$=-0.047) or Brazilian ($\hat{\beta}$=-0.051) ones. Price value is significant ($p<0.05$) and more important for Mozambican ($\hat{\beta}$=-0.160) than Portuguese ($\hat{\beta}$=0.020) users. For the use behaviour, behavioural intention is a more important factor (respectively $p<0.05$ and $p<0.10$) for Mozambican ($\hat{\beta}$=-0.287) than Portuguese ($\hat{\beta}$=0.199) or Brazilian ($\hat{\beta}$=0.087) users, and there are no significant differences between Portugal and Brazil. The facilitating conditions is a more important factor (respectively $p<0.01$ and $p<0.1$) for Mozambican ($\hat{\beta}$=0.202) than Portuguese ($\hat{\beta}$=-0.047) or Brazilian ($\hat{\beta}$=0.001) users, but there are no statistically significant differences between Portugal and Brazil.

7.2. Main contributions

This work provides several contributions for research and practice, contributing to the advancement of knowledge, exploring and discussing direct implications for banks, financial institutions, service providers, service managers, IT and marketing departments, users, and researchers.

In chapter two, a synthesis of findings from existing research on mobile banking acceptance was presented. As far as we know, it is the first time that a sustained meta-analysis is made in mobile banking area of subject combined with a weight analysis and with a period of analysis as large as ours, contribute to a clearer and more concise view on mobile banking acceptance most important drivers of acceptance.

Another contribution, common to the studies presented in chapters three, four, five, and six, is the investigation of the direct effects of the mobile banking or mobile payment acceptance determinants using integrated models, following the suggestion of Venkatesh et al. (2012) to test the extended unified theory of acceptance and use of technology (UTAUT2) in different countries, age groups, and technologies, identifying at the same time relevant factors to extend it.

In the third chapter study cultural moderators were included in the theoretical model presented to evaluate the impact of culture on mobile banking use. This is important because of globalisation of business and systems, following a pressing need to understand the impact of culture (Straub et al., 1997) on technology acceptance and use. Earlier research on mobile banking acceptance in African countries and cultural differences analysis is very limited. It is the first time, to our knowledge, that Venkatesh et al.'s (2012) UTAUT2 and Hofstede's cultural moderators are combined in a mobile banking acceptance work, joining the strengths of these two theories with data from an African country, Mozambique. Assuming that studies that use cultural values as moderators are analytically superior to those that test only for country value effect (Kirkman et al., 2006), Hofstede's cultural variables were used, furthering our understanding of individual and situational characteristics in mobile banking acceptance and use, providing new insights into how culture influences individual behaviour.

In the chapter four study we advanced the body of knowledge of mobile payment field by proposing an innovative research model that combines the strengths of two well-known theories; the extended unified theory of acceptance and use of technology (UTAUT2) with the innovation characteristics of the diffusion of innovations (DOI), with perceived security and intention to recommend the technology constructs. The intention to recommend was included in order to evaluate the success of the mobile payment within social networks, filling a gap in literature on this matter, that can be of great commercial interest (Moe & Schweidel, 2012). Recommending a technology to others is a post-adoption behaviour that has often been neglected by researchers due to an overwhelming emphasis on use (Miltgen et al.,

2013). Considering that previous studies failed to introduce innovative approaches or constructs (Dahlberg et al., 2015), this research included the intention to recommend construct. This is the first time, to our knowledge, that intention to recommend is studied in the mobile payment field.

In the study presented in the chapter five a gamification construct was combined with the extended unified theory of acceptance and use of technology (UTAUT2) in order to evaluate the impact of game mechanics and design technics on mobile banking intention to use. The globalisation of business and systems is fuelling the need to acquire a deeper understand on the impact of gamification in technology acceptance and use within the financial industry. Earlier research on mobile banking acceptance and potential gamification impact analysis is very limited, not following the accelerated and consistent grow of banks and financial institutions that decided to apply it on their systems and services, registered worldwide over the last few years; a gap that we try hereby to reduce. This is the first time to our knowledge that Venkatesh et al.'s (2012) UTAUT2 theory and a gamification construct are combined in a mobile banking acceptance work, supported by data from a South American country, Brazil.

In chapter six, built on the premise that mobile banking perceived risk may be higher than traditional branch services (Koenig-Lewis et al., 2010), due to the natural implicit uncertainty of the environment (Pavlou, 2003), and the fact that trust plays an important factor mitigating the inherent risks in transactions (Ehavior & Pavlou, 2002), we introduced Bélanger & Carter (2008) risk and trust model in this work. Combining it with UTAUT2 intended to reinforce even more results significance and predictability, capturing in the same work positive and negative factors towards acceptation. There is limited empirical work which simultaneously capture the success or positive and resistance or negative factors (Lee, 2009). This study fill in this gap in literature capturing both factors towards mobile banking acceptance. It is the first time, to our knowledge, that UTAUT2 and Bélanger & Carter trust and risk model are combined in a single mobile banking acceptance study, joining the strengths of these two well-known theories with data from three different countries, from three distinct continents, namely Portugal, Brazil, and Mozambique. An additional contribution is also presented in this study; for the statistical analysis we used the consistent partial least square (PLSc) (Dijkstra & Henseler, 2015b), providing for the first time results of this innovative statistical method in the mobile banking industry, as far as we know not yet done until now.

For researchers the work presented in chapters two, three, four, five, and six, provides a basis for further refinement of individual models of acceptance for future research. For practitioners, understanding the key constructs is crucial to design, refine, and implement mobile banking and mobile payment services that achieve high consumer acceptance and notability. Further research and work in mobile banking and mobile payment fields are still needed to confirm the main conclusions identified in our studies.

7.3. Limitations and future work

There are several limitations in this study requiring further examination and additional research. As any research, care should be taken when generalizing its results. The research and the theoretical models presented need to be replicated to examine findings across a wider range of individuals in different samples, environments, countries, cultural groups, and with different technologies. Since beliefs and values are not necessarily static, incorporating longitudinal studies that examine how the mobile banking and mobile payment acceptance evolves, as well as introducing new studies as they are being published, in the case of the meta-analysis study, would reinforce our results or provide additional insights.

In what concerns to the meta-analysis, a first identifiable limitation was the time-frame during which the study was developed, only ending after the completion of the remaining studies presented. This fact didn't allow to test, in a practical case, the model with the constructs most used in literature. Nevertheless, this can became a very interesting field of future research. Some studies were not included in the study due to the fact they were qualitative or experimental by nature, other due to the fact that they didn't present enough quantitative data. Incorporating these studies could also produce some differences in terms of significance of the variables and/or relationships identified. The additional chapter six' three datasets would have permitted the habit relationships with intention and use to be considered as explored more than three times in the literature, possibly allowing to incorporate them in the model of best predictors, to be confirmed in future work.

Studying culture is important. Even though Hofstede's model is generally accepted as the most comprehensive framework of national culture values, its validity and its limitations have been criticized by some researchers. Cultural values can vary within, as well as between, countries. Using a single score for each country ignores the within-country variance (Kirkman

et al., 2006). Using other cultural dimensions, such as willingness to share (Lee et al., 2005), may also become an interesting future research area. Culture can also influence the way hedonic and game techniques can be applied; it is necessary to understand what works in a particular culture and plan for the correct customer interactions (Plummer, 2012). Understanding culture and their impact on the acceptance of mobile banking and mobile payment services can be a very interesting field of analysis to pursue and develop.

End-users activities related to mobile payment were not considered in our work. Future research can target: (1) the usability of this technology (for e.g., assessing the significance of usage pattern in activities related to shopping, dining, etc.); (2) whether or not the use of the technology enables productivity gains for businesses and customers; (3) outcome measures (for e.g., pattern of usage with or without PIN, volume of usage, time saved, comparison with credit card use, etc). In many practical cases, mobile payment is being marketed with different services and products (Miao & Jayakar, 2016), such as mobile marketing, ticketing, commerce, or coupons. Understanding how these kinds of activities are contributing to the acceptance of mobile payments can be another area of interest in future work. As the development of mobile payment vary from country to country in terms of maturity and usage (Guo & Bouwman, 2015), studies across multiple countries could also provide additional insights (Dennehy & Sammon, 2015).

PLSc, used in the chapter six study, is still a relatively new method, if there is no doubt that it brings several advantages to the statistical estimation, it may have some unknown inconsistencies or problems, not yet explored, that may need further investigating. The heterotrait-monotrait ratio of correlations (HTMT) criterion to assess discriminant validity is also a new approach whose findings are not yet generalized to PLSc (Henseler et al., 2015), and consequently should be used carefully. Supported in the fact that the PLSc introduce several statistical improvements, the results from previous mobile banking studies should to be recalculated, or new studies should be done, in light of this new reality. We also suggest that future information technology SEM studies should use PLSc instead of simple PLS, as it increases reliability and model explanatory power.

As an Internet full dependent service, future research could also study the impact of mobile Internet service providers' quality on mobile banking acceptance. Considering that most customer have access to both Internet and mobile banking services, future research could include then a comparison between Internet and mobile banking services trying to

identify affinities and the main drivers of user retention in each channel. Studying cross-channel cognitive influences may be another field of future study. Last but not least, some authors considers that acceptance behaviour is associated with the market share of banks (Campbell & Frei, 2010). A comparison between financial institution market share, different service providers in different countries, with the level of intention and acceptance of mobile banking services could also be interesting matter to pursue.

8. References

Aboelmaged, M. G., & Gebba, T. R. (2013). Mobile banking adoption: An examination of technology acceptance model and theory of planned behavior. *International Journal of Business Research and Development*, *2*(1), 35–50.

Afshan, S., & Sharif, A. (2016). Acceptance of mobile banking framework in Pakistan. *Telematics and Informatics*, *33*(2), 370–387. doi:10.1016/j.tele.2015.09.005

Agarwal & Prasad, J., R. (1998). A conceptual and operational definition of personal innovativeness in the domain of information technology. *Information Systems Research*, *9(2)*, 204–215.

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, *211*(50), 179–211.

Ajzen, I. (2002). Residual effects of past on later behavior: Habituation and reasoned action perspectives. *Personality and Social Psychology Review*, *6*(2), 107–122.

Aker, J., & Mbiti, I. (2010). Mobile phones and economic development in Africa. *Journal of Economic Perspectives*, *24 (3)*(June 2010), 207–232.

Akturan, U., & Tezcan, N. (2010). The effects of innovation characteristics on mobile banking adoption. In *10th Global Conference on Business & Economics*. Rome, Italy.

Akturan, U., & Tezcan, N. (2012). Mobile banking adoption of the youth market: Perceptions and intentions. *Marketing Intelligence & Planning*, *30*(4), 444–459. doi:10.1108/02634501211231928

Alalwan, A. A., Dwivedi, Y., Rana, N. P., & Williams, M. D. (2016). Consumer adoption of mobile banking in Jordan: Examining the role of usefulness, ease of use, perceived risk and self-efficacy. *Journal of Enterprise Information Management*, *29*(1).

Al-Debei, M. M., Akroush, M. N., & Ashouri, M. I. (2015). Consumer attitudes towards online shopping: The effects of trust, perceived benefits, and perceived web quality. *Internet Research*, *25*(5), 707–733.

Al-Dhanhani, A., Mizouni, R., Otrok, H., & Al-Rubaie, A. (2014). A game theoretical model for collaborative groups in social applications. *Expert Systems with Applications*, *41*(11), 5056–5065. doi:10.1016/j.eswa.2014.02.050

Al-Gahtani, S. S., Hubona, G. S., & Wang, J. (2007). Information technology (IT) in Saudi Arabia: Culture and the acceptance and use of IT. *Information & Management*, *44*(8), 681–691. doi:10.1016/j.im.2007.09.002

Al-Jabri, I. M., & Sohail, M. S. (2012). Mobile banking adoption: Application of diffusion of

innovation theory. *Journal of Electronic Commerce Research*, *13*(4), 379–391.

Amin, H., Supinah, R., Aris, M. M., & Baba, R. (2012). Receptiveness of mobile banking by Malaysian local customers in Sabah: An empirical investigation. *Journal of Internet Banking and Commerce*, *17*(1), 1–12.

Anderson, J. (2010). M-banking in developing markets: Competitive and regulatory implications. *Info*, *12*(1), 18–25. doi:10.1108/14636691011015358

Anderson, J., & Gerbing, D. (1988). Structural equation modeling in practice: A review and recommended two-step approach. *Psychological Bulletin*, *103*(3), 411–423. doi:10.1037/0033-2909.103.3.411

Armstrong, J. S., & Overton, T. S. (1977). Estimating nonresponse bias in mail surveys. *Journal of Marketing*, *14*(3), 396–402.

Au, Y. a., & Kauffman, R. J. (2008). The economics of mobile payments: Understanding stakeholder issues for an emerging financial technology application. *Electronic Commerce Research and Applications*, *7*(2), 141–164. doi:10.1016/j.elerap.2006.12.004

Bagozzi, R. P., & Yi, Y. (2012). Specification, evaluation, and interpretation of structural equation models. *Journal of the Academy of Marketing Science*, *40*(1), 8–34. doi:10.1007/s11747-011-0278-x

Bagozzi, R. P., Yi, Y., & Phillips, L. W. (1991). Assessing construct validity in organizational research. *Administrative Science Quarterly*, *36*(3), 421–458. doi:10.2307/2393203

Bain&Company. (2014). *Customer loyalty in retail banking - Global edition 2014*. *Bain&Company*. Retrieved from http://www.bain.com/Images/BAIN_REPORT_Customer_loyalty_in_retail_banking.pdf

Bandura, A. (1986). *Social foundations of thought and action* (Prentice H.). NJ.

BankofMozambique. (2013). Challenges of financial inclusion in Mozambique: A supply side approach. In *Government/IMF Seminar*. Banco de Moçambique.

Bankole, F. O., Bankole, O. O., & Brown, I. (2011). Mobile banking adoption in Nigeria. *The Electronic Journal on Information Systems in Developing Countries*, *47*(2), 1–23.

Baptista, G., & Oliveira, T. (2015). Understanding mobile banking: The unified theory of acceptance and use of technology combined with cultural moderators. *Computers in Human Behavior*, *50*, 418–430. doi:10.1016/j.chb.2015.04.024

Baptista, G., & Oliveira, T. (2016a). A weight and a meta-analysis on mobile banking acceptance. *Computers in Human Behavior*, *63*, 480–489. doi:10.1016/j.chb.2016.05.074

Baptista, G., & Oliveira, T. (2016b). Why so serious? Gamification impact in the acceptance of mobile banking services. *Internet Research*, *27*(2).

Bélanger, F., & Carter, L. (2008). Trust and risk in e-government adoption. *Journal of Strategic Information Systems*, *17*(2), 165–176. doi:10.1016/j.jsis.2007.12.002

Bergstein, B. (2011). Avoiding the faddish side of gamification. Retrieved July 14, 2015, from http://www.technologyreview.com/news/426115/avoiding-the-faddish-side-of-gamification/page/1/

Bidar, R., Fard, M. B., Salman, Y. B., Tunga, M. A., & Cheng, H.-I. (2014). Factors affecting the adoption of mobile banking: Sample of Turkey. In *16th International Conference on Advanced Communication Technology* (pp. 1278–1282). Global IT Research Institute (GIRI). doi:10.1109/ICACT.2014.6779165

Bogost, I. (2011). Persuasive games: Exploitationware. Retrieved January 5, 2015, from http://www.gamasutra.com/view/feature/6366/persuasive_games_exploitationware.php

Boinodiris, P. (2012). Playing to win: Serious games for busines. In *The bridge: Linking Engineering and Society* (pp. 34–39). National Academy of Sciences.

Bollen, K. A. (1989). *Structural equations with latent variables.* New York: Wiley-Interscience. doi:10.2307/2072165

Borenstein, M., Hedges, L. V., Higgins, J. P. T., & Rothstein, H. R. (2009). *Criticisms of meta-analysis*. *Introduction to Meta-Analysis*. doi:10.1002/9780470743386.ch43

Brislin, R. (1970). Back-translation for cross-cultural research. *Journal of Cross-Cultural Psychology*, (1:3), 185–216.

Brown, S. A., & Venkatesh, V. (2005). Model of adoption of technology in households: A baseline model test and extension incorporating household life cycle. *MIS Quartely*, *29*(3), 399–426.

Burke, B. (2012a). *Gamification 2020: What is the future of gamification? Gartner*. Retrieved from https://www.gartner.com/doc/2226015/gamification--future-gamification

Burke, B. (2012b). *Gamification: Engagement strategies for business and IT*. *Gartner*. Retrieved from http://www.gartner.com/technology/research/gamification/

Calisir, F., & Gumussoy, C. A. (2008). Internet banking versus other banking channels: Young consumers' view. *International Journal of Information Management*, *28*(3), 215–221. doi:10.1016/j.ijinfomgt.2008.02.009

Campbell, D., & Frei, F. (2010). Cost structure, customer profitability, and retention implications of self-service distribution channels: Evidence from customer behavior in an online banking channel. *Management Science*, *56*(1), 4–24. doi:10.1287/mnsc.1090.1066

Carlsson, C., Carlsson, J., Hyvönen, K., Puhakainen, J., & Walden, P. (2006). Adoption of mobile devices / services – searching for answers with the UTAUT. In *Proceedings of the 39th Hawaii International Conference on System Sciences* (pp. 1–10).

Carson, D., Gilmore, A., Perry, C., & Gronhaug, K. (2001). *Qualitative marketing research*. Sage.

Carter, L., & Bélanger, F. (2005). The utilization of e-government services: Citizen trust, innovation and acceptance factors. *Information Systems Journal*, *15*(1), 5–25. doi:10.1111/j.1365-2575.2005.00183.x

Chang, I.-C., Liu, C.-C., & Chen, K. (2014). The effects of hedonic/utilitarian expectations and social influence on continuance intention to play online games. *Internet Research*, *24*(1), 21–45. doi:10.1108/IntR-02-2012-0025

Chang, N., Chiang, C., & Hopkinson, A. (2013). A study of user acceptance using Google software as a service (Saas). In *Proceedings of the International Conference on Computer, Networks and Communication Engineering (ICCNCE 2013)* (pp. 73–76). doi:10.2991/iccnce.2013.18

Chang, T. (2014). A Secure operational model for mobile payments. *The Scientific World Journal*, *2014*, 14.

Chang, Y. F., Chen, C. S., & Zhou, H. (2009). Smart phone for mobile commerce. *Computer Standards & Interfaces*, *31*(4), 740–747. doi:10.1016/j.csi.2008.09.016

Chau, P. Y. K., Hu, P. J. H., Lee, B. L. P., & Au, A. K. K. (2007). Examining customers' trust in online vendors and their dropout decisions: An empirical study. *Electronic Commerce Research and Applications*, *6*(2), 171–182. doi:10.1016/j.elerap.2006.11.008

Chen, C. (2013). Perceived risk, usage frequency of mobile banking services. *Managing Service Quality*, *23*(5), 410–436. doi:10.1108/MSQ-10-2012-0137

Chen, L. (2008). A model of consumer acceptance of mobile payment. *Int. J. Mob. Commun.*, *6*(1), 32–52. doi:10.1504/IJMC.2008.015997

Cheng, T. C. E., Lam, D. Y. C., & Yeung, C. L. (2006). Adoption of internet banking: An empirical study in Hong Kong. *Decision Support Systems*, *42*, 1558–1572.

Chin, W. W. (1998). Issues and opinion on structural equation modeling. *MIS Quarterly*, *22*(1), 1.

Chitungo, S., & Munongo, S. (2013). Extending the technology acceptance model to mobile banking adoption in rural Zimbabwe. *Journal of Business Administration and Education*, *3*(1), 51–79.

Cho, D., Kwon, H., & Lee, H. (2007). Analysis of trust in internet and mobile commerce adoption. *40th Annual Hawaii International Conference on System Sciences (HICSS'07)*.

doi:10.1109/HICSS.2007.76

Choi, J., & Geistfeld, L. V. (2004). A cross-cultural investigation of consumer e-shopping adoption. *Journal of Economic Psychology*, *25*, 821–838. doi:10.1016/j.joep.2003.08.00

Chong, A. Y.-L. (2013). A two-staged SEM-neural network approach for understanding and predicting the determinants of m-commerce adoption. *Expert Systems with Applications*, *40*(4), 1240–1247. doi:10.1016/j.eswa.2012.08.067

Chong, A. Y.-L., Chan, F. T. S., & Ooi, K.-B. (2012). Predicting consumer decisions to adopt mobile commerce: Cross country empirical examination between China and Malaysia. *Decision Support Systems*, *53*(1), 34–43. doi:10.1016/j.dss.2011.12.001

Chu, S., & Lu, Y. Bin. (2009). The effect of online-to-mobile trust transfer and previous satisfaction on the foundation of mobile banking initial trust. In *2009 8th International Conference on Mobile Business* (pp. 1–6). doi:10.1109/ICMB.2009.8

Churchill, G. A. (1979). A paradigm for developing better measures of marketing constructs. *Journal of Marketing Research*, *16(1)*, 64–73.

Compeau, D., & Higgins, C. (1995). Computer self-efficacy: Development of a measure and initial test. *MIS Quarterly*.

Cook, T. D. (1991). Meta-analysis: Its potential for causal description and causal explanation within program evaluation. In W. de Gruyter (Ed.), *Social Prevention and the Social Sciences: Theoretical Controversies, Research Problems, and Evaluation Strategies* (pp. 245–285).

Corbitt, B. J., Thanasankit, T., & Yi, H. (2003). Trust and e-commerce: A study of consumer perceptions. *Electronic Commerce Research and Applications*, *2*, 203–215.

Corritore, C. L., Kracher, B., & Wiedenbeck, S. (2003). On-line trust: Concepts, evolving themes, a model. *International Journal of Human Computer Studies*, *58*(6), 737–758. doi:10.1016/S1071-5819(03)00041-7

Crabbe, M., Standing, C., Standing, S., & Karjaluoto, H. (2009). An adoption model for mobile banking in Ghana. *International Journal of Mobile Communications*, *7*(5), 515–543. doi:10.1504/IJMC.2009.024391

Cunningham, S. M. (1967). The major dimensions of perceived risk. In C. DF (Ed.), *Risk taking and information handling in consumer behaviour* (Harvard Un., pp. 82–108). Boston.

Dahlberg, T., Guo, J., & Ondrus, J. (2015). A critical review of mobile payment research. *Electronic Commerce Research and Applications*, *14*(5), 265–284. doi:10.1016/j.elerap.2015.07.006

Dahlberg, T., Mallat, N., Ondrus, J., & Zmijewska, A. (2008). Past, present and future of mobile

payments research: A literature review. *Electronic Commerce Research and Applications*, *7*, 165–181.

Daud, N. M., Kassim, N. E. M., Said, W. S. R. M., & Noor, M. M. (2011). Determining critical success factors of mobile banking adoption in Malaysia. *Australian Journal of Basic and Applied Sciences*, *5*(9), 252–265.

Davis, F. D. (1989). Perceived usefulness , perceived ease of use, and user acceptance. *MIS Quarterly*, *13*(3), 319–340. doi:10.2307/249008

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.

DeCos, L. (2015). *Opportunity for banks to utilize gamification as a tool to promote financial education to children*. Turku University of Applied Sciences.

Dennehy, D., & Sammon, D. (2015). Trends in mobile payments research : A literature review. *Journal of Innovation Management*, *1*, 49–61.

Dennis, A., Wixom, B., & Vandenberg, R. (2001). Understanding fit and appropriation effects in group support systems via meta-analysis. *MIS Quarterly*, *25*(2), 167–193. doi:10.2307/3250928

Dijkstra, T. K., & Henseler, J. (2015a). Consistent and asymptotically normal PLS estimators for linear structural equations. *Computational Statistics and Data Analysis*, *81*, 10–23. doi:10.1016/j.csda.2014.07.008

Dijkstra, T. K., & Henseler, J. (2015b). Consistent partial least squares path modeling. *MIS Quarterly*, *39*(3X).

Dodds, W. (1996). Perceived value: A dimension of the consumer risk construct. *American Journal of Business*, *11*.

Dona, P. Das, & Mouri, S. I. (2014). Significance of exponential uses of mobile financial services (MFS) in Bangladesh. *Global Journal of Management and Business Research*, *14*(4), 92–102.

Donner, J., & Tellez, C. A. (2008). Mobile banking and economic development: Linking adoption, impact, and use. *Asian Journal of Communication*, *18*(4), 318–322.

Duane, A., Andreev, P., & O'Reilly, P. (2011). Trusting M-Payments – Realising the Potential of Smart Phones for M-Commerce : A Conceptual Model & Survey of Consumers in Ireland. *Thirty Second International Conference on Information Systems*, 1–18.

Duane, A., O'Reilly, P., & Andreev, P. (2014). Realising m-payments: Modelling consumers' willingness to M-pay using smart phones. *Behaviour and Information Technology*, *33*(4), 318–334. doi:10.1080/0144929X.2012.745608

Ehavior, B., & Pavlou, P. A. (2002). Evidence of the effect of trust building technology in electronic markets: Price premiums and buyer. *MIS Quartely*, *26*(3), 243–268.

Exchangerates. (2014). Euro/Real exchange rate history. Retrieved September 25, 2014, from http://www.exchangerates.org.uk/EUR-BRL-25_09_2014-exchange-rate-history.html

Faria, M. G. (2012). *Mobile banking adoption: A novel model in the Portuguese context*. Universidade Nova de Lisboa.

Farrar, D. E., & Glauber, R. R. (1967). Multicollinearity in regression analysis: The problem revisited. *Review of Econometrics and Statistics*, *49*(1), 92–107.

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. doi:10.1016/S1071-5819(03)00111-3

Fettke, P. (2006). State-of-the-Art des State-of-the-Art eine Untersuchung der Forschungsmethode "Review" innerhalb der Wirtschaftsinformatik. *Wirtschaftsinformatik*, *48*(4), 257–266.

Financialbrand.com. (2014). The gamification of retail banking services. Retrieved November 24, 2014, from http://thefinancialbrand.com/25728/gamification-in-retail-banking/

Fishbein, M., & Ajzen, I. (1975). Belief, attitud, intention and behavior: An introduction to theory and research. MA: Addison-Wesley. doi:10.4135/9781452276236.n498

Fornell, C., & Larcker, D. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, *18(1)*, 39–50.

Forsythe, S. M., & Shi, B. (2003). Consumer patronage and risk perceptions in Internet shopping. *Journal of Business Research*, *56*(11), 867–875. doi:10.1016/S0148-2963(01)00273-9

Fraenkel, J. R., & Wallen, N. E. (2009). *How to design and evaluate research in Education*. *Research methods in Education*. New York: McGraw-Hill.

Freecurrencyrates. (2014). Euro/Mozambican metical exchange rate history. Retrieved June 20, 2014, from http://www.freecurrencyrates.com/exchange-rate-history/EUR-MZN/2014

Gefen, D., Karahanna, E., & Straub, D. W. (2003). Trust and TAM in online shopping: An integrated model. *MIS Quartely*, *27*(1), 51–90.

Gefen, D., & Straub, D. (2005). A practical guide to factorial validity using PLS-Graph: Tutorial and annotated example. *Communications of the Association for Information Systems*, *16*, 91–109.

George, J. (2002). Influences on the intent to make internet purchases. *Internet Research*,

12(2), 165–180.

Gerow, J. E., Grover, V., Thatcher, J., & Roth, P. L. (2014). Looking toward the future of IT-business strategic alignment through the past: A meta-analysis. *MIS Quartely*, *38*(4), 1159–1185.

Gerrard, P., & Cunningham, J. B. (2003). The diffusion of Internet banking among Singapore consumers. *International Journal of Bank Marketing*, *21*(1), 16–28. doi:10.1108/02652320310457776

Ghezzi Renga, F., Balocco, R., & Pescetto, P., A. (2010). Mobile payment applications: Offer state of the art in the Italian market. *Info*, *12(5)*, 3–22.

Gold, A. H., Malhotra, A., & Segars, A. H. (2001). Knowledge management: an organizational capabilities perspective. *Journal of Management Information Systems*, *18*(1), 185–214. doi:10.2307/40398521

Graham, B. (2014). Mobile banking trends for 2014. *Banking Systems & Technology*.

Gu, J.-C., Lee, S.-C., & Suh, Y.-H. (2009). Determinants of behavioral intention to mobile banking. *Expert Systems with Applications*, *36*(9), 11605–11616. doi:10.1016/j.eswa.2009.03.024

Guo, J., & Bouwman, H. (2015). An analytical framework for an m-payment ecosystem: A merchants' perspective. *Telecommunications Policy*, *40*(2-3), 147–167. doi:10.1016/j.telpol.2015.09.008

Ha, K.-H., Canedoli, A., Baur, A. W., & Bick, M. (2012). Mobile banking - insights on its increasing relevance and most common drivers of adoption. *Electronic Markets*, *22*(4), 217–227. doi:10.1007/s12525-012-0107-1

Hair Jr, J. F., Hult, G. T. M., Ringle, C., & Sarstedt, M. (2013). *A primer on partial least squares structural equation modeling (PLS-SEM)*. *SAGE Publications*. doi:10.1016/j.lrp.2013.01.002

Hair, J. F., Ringle, C. M., & Sarstedt, M. (2011). PLS-SEM: Indeed a silver bullet. *Journal of Marketing Theory and Practice*, *19*(2), 139–152. doi:10.2753/MTP1069-6679190202

Hair, J. F., Sarstedt, M., Ringle, C. M., & Mena, J. A. (2012). An assessment of the use of partial least squares structural equation modeling in marketing research. *Journal of the Academy of Marketing Science*, *40(3)*, 414–433.

Hamari, J. (2013). Transforming homo economicus into homo ludens: A field experiment on gamification in a utilitarian peer-to-peer trading service. *Electronic Commerce Research and Applications*, *12*(4), 236–245. doi:10.1016/j.elerap.2013.01.004

Hamari, J., & Koivisto, J. (2015a). Why do people use gamification services? *International*

Journal of Information Management, *35*(4), 419–431. doi:10.1016/j.ijinfomgt.2015.04.006

Hamari, J., & Koivisto, J. (2015b). "Working out for likes": An empirical study on social influence in exercise gamification. *Computers in Human Behavior*, *50*, 333–347. doi:10.1016/j.chb.2015.04.018

Hamari, J., Koivisto, J., & Sarsa, H. (2014). Does gamification work? A literature review of empirical studies on gamification. In *2014 47th Hawaii International Conference on System Sciences* (pp. 3025–3034). IEEE Conference Publications. doi:10.1109/HICSS.2014.377

Han, C., & Yang, S. (2010). Value-based adoption of mobile banking service: A multi-channel perspective. In *ICINA 2010 - 2010 International Conference on Information, Networking and Automation, Proceedings* (Vol. 2, pp. 506–510). doi:10.1109/ICINA.2010.5636459

Hanafizadeh, P., Behboudi, M., Koshksaray, A., & Tabar, M. (2014). Mobile-banking adoption by Iranian bank clients. *Telematics and Informatics*, *31*(1), 62–78. doi:10.1016/j.tele.2012.11.001

Hanafizadeh, P., Keating, B. W., & Khedmatgozar, H. R. (2013). A systematic review of Internet banking adoption. *Telematics and Informatics*, *31*(3), 492–510. doi:10.1016/j.tele.2013.04.003

Hanus, M. D., & Fox, J. (2015). Assessing the effects of gamification in the classroom: A longitudinal study on intrinsic motivation, social comparison, satisfaction, effort, and academic performance. *Computers & Education*, *80*, 152–161. doi:10.1016/j.compedu.2014.08.019

Hassan, L. M., Shiu, E., & Walsh, G. (2011). A multi-country assessment of the long-term orientation scale. *International Marketing Review*, *28*(1), 81–101. doi:10.1108/02651331111107116

Hedman, J., & Henningsson, S. (2015). The new normal: Market cooperation in the mobile payments ecosystem. *Electronic Commerce Research and Applications*, *14*(5), 305–318. doi:10.1016/j.elerap.2015.03.005

Heijden, H. Van der. (2004). User acceptance of hedonic information systems. *MIS Quarterly*, *28*(4), 695–704.

Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the Academy of Marketing Science*, *43*(1), 115–135. doi:10.1007/s11747-014-0403-8

Henseler, J., Ringle, C. M., & Sinkovics, R. R. (2009). The use of partial least squares path

modeling in international marketing. *Advances in International Marketing*, *20*(2009), 277–319. doi:10.1108/S1474-7979(2009)0000020014

Hernández-Ortega, B. (2011). The role of post-use trust in the acceptance of a technology: Drivers and consequences. *Technovation*, *31*(10-11), 523–538. doi:10.1016/j.technovation.2011.07.001

Higgins, E. T. (2006). Value from hedonic experience and engagement. *Psychological Review*, *113*(3), 439–60. doi:10.1037/0033-295X.113.3.439

Hoehle, H., Scornavacca, E., & Huff, S. (2012). Three decades of research on consumer adoption and utilization of electronic banking channels: A literature analysis. *Decision Support Systems*, *54*(1), 122–132. doi:10.1016/j.dss.2012.04.010

Hoffman, D. L., Novak, T. P., & Peralta, M. (1999). Building Consumer Trust Online. *Communications of the ACM*, *42(4)*(4), 80–85. doi:10.1145/299157.299175

Hofstede, G. (2014). The hofstede centre. Retrieved October 23, 2014, from http://geert-hofstede.com/mozambique.html

Hofstede, G., & Bond, M. H. (1988). The Confucius connection: From cultural roots to economic growth. *Organizational Dynamics*, *16(4)*, 5–21.

Hofstede, G. H. (1980). *Culture's consequences: International differences in work-related values*. Sage Publications, Beverly Hills, CA.

Hofstede, G., Hofstede, G. J., & Minkov, M. (2010). *Cultures and organizations: Software for the mind* (Third Edit.). McGraw-Hill.

Hsieh, C., Wu, C., & Hsu, C. (2014). Convergence or divergence? A comparison of acceptance and use of technology for smart phones and tablets. In *PICMET'14: Infrastructure and Service Integration* (pp. 3084–3090). IEEE Conference Publications.

Hsu, C.-L., Wang, C.-F., & Lin, J. C.-C. (2011). Investigating customer adoption behaviours in mobile financial services. *International Journal of Mobile Communications*, *9*(5), 477–494.

Hung, C., Sun, J. C., & Yu, P. (2015). The benefits of a challenge: student motivation and flow experience in tablet-PC-game-based learning. *Interactive Learning Environments*, *23*(2), 172–190.

Im, I., Hong, S., & Kang, M. S. (2011). An international comparison of technology adoption. *Information & Management*, *48*(1), 1–8. doi:10.1016/j.im.2010.09.001

ITC. (2014). WTID, 2005-2014 ICT data for the world. In *World Telecommunication/ICT Indicators Database*. United Nations. Retrieved from www.itu.int/en/ITU-D/Statistics/Documents/statistics/2014/ITU_Key_2005-2014_ICT_data.xls

Jackson, J. D., Yi, M. Y., & Park, J. S. (2013). An empirical test of three mediation models for the relationship between personal innovativeness and user acceptance of technology. *Information and Management*, *50*(4), 154–161. doi:10.1016/j.im.2013.02.006

Jairak, K., Praneetpolgrang, P., & Mekhabunchakij, K. (2009). An acceptance of mobile learning for higher education students in Thailand. *The Sixth International Conference on eLearning for Knowledge-Based Society, Thailand*, (December), 17–18.

Jarvenpaa, S. L., & Tractinsky, N. (1999). Consumer trust in an Internet store: A cross cultural validation. *Journal of Computer Mediated Communications*, *5*(2), 1–5. doi:10.1111/j.1083-6101...Back

Jeyaraj, A., Rottman, J. W., & Lacity, M. C. (2006). A review of the predictors, linkages, and biases in IT innovation adoption research. *Journal of Information Technology*, *21*(1), 1–23.

Jiang, Q. (2014). Internet addiction among young people in China: Internet connectedness, online gaming, and academic performance decrement. *Internet Research*, *24*(1), 2–20.

Johnson, R. E., Rosen, C. C., & Djurdjevic, E. (2011). Assessing the impact of common method variance on higher order multidimensional constructs. *The Journal of Applied Psychology*, *96*(4), 744–761. doi:10.1037/a0021504

Juniper. (2015). Mobile Banking Users to Exceed 1.75 Billion by 2019. Retrieved June 25, 2015, from http://www.juniperresearch.com/press-release/digital-banking-pr1

Keil, M., Tan, B. C., Wei, K. K., Saarinen, T., Tuunainen, V., & Wassenaar, A. (2000). A cross-cultural study on escalation of commitment behavior in software projects. *MIS Quartely*, *24*(2), 299–325.

Kiesnoski, K. (2000). Wireless banking. *Bank Systems and Technology*, *37.2*, 40–44.

Kim, B., & Han, I. (2011). The role of utilitarian and hedonic values and their antecedents in a mobile data service environment. *Expert Systems with Applications*, *38*(3), 2311–2318. doi:10.1016/j.eswa.2010.08.019

Kim, D., Ferrin, D., & Rao, R. (2008). A trust-based consumer decision-making model in electronic commerce: The role of trust, perceived risk, and their antecedents. *Decision Support Systems*, *44*(2), 544–564. doi:10.1016/j.dss.2007.07.001

Kim, D., Song, Y., Braynov, S., & Rao, H. (2005). A multidimensional trust formation model in B-to-C e-commerce: A conceptual framework and content analyses of academia/practitioner perspectives. *Decision Support Systems*, *40*(2), 143–165. doi:10.1016/j.dss.2004.01.006

Kim, G., Shin, B., & Lee, H. G. (2009). Understanding dynamics between initial trust and usage

intentions of mobile banking. *Information Systems Journal*, *19*(3), 283–311. doi:10.1111/j.1365-2575.2007.00269.x

Kim, H.-W., & Kankanhalli, A. (2009). Investigating user resistance to information systems implementation: A status quo bias perspective. *MIS Quartely*, *33*(3), 567–582.

Kim, S. S., & Malhotra, N. K. (2005). A longitudinal model of continued IS use: An integrative view of four mechanisms underlying postadoption phenomena. *Management Science*, *51*(5), 741–755. doi:10.1287/mnsc.1040.0326

Kimenyi, M. S., & NDungu, N. S. (2009). Expanding the financial services frontier: Lessons from mobile phone banking in Kenya. *Brookings*, (July).

Kirkman, B. L., Lowe, K. B., & Gibson, C. B. (2006). A quarter century of Culture's Consequences: a review of empirical research incorporating Hofstede's cultural values framework. *Journal of International Business Studies*, *37*(3), 285–320. doi:10.1057/palgrave.jibs.8400202

Koenig-Lewis, N., Palmer, A., & Moll, A. (2010). Predicting young consumers' take up of mobile banking services. *International Journal of Bank Marketing*, *28*(5), 410–432. doi:10.1108/02652321011064917

Kroeber, A. L., & Parsons, T. (1958). The concepts of culture and of social system. *American Sociological Review 23*, *23*, 582–3.

Kuo & Yen, S.-N., Y.-F. (2009). Towards an understanding of the behavioral intention to use 3G mobile value-added services. *Computers in Human Behavior* , *25(1)*, 103–110.

Kuo, M.-S., & Chuang, T.-Y. (2016). How gamification motivates visits and engagement for online academic dissemination – An empirical study. *Computers in Human Behavior*, *55*, 16–27. doi:10.1016/j.chb.2015.08.025

Lai, P. M., & Chuah, K. B. (2010). Developing an analytical framework for mobile payments adoption in retailing: A supply-side perspective. *Proceedings - 2010 International Conference on Management of E-Commerce and E-Government, ICMeCG 2010*, 356–361. doi:10.1109/ICMeCG.2010.79

Laukkanen, T. (2007). Internet vs mobile banking: comparing customer value perceptions. *Business Process Management Journal*, *13*(6), 788–797. doi:10.1108/14637150710834550

Lee, I., Choi, B., Kim, J., & Hong, S.-J. (2007). Culture-technology fit: Effects of cultural characteristics on the post-adoption beliefs of mobile internet users. *International Journal of Electronic Commerce*, *11*(4), 11–51. doi:10.2753/JEC1086-4415110401

Lee, I., Kim, J., & Kim, J. (2005). Use contexts for the mobile Internet: A longitudinal study

monitoring actual use of mobile Internet services. *International Journal of Human-Computer Interaction*, *18*(3), 269–292. doi:10.1207/s15327590ijhc1803_2

Lee, K. C., & Chung, N. (2009). Understanding factors affecting trust in and satisfaction with mobile banking in Korea: A modified DeLone and McLean's model perspective. *Interacting with Computers*, *21*(5-6), 385–392. doi:10.1016/j.intcom.2009.06.004

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. doi:10.1016/j.elerap.2008.11.006

Lee, Y., & Benbasat, I. (2003). Interface design for mobile commerce. *Communications of the ACM*, *46*(12), 49–52. doi:10.1145/953460.953487

Lee, Y., Kozar, a. K., & Larsen, K. R. T. (2003). The technology acceptance model: Past, present, and future. *The Communications of the Association for Information Systems*, *12*(1), 752–780.

Leong, L.-Y., Hew, T.-S., Tan, G. W.-H., & Ooi, K.-B. (2013). Predicting the determinants of the NFC-enabled mobile credit card acceptance: A neural networks approach. *Expert Systems With Applications*, *40*(14), 5604–5620.

Li, F. (2013). Why users adopt mobile banking service: An empirical study. In *2013 10th International Conference on Service Systems and Service Management - Proceedings of ICSSSM 2013* (pp. 490–493). doi:10.1109/ICSSSM.2013.6602554

Liao, C., Liu, C.-C., & Chen, K. (2011). Examining the impact of privacy, trust and risk perceptions beyond monetary transactions: An integrated model. *Electronic Commerce Research and Applications*, *10*(6), 702–715. doi:10.1016/j.elerap.2011.07.003

Liao, C., Palvia, P., & Lin, H.-N. (2006). The roles of habit and web site quality in e-commerce. *International Journal of Information Management*, *26*(6), 469–483. doi:10.1016/j.ijinfomgt.2006.09.001

Liébana-Cabanillas, F., Nogueras, R., Herrera, L. J., & Guillén, A. (2013). Analysing user trust in electronic banking using data mining methods. *Expert Systems with Applications*, *40*(14), 5439–5447.

Liébana-Cabanillas, F., Sánchez-Fernández, J., & Munoz-Leiva, F. (2014). Antecedents of the adoption of the new mobile payment systems: The moderating effect of age. *Computers in Human Behavior*, *35*, 464–478. doi:10.1016/j.chb.2014.03.022

Limayem, M., Hirt, S., & Cheung, C. (2007). How habit limits the predictive power of intention: The case of information systems continuance. *MIS Quartely*, *31*(4), 705–737.

Lin, H.-F. (2011). An empirical investigation of mobile banking adoption: The effect of

innovation attributes and knowledge-based trust. *International Journal of Information Management*, *31*(3), 252–260. doi:10.1016/j.ijinfomgt.2010.07.006

Lin, H.-F. (2012). Determining the relative importance of mobile banking quality factors. *Computer Standards & Interfaces*, *35*(2), 195–204. doi:10.1016/j.csi.2012.07.003

Lindell, M. K., & Whitney, D. J. (2001). Accounting for common method variance in cross-sectional research designs. *Journal of Applied Psychology*, *86*(1), 114–121. doi:10.1037/0021-9010.86.1.114

Lipsey, M. W., & Wilson, D. B. (2001). *Practical meta-analysis*. Sage Publications, Inc.

Liu, J., Kauffman, R. J., & Ma, D. (2015). Competition, cooperation, and regulation: Understanding the evolution of the mobile payments technology ecosystem. *Electronic Commerce Research and Applications*, *14*(5), 372–391. doi:10.1016/j.elerap.2015.03.003

Luarn, P., & Lin, H.-H. (2005). Toward an understanding of the behavioral intention to use mobile banking. *Computers in Human Behavior*, *21*(6), 873–891. doi:10.1016/j.chb.2004.03.003

Luo, X., Li, H., Zhang, J., & Shim, J. P. (2010). Examining multi-dimensional trust and multi-faceted risk in initial acceptance of emerging technologies: An empirical study of mobile banking services. *Decision Support Systems*, *49*(2), 222–234. doi:10.1016/j.dss.2010.02.008

Lynn, P. (2008). The problem of nonresponse. *Journal of Statistics*, *42*(2), 255–70. doi:10.4324/9780203843123.ch3

Lytras, M., & de Pablos, P. O. (2011). Software Technologies in Knowledge Society. *Journal of Universal Computer Science*, *17*(9), 1219–1221.

Mahmood, M., Burn, J. M., Gemoets, L. a., & Jacquez, C. (2000). Variables affecting information technology end-user satisfaction: a meta-analysis of the empirical literature. *International Journal of Human-Computer Studies*, *52*(4), 751–771. doi:10.1006/ijhc.1999.0353

Malaquias, R. F., & Hwang, Y. (2016). An empirical study on trust in mobile banking: A developing country perspective. *Computers in Human Behavior*, *54*, 453–461. doi:10.1016/j.chb.2015.08.039

Mallat, N. (2007). Exploring consumer adoption of mobile payments – A qualitative study. *Journal of Strategic Information Systems*, *16*, 413–432.

Marlow, S. L., Salas, E., Landon, L. B., & Presnell, B. (2016). Eliciting teamwork with game attributes: A systematic review and research agenda. *Computers in Human Behavior*, *55*,

413–423. doi:10.1016/j.chb.2015.09.028

Martínez-López, F. J., Pla-García, C., Gázquez-Abad, J. C., & Rodríguez-Ardura, I. (2014). Utilitarian motivations in online consumption: Dimensional structure and scales. *Electronic Commerce Research and Applications*, *13*, 188–204. doi:10.1016/j.elerap.2014.02.002

Martins, C., Oliveira, T., & Popovič, A. (2014). Understanding the Internet banking adoption: A unified theory of acceptance and use of technology and perceived risk application. *International Journal of Information Management*, *34*(1), 1–13. doi:10.1016/j.ijinfomgt.2013.06.002

Masrek, M. N., Mohamed, I. S., Daud, N. M., & Omar, N. (2014). Technology trust and mobile banking satisfaction: A case of Malaysian consumers. In *Procedia - Social and Behavioral Sciences* (Vol. 129, pp. 53–58). Elsevier B.V. doi:10.1016/j.sbspro.2014.03.647

Masrek, M. N., & Razali, M. H. (2014). Antecedents and impacts of mobile banking transactions: A case of malaysian consumers. In *Proceedings - 2013 International Conference on Advanced Computer Science Applications and Technologies, ACSAT 2013* (pp. 401–405). doi:10.1109/ACSAT.2013.85

Matos, J. De, & D'Aguiar, L. (2010). Measuring the evolution of monetary and financial services in Portugal. *IFC Bulletin*, (33), 283–295.

Mayer, R. C., Davis, J. H., & Schoorman, F. D. (1995). An integrative model of organizational trust. *Academy of Management Review*, *20*(3), 709–734. doi:10.5465/AMR.1995.9508080335

McFadzean, J., Monson, J. P., Watson, J. D., & Coakley, J. H. (1997). The dilemma of the incapacitated patient who has previously refused consent for surgery. *British Medical Journal*, *315*(7121), 1530–1532. doi:10.1136/bmj.315.7121.1533

McGonigal, J. (2011). *Reality is broken: Why games make us better and how they can change the world*. New York: Penguin Press.

McKinsey. (2011). Private sector finance in Africa. *African Development Report*, 81–99.

Mcknight, D. H., & Chervany, N. L. (2001). What trust means in e-commerce customer relationships: An interdisciplinary conceptual typology. *International Journal of Electronic Commerce*, *6*(2), 35–59. doi:Article

Mekler, E. D., Brühlmann, F., Opwis, K., & Tuch, A. N. (2013). Do points, levels and leaderboards harm intrinsic motivation? An empirical analysis of common gamification elements. In *Proceedings of the First International Conference on Gameful Design, Research, and Applications - Gamification '13* (pp. 66–73).

doi:10.1145/2583008.2583017

Merritt, C. (2011). Mobile money transfer services: The next phase in the evolution of person-to-person payments. *Journal of Payments Strategy & Systems*, *5*(2), 143–160.

Miao, M., & Jayakar, K. (2016). Mobile payments in Japan, South Korea and China: Cross-border convergence or divergence of business models? *Telecommunications Policy*, *40*(2-3), 1–15. doi:10.1016/j.telpol.2015.11.011

Miltgen, C. L., Popovič, A., & Oliveira, T. (2013). Determinants of end-user acceptance of biometrics: Integrating the "Big 3" of technology acceptance with privacy context. *Decision Support Systems*, *56*, 103–114. doi:10.1016/j.dss.2013.05.010

Minkov, M., & Hofstede, G. (2010). Hofstede's fifth dimension: New evidence from the world values survey. *Journal of Cross-Cultural Psychology*, *43*(1), 3–14. doi:10.1177/0022022110388567

Mishra, R. K. (2013). Infosys Labs briefings gamification: Rediscover the power of engagement. *Infosys Labs Briefings*, *11*(3).

Moe, W. W., & Schweidel, D. A. (2012). Online product opinions: Incidence, evaluation and evolution. *Marketing Science*, *31*(3), 372–386.

Mohammadi, H. (2015). A study of mobile banking loyalty in Iran. *Computers in Human Behavior*, *44*, 35–47.

Montola, M., Nummenmaa, T., Lucero, A., Boberg, M., & Korhonen, H. (2009). Applying game achievement systems to enhance user experience in a photo sharing service. *MindTrek*, *4*(46), 1–4.

Moore & Benbasat, I., G. C. (1991). Development of an instrument to measure the perceptions of adopting an information technology innovation. *Information Systems Research*, *2 (3)*, 192–222.

Morosan, C., & DeFranco, A. (2016). It's about time: Revisiting UTAUT2 to examine consumers' intentions to use NFC mobile payments in hotels. *International Journal of Hospitality Management*, *53*, 17–29. doi:10.1016/j.ijhm.2015.11.003

Morschheuser, B., Henzi, C., & Alt, R. (2015). Increasing intranet usage through gamification – insights from an experiment in the banking industry. In *48th Hawaii International Conference on System Sciences* (pp. 635–642). IEEE. doi:10.1109/HICSS.2015.83

Mortimer, G., Neale, L., Hasan, S. F. E., & Dunphy, B. (2015). Investigating the factors influencing the adoption of m-banking: A cross cultural study. *International Journal of Bank Marketing*, *33*(4), 545–570.

Negahban, A., & Chung, C.-H. (2014). Discovering determinants of users perception of mobile

device functionality fit. *Computers in Human Behavior*, *35*, 75–84. doi:10.1016/j.chb.2014.02.020

Negash, S., Meso, P. N., & Wired, G. O. (2011). Mobile banking adoption by under-banked communities in the United States: Adapting mobile banking features from low-income countries. In *Proceedings - 2011 10th International Conference on Mobile Business, ICMB 2011* (pp. 205–209). doi:10.1109/ICMB.2011.12

Nguyen, T., Nguyen, D., & Cao, T. (2014). Acceptance and use of information system: E-learning based on cloud computing in Vietnam." . , 2014. 139-149. *Information and Communication Technology*, 139–149. doi:10.1007/978-3-642-55032-4_14

Njenga, K., & Ndlovu, S. (2012). On rational choice, risk and utility in mobile banking. In *2012 e-Leadership Conference on Sustainable e-Government and e- Business Innovations, E-LEADERSHIP 2012*. doi:10.1109/e-Leadership.2012.6524698

O'Reilly, P., Duane, A., & Andreev, P. (2012). To M-Pay or not to M-Pay—Realising the potential of smart phones: conceptual modeling and empirical validation. *Electronic Markets*, *22*(4), 229–241. doi:10.1007/s12525-012-0105-3

Okazaki, S. (2005). New perspectives on m-commerce research. *Journal of Electronic Commerce Research*, *6*(4), 160–164.

Olding, E. (2012). "Engagification" of the enterprise. Retrieved April 3, 2013, from http://blogs.gartner.com/elise-olding/2012/11/14/engagificationof-the-enterprise-gamification-and-employee-engagement/

Oliveira, T., Faria, M., Thomas, M. A., & Popovič, A. (2014). Extending the understanding of mobile banking adoption: When UTAUT meets TTF and ITM. *International Journal of Information Management*, *34*(5), 689–703. doi:10.1016/j.ijinfomgt.2014.06.004

Ondrus, J., & Pigneur, Y. (2007). An assessment of NFC for future mobile payment systems. In *International Conference on the Management of Mobile Business (ICMB 2007)*. IEEE. doi:10.1109/ICMB.2007.9

Orlikowski, W., & Baroudi, J. J. (1990). *Studying information technology in organizations: Research approaches and assumptions* (No. STERN IS-90-4).

Pappas, C., & Williams, I. (2011). Grey literature: Its emerging importance. *Journal of Hospital Librarianship*, *11*(October), 228–234. doi:10.1080/15323269.2011.587100

Park, J., Yang, S., & Lehto, X. (2007). Adoption of mobile technologies for chinese consumers. *Journal of Electronic Commerce Research*, *Vol 8*, 196–206.

Pavlou, P. A. (2003). Consumer acceptance of electronic commerce: Integrating trust and risk with the technology acceptance model. *International Journal of Electronic Commerce*,

7(3), 69–103.

Pavlou, P., Liang, H., & Xue, Y. (2007). Understanding and mitigating uncertainty in online exchange relationships: A principal-agent perspective. *MIS Quarterly*, *31(1)*, 105–136.

Pedreira, O., García, F., Brisaboa, N., & Piattini, M. (2015). Gamification in software engineering – A systematic mapping. *Information and Software Technology*, *57*, 157–168. doi:10.1016/j.infsof.2014.08.007

Peter, J. P., & Ryan, M. J. (1976). An investigation of perceived risk at the brand level. *Journal of Marketing Research*, *13*, 184–188.

Pham, T. T. T., & Ho, J. C. (2015). The effects of product-related, personal-related factors and attractiveness of alternatives on consumer adoption of NFC-based mobile payments. *Technology in Society*, *43*, 159–172. doi:10.1016/j.techsoc.2015.05.004

Plummer, D. (2012). *Top technology predictions for 2013 and beyond*. Retrieved from http://www.gartner.com

Png, I. P. L., & Tan, B. C. Y. (2001). Dimensions of national culture and corporate adoption of IT infrastructure. *IEEE Transactions on Engineering Management*, *48*(1), 36–45. doi:10.1109/17.913164

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. *The Journal of Applied Psychology*, *88*(5), 879–903. doi:10.1037/0021-9010.88.5.879

Porteous, D. (2006). *The enabling environment for mobile banking in Africa*. London.

Poushter, J. (2016). *Smartphone ownership and Internet usage continues to climb in emerging economies*. *Pew Research Center*.

Pousttchi, K., & Schurig, M. (2004). Assessment of today ’s mobile banking applications from the view of customer requirements. In *Proceeding of the 37th Hawaii International Conference on System Sciences* (pp. 1–10).

Püschel, J., Mazzon, J. A., & Hernandez, J. M. C. (2010). Mobile banking: proposition of an integrated adoption intention framework. *International Journal of Bank Marketing*, *28*(5), 389–409. doi:10.1108/02652321011064908

Putit, L., & Arnott, D. C. (2007). Micro-culture and consumers adoption of technology: A need to re-evaluate the concept of national culture. *Academy of Marketing Science Review*, *2007*(06), 1–15.

Qingfei, M. I. N., Shaobo, J. I., & Gang, Q. U. (2008). Mobile commerce user acceptance study in China: A revised UTAUT model. *Tsinghua Science and Technology*, *13*(3), 257–264.

Raleting, T., & Nel, J. (2011). Determinants of low-income non-users ' attitude towards WIG mobile phone banking: Evidence from South Africa. *African Journal of Business Management*, *5*(1), 212–223. doi:10.5897/AJBM10.1018

Raman, A., & Don, Y. (2013). Preservice teachers' acceptance of learning management software: An application of the UTAUT2 model. *International Education Studies*, *6*(7), 157–164. doi:10.5539/ies.v6n7p157

Rana, N. P., Dwivedi, Y. K., & Williams, M. D. (2015). A meta-analysis of existing research on citizen adoption of e-government. *Information Systems Frontiers*, *17*(3), 547–563.

Ratten, V. (2012). Entrepreneurship, e-finance and mobile banking. *International Journal of Electronic Finance*, *6*(1), 1. doi:10.1504/IJEF.2012.046590

Ringle Wende, S., & Will, A, C. M. (2005). SmartPLS 2.0. Retrieved from: http://www.smartpls.de.

Ringle, C. M., Wende, S., & Becker, J.-M. (2015). SmartPLS 3. Boenningstedt: SmartPLS GmbH. Retrieved from http://www.smartpls.de

Ringle, C. M., Wende, S., & Will, A. (2005). SmartPLS 2.0. Retrieved from http://www.smartpls.de

Riquelme, H. E., & Rios, R. E. (2010). The moderating effect of gender in the adoption of mobile banking. *International Journal of Bank Marketing*, *28*(5), 328–341. doi:10.1108/02652321011064872

Robson, K., Plangger, K., Kietzmann, J. H., McCarthy, I., & Pitt, L. (2015). Is it all a game? Understanding the principles of gamification. *Business Horizons*, *58*(4), 411–420. doi:10.1016/j.bushor.2015.03.006

Rodrigues, L. F., Costa, C. J., & Oliveira, A. (2013a). How to develop financial applications with game features in e-banking? In *Proceedings of the 2013 International Conference on Information Systems and Design of Communication - ISDOC '13* (pp. 124–134). ACM. doi:10.1145/2503859.2503881

Rodrigues, L. F., Costa, C. J., & Oliveira, A. (2013b). The adoption of gamification in e-banking. In *Proceedings of the 2013 International Conference on Information Systems and Design of Communication - ISDOC '13* (pp. 47–55). ACM. doi:10.1145/2503859.2503867

Rodrigues, L. F., Costa, C. J., & Oliveira, A. (2014). How gamification can influence the web design and the customer to use the e-banking systems. In *Proceedings of the International Conference on Information Systems and Design of Communication - ISDOC '14* (pp. 35–44). New York, USA: ACM Press. doi:10.1145/2618168.2618174

Rogers, E. (1995). *Diffusion of innovations*. (F. Press, Ed.). New York.

Rogers, E. M. (1962). *Diffusion of innovations*.

Rogers, E. M. (2003). *Diffusion of innovations, 5th Edition, The Free Press, New York*.

Rogerson, P. A. (2001). *Statistical methods for geography*. London: Sage.

Rose, G., Khoo, H., & Straub, D. W. (1999). Current technological impediments to business-to-consumer electronic commerce. *Communications of the AIS*, *1*(16), 1–73.

Rothstein, H. R., Sutton, A. J., & Borenstein, M. (2004). Publication bias in meta analysis. *BMC Medical Research Methodology*, *4*, 20. doi:10.1186/1471-2288-4-20

Rotter, J. B. (1971). Generalized expectancies of interpersonal trust. *American Psychologist, 26, 443–452*, *26*, 443–452.

Ryans, A. B. (1974). Estimating consumer preferences for a new durable brand in an established product class. *Journal of Marketing Research*, *XI*(November), 434–443.

Sabherwal, R., Jeyaraj, A., & Chowa, C. (2006). Information system success: Individual and organizational determinants. *Management Science*, *52*(12), 1849–1864. doi:10.1287/mnsc.1060.0583

Salam, A. F., Rao, H. R., & Pegels, C. C. (2003). Consumer-perceived risk in e-commerce transactions. *Communications of the ACM*, *46*(12), 325–332.

Saleem, Z., & Rashid, K. (2011). Relationship between customer satisfaction and mobile banking adoption in Pakistan. *International Journal of Trade, Economics and Finance*, *2*(6), 537–543. doi:10.7763/IJTEF.2011.V2.162

Salisbury, R. P., Pearson, A., & Miller, D., W. (2001). Identifying barriers that keep shoppers off the World Wide Web: Developing a scale of perceived web security. *Industrial Management & Data Systems*, *101(4)*, 165–176.

Sarangi, S., & Shah, S. (2015). Individuals, teams and organizations score with gamification: Tool can help to motivate employees and boost performance. *Human Resource Management International Digest*, *23*(4), 24–27.

Sarma, M. (2012). *Index of financial inclusion – a measure of financial sector inclusiveness*. Berlin.

Schein, E. H. (1985). *Organizational culture and leadership: A dynamic view*. *Organization Studies* (Vol. 7). San Francisco: Jossey-Bas. doi:10.1177/017084068600700208

Schierz, P. G., Schilke, O., & Wirtz, B. W. (2010). Understanding consumer acceptance of mobile payment services: An empirical analysis. *Electronic Commerce Research and Applications*, *9*, 209–216. doi:10.1016/j.elerap.2009.07.005

Schmidt, F. L., & Hunter, J. E. (2014). *Methods of meta-analysis: Correcting error and bias in research findings*. Sage publications.

Seaborn, K., & Fels, D. I. (2015). Gamification in theory and action: A survey. *International Journal of Human-Computer Studies*, *74*, 14–31. doi:10.1016/j.ijhcs.2014.09.006

Shaikh, A. a., & Karjaluoto, H. (2014). Mobile banking adoption: A literature review. *Telematics and Informatics*, *32*(1), 129–142. doi:10.1016/j.tele.2014.05.003

Shanmugam, A., Savarimuthu, M., & Wen, T. (2014). Factors affecting Malaysian behavioral intention to use mobile banking with mediating effects of attitude. *Academic Research International*, *5*(2), 236–253.

Sharma, R., & Yetton, P. (2003). The contingent effects of management support and task interdependence on successful information systems implementation. *MIS Quartely*, *27*(4), 533–556.

Sharma, S. K., Govindaluri, S. M., Al-Muharrami, S., & Tarhini, A. (2016). Predicting mobile banking adoption: A neural network approach. *Journal of Enterprise Information Management*, *29*(1).

Shen, Y.-C., Huang, C.-Y., Chu, C.-H., & Hsu, C.-T. (2010). A benefit–cost perspective of the consumer adoption of the mobile banking system. *Behaviour & Information Technology*, *29*(5), 497–511. doi:10.1080/01449290903490658

Sheng, M., Wang, L., & Yu, Y. (2011). An empirical model of individual mobile banking acceptance in China. In *Proceedings - 2011 International Conference on Computational and Information Sciences, ICCIS 2011* (pp. 434–437). doi:10.1109/ICCIS.2011.75

Simione, F. F., & Xiao, Y. (2014). Financial inclusion in Mozambique. In D. C. Ross (Ed.), *Mozambique Rising, Building a New Tomorrow*. Washington, D.C.: International Monetary Fund.

Singh, S., Srivastava, V., & Srivastava, R. K. (2010). Customer acceptance of mobile banking: A conceptual framework. *SIES Journal of Management*, *7*(1), 55–64.

Slade, E. L., Williams, M. D., & Dwivedi, Y. K. (2013). Extending UTAUT2 to explore consumer adoption of mobile payments. In *Proceedings of the UK Academy for Information Systems Conference*. Oxford.

Slade, E., Williams, M., Dwivedi, Y., & Piercy, N. (2015). Exploring consumer adoption of proximity mobile payments. *Journal of Strategic Marketing*, *23*(3), 1–15.

Smith, J. (2012). The benefits and pitfalls of gamification. Retrieved July 16, 2015, from http://webdesign.tutsplus.com/articles/the-benefits-and-pitfalls-of-gamification--webdesign-6454

Smith, M. L. (2006). Overcoming theory-practice inconsistencies: Critical realism and information systems research. *Information and Organization*, *16*(3), 191–211.

doi:10.1016/j.infoandorg.2005.10.003

Smith, P. B., & Bond, M. H. (1999). *Social Psychology across cultures* (2nd edn.). Allyn & Bacon: Boston.

Sohn & Kim, Y., S. Y. (2008). Searching customer patterns of mobile service using clustering and quantitative association rule. *Expert Systems with Applications*, *34*(2), 1070–1077.

Srite, M., & Karahanna, E. (2006). The role of espoused national cultural values in technology acceptance. *MIS Quartely*, *30*(3), 679–704.

Sriwindono, H., & Yahya, S. (2012). Toward modeling the effects of cultural dimension on ICT acceptance in Indonesia. *Procedia - Social and Behavioral Sciences*, *65*(ICIBSoS), 833–838. doi:10.1016/j.sbspro.2012.11.207

Statista. (2015). Mobile payment transaction volume 2010-2017. Retrieved September 1, 2015, from http://www.statista.com/statistics/226530/mobile-payment-transaction-volume-forecast/

Straub, D. (1989). Validating instruments in MIS Research. *MIS Quarterly*, *13*(2), 147–169.

Straub, D., Keil, M., & Brenner, W. (1997). Testing the technology acceptance model across cultures: A three country study. *Information & Management*, *33*(1), 1–11. doi:10.1016/S0378-7206(97)00026-8

Straub, D., Loch, K., Evaristo, R., Karahanna, E., & Strite, M. (2002). Toward a theory-based measurement of culture. *Journal of Global Information Management*, *10*(1), 13–23.

Suoranta, M. (2003). *Adoption of mobile banking in Finland*. Jyvaskyla Studies in Business and Economics.

Surendran, P. (2012). Technology acceptance model: A survey of literature. *International Journal of Business and Social Research*, *2*(4), 175–178.

Tan Ooi, K.-B., Chong, S.-C., & Hew, S.-C., G. (2014). NFC mobile credit card: The next frontier of mobile payment? *Telematics and Informatics*, *31*, 292–307.

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, Y., & Thoen, W. (2001). Toward a generic model of trust for electronic commerce. *International Journal of Electronic Commerce*, *5*(2), 61–74.

Taylor, S., & Todd, P. (1995). Assessing IT usage: The role of prior experience. *MIS Quarterly*, *19*(4), 561–570.

Tchouassi, G. (2012). Can mobile phones really work to extend banking services to the unbanked? *International Journal of Developing Societies*, *1*(2), 70–81.

Teng, C.-I., & Chen, W.-W. (2014). Team participation and online gamer loyalty. *Electronic Commerce Research and Applications*, *13*(1), 24–31. doi:10.1016/j.elerap.2013.08.001

Teo, A.-C., Tan, G. W.-H., Cheah, C.-M., Ooi, K.-B., & Yew, K.-T. (2012). Can the demographic and subjective norms influence the adoption of mobile banking? *International Journal of Mobile Communications*, *10*(6), 578–597. doi:10.1504/IJMC.2012.049757

Teo, A.-C., Tan, G. W.-H., Ooi, K.-B., Hew, T.-S., & Yew, K.-T. (2015). The effects of convenience and speed in m-payment. *Industrial Management & Data Systems*, *115*(2), 311–331. doi:10.1108/IMDS-08-2014-0231

Thompson, R. L., Higgins, C. A., & Howell, J. M. (1991). Personal computing: Toward a conceptual model of utilization. *MIS Quarterly, 15(1)*, 124–143.

Tran, H. T. T., & Corner, J. (2016). The impact of communication channels on mobile banking adoption. *International Journal of Bank Marketing*, *34*(1), 78–109. doi:10.1108/IJBM-06-2014-0073

Trompenaars, F. (1993). *Riding the waves of culture: understanding diversity in global business*. Chicago,IL: Irwin.

Urbach, N., Smolnik, S., & Riempp, G. (2009). The state of research on information systems success. *Business & Information Systems Engineering*, *1*(4), 315–325. doi:10.1007/s12599-009-0059-y

Venkatesh, V., Morris, M. G., Hall, M., Davis, G. B., Davis, F. D., & Walton, S. M. (2003). User acceptance of information technology: Toward a unified view. *MIS Quartely*, *27*(3), 425–478.

Venkatesh, V., Thong, J. Y., & Xu, X. (2012). Consumer acceptance and use of information technology: Extending the unified theory of acceptance and use of technology. *MIS Quartely*, *36*(1), 157–178.

Wang, L., & Yi, Y. (2012). The impact of use context on mobile payment acceptance: An empirical study in China. In *Advances in Computer Science and Education SE - 47* (Vol. 140, pp. 293–299). Springer Berlin Heidelberg. doi:10.1007/978-3-642-27945-4_47

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*, 501–519. doi:10.1108/09564230310500192

Webster, J., & Watson, R. (2002). Analyzing the past to prepare for the future: Writing a literature review. *MIS Quarterly*, *26*(2). doi:10.1.1.104.6570

Wei, X., Hu, B., & Carley, K. (2013). Combination of empirical study with qualitative simulation for optimization problem in mobile banking adoption. *Journal of Artificial Societies &*

Social Simulation.

Wessels, L., & Drennan, J. (2010). An investigation of consumer acceptance of m-banking in Australia. In *ANZMAC 2009* (pp. 1–10).

Wilson, C. (2014). Why so serious? – Gamification trends in the banking industry. Retrieved April 12, 2015, from https://informationstrategyrsm.wordpress.com/2014/10/09/why-so-serious-gamification-trends-in-the-banking-industry/

Wood, J. (2008). Methodology for dealing with duplicate study effects in a meta-analysis. *Organizational Research Methods*, *11*(1), 79–95.

Wu, I.-L., & Wu, S.-M. (2015). A strategy-based model for implementing channel integration in e-commerce: An empirical examination. *Internet Research*, *25*(2), 239–261.

Wu, J. H., & Wang, S. C. (2005). What drives mobile commerce? An empirical evaluation of the revised technology acceptance model. *Information and Management*, *42*(5), 719–729. doi:10.1016/j.im.2004.07.001

Wu, J., & Lederer, A. (2009). A meta-analysis of the role of environment-based voluntariness in information technology acceptance. *MIS Quartely*, *33*(2), 1–9.

Xiong, S. (2013). Adoption of mobile banking model based on perceived value and trust. In *2013 6th International Conference on Information Management, Innovation Management and Industrial Engineering* (pp. 632–635). doi:10.1109/ICIII.2013.6703015

Xu, X. (2014). Understanding users' continued use of online games: An application of UTAUT2 in social network games. In *MMedia 2014: The Sixth International Conferences on Advances in Multimedia* (pp. 58–65). Iaria.

Yang, A. S. (2009). Exploring adoption difficulties in mobile banking services. *Canadian Journal of Administrative Sciences*, *149*(April), 136–149.

Yang, S., Lu, Y., Gupta, S., Cao, Y., & Zhang, R. (2012). Mobile payment services adoption across time: An empirical study of the effects of behavioral beliefs, social influences, and personal traits. *Computers in Human Behavior*, *28*(1), 129–142. doi:10.1016/j.chb.2011.08.019

Yang, Y., Liu, Y., Li, H., & Yu, B. (2015). Understanding perceived risks in mobile payment acceptance. *Industrial Management & Data Systems*, *115*(2), 253–269. doi:10.1108/IMDS-08-2014-0243

Yi, M. Y., Jackson, J. D., Park, J. S., & Probst, J. C. (2006). Understanding information technology acceptance by individual professionals: Toward an integrative view. *Information & Management*, *43*(3), 350–363. doi:10.1016/j.im.2005.08.006

Yoon, C. (2009). The effects of national culture values on consumer acceptance of e-

commerce: Online shoppers in China. *Information & Management*, *46*(5), 294–301. doi:10.1016/j.im.2009.06.001

Yu, C. (2012). Factors affecting individuals to adopt mobile banking: Empirical evidence from the UTAUT model. *Journal of Electronic Commerce Research*, *13*(2), 104–121.

Zakour, A. (2004). Cultural differences and information technology acceptance. In *7th Annual Conference of the Southern Association for Information Systems* (pp. 156–161).

Zhang, L., Zhu, J., & Liu, Q. (2012). A meta-analysis of mobile commerce adoption and the moderating effect of culture. *Computers in Human Behavior*, *28*(5), 1902–1911. doi:10.1016/j.chb.2012.05.008

Zhang, X., Wang, W., de Pablos, P. O., Tang, J., & Yan, X. (2015). Mapping development of social media research through different disciplines: Collaborative learning in management and computer science. *Computers in Human Behavior*, *51*, 1142–1153. doi:10.1016/j.chb.2015.02.034

Zhao, J., & de Pablos, P. O. (2011). Regional knowledge management: the perspective of management theory. *Behaviour & Information Technology*, *30*(March 2015), 39–49. doi:10.1080/0144929X.2010.492240

Zhong, J. (2009). A Comparison of Mobile Payment Procedures in Finnish and Chinese Markets. In *22Nd Bled Econference-eEnablement: Facilitating an open, effective and representative esociety* (pp. 79–96). Bled, Slovenia.

Zhou, T. (2012a). Examining mobile banking user adoption from the perspectives of trust and flow experience. *Information Technology and Management*, *13*(1), 27–37. doi:10.1007/s10799-011-0111-8

Zhou, T. (2012b). Understanding users' initial trust in mobile banking: An elaboration likelihood perspective. *Computers in Human Behavior*, *28*(4), 1518–1525. doi:10.1016/j.chb.2012.03.021

Zhou, T. (2014a). An empirical examination of initial trust in mobile banking. *Internet Research*, *77*(2), 1519–1531. doi:10.1007/s11277-013-1596-8

Zhou, T. (2014b). Understanding the determinants of mobile payment continuance usage. *Industrial Management & Data Systems*, *114*(6), 936–948. doi:10.1108/IMDS-02-2014-0068

Zhou, T., Lu, Y., & Wang, B. (2010). Integrating TTF and UTAUT to explain mobile banking user adoption. *Computers in Human Behavior*, *26*(4), 760–767. doi:10.1016/j.chb.2010.01.013

Zichermann, G., & Linder, J. (2010). *Game based marketing: Inspire customer loyalty trough*

rewards. (J. W. & Sons, Ed.)*Game-based marketing*.

Zichermann, G., & Linder, J. (2013). *The gamification revolution*. McGraw-Hill.

Appendix A. Survey (chapter 3)

Constructs	Items	#	Source
Performance Expectancy (PE)	- I find mobile banking services useful in my daily life. - Using mobile banking services increases my productivity. - Using mobile banking services helps me accomplish things more quickly. - Using mobile banking services increases my chances of achieving things that are important to me.	PE1 PE2 PE3 PE4	(Venkatesh et al., 2003, 2012)
Effort Expectancy (EE)	- Learning how to use mobile banking services is easy for me. - My interaction with mobile banking services is clear and understandable. - I find mobile banking services easy to use. - It is easy for me to become skilful at using mobile banking services.	EE1 EE2 EE3 EE4	(Venkatesh et al., 2003, 2012)
Social Influence (SI)	- People who are important to me think that I should use mobile banking services. - People who influence my behaviour think that I should use mobile banking services. - Mobile banking services use is a status symbol in my environment.	SI1 SI2 SI3	(Venkatesh et al., 2003, 2012)
Facilitating Conditions (FC)	- I have the resources necessary to use mobile banking services. - I have the knowledge necessary to use mobile banking services. - Mobile banking is compatible with other technologies I use. - I can get help from others when I have difficulties using mobile banking services.	FC1 FC2 FC3 FC4	(Venkatesh et al., 2003, 2012)
Hedonic Motivation (HM)	- Using mobile banking services is fun. - Using mobile banking services is enjoyable. - Using mobile banking services is entertaining.	HM1 HM2 HM3	(Venkatesh et al., 2012)
Price Value (PV)	- Mobile banking services are reasonably priced. - Mobile banking services are reasonably priced comparing with other banking channels. - Mobile banking services are a good value for the money. - At the current price, mobile banking services provide a good value.	PV1 PV2 PV3 PV4	(Venkatesh et al., 2012)
Habit (HB)	- The use of mobile banking services has become a habit for me. - I am addicted to using mobile banking services. - I must use mobile banking services. - Using mobile banking has become natural to me.	HB1 HB2 HB3 HB4	(Venkatesh et al., 2012)
Behavioural Intention (BI)	- I intend to continue using mobile banking in the future. - I will always try to use mobile banking in my daily life. - I plan to continue to use mobile banking frequently.	BI1 BI2 BI3	(Venkatesh et al., 2003, 2012)
Individualism /Collectivism (IC)	- Being accepted as a member of a group is more important than having autonomy and independence. - Group success is more important than individual success. - Being loyal to a group is more important than individual gain. - Individual rewards are not as important as group welfare.	IC1 IC2 IC3 IC4	(Srite & Karahanna, 2006)
Uncertainty Avoidance (UC)	- Rules and regulations are important because they inform workers what the organization expects of them. - Order and structure are very important in a work environment. - It is better to have a bad situation that you know about, than to have an uncertain situation which might be better. - People should avoid making changes because things could get worse.	UC1 UC2 UC3 UC4	(Srite & Karahanna, 2006)
Long /short Term (LT)	- Respect for tradition is important for me. - I work hard for success in the future. - Traditional values are important for me. - I plan for the long term.	LT1 LT2 LT3 LT4	(Hassan et al., 2011)

Constructs	Items	#	Source
Masculinity / Femininity (MF)	- It is preferable to have a man in a high level position rather than a woman.	MF1	(Srite & Karahanna, 2006)
	- Solving organizational problems requires the active forcible approach which is typical of men.	MF2	
	- It is more important for men to have a professional career than it is for women to have one.	MF3	
	- Women do not value recognition and promotion in their work as much as men do.	MF4	
Power Distance (PD)	- Managers should make most decisions without consulting subordinates.	PD1	(Srite & Karahanna, 2006)
	- Manager should not ask subordinates for advice, because they might appear less powerful.	PD2	
	- Decision making power should stay with top management in the organization and not delegate to lower level employees.	PD3	
	- Employees should not question their manager's decision.	PD4	
Use Behaviour (UB)	What is your actual frequency of use of mobile banking services? i) Have not use; 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; x) Every day; xi)Several times a day.	UB	(Martins et al., 2014)

Appendix B. Cross-loadings (chapter 3)

Constructs		PE	EE	SI	FC	HM	PV	HB	BI	IC	UC	LT	MF	PD
PE	PE1	**0.899**	0.544	0.420	0.492	0.538	0.510	0.598	0.675	0.050	0.417	0.273	0.016	-0.125
	PE2	**0.851**	0.399	0.393	0.407	0.419	0.472	0.561	0.611	-0.031	0.396	0.247	-0.062	-0.150
	PE3	**0.905**	0.566	0.387	0.569	0.516	0.526	0.608	0.709	0.080	0.421	0.259	0.024	-0.149
	PE4	**0.896**	0.432	0.409	0.411	0.502	0.423	0.539	0.600	0.045	0.305	0.249	-0.069	-0.086
EE	EE1	0.413	**0.903**	0.156	0.557	0.281	0.267	0.334	0.385	0.042	0.318	0.224	-0.008	-0.159
	EE2	0.463	**0.913**	0.142	0.582	0.352	0.339	0.438	0.441	-0.027	0.342	0.230	-0.035	-0.200
	EE3	0.522	**0.931**	0.245	0.548	0.435	0.351	0.462	0.508	0.072	0.294	0.244	0.011	-0.165
	EE4	0.602	**0.929**	0.298	0.593	0.440	0.381	0.470	0.520	0.146	0.304	0.243	0.076	-0.119
SI	SI1	0.432	0.227	**0.922**	0.276	0.491	0.277	0.389	0.394	0.225	0.201	0.301	0.278	0.010
	SI2	0.403	0.226	**0.917**	0.296	0.513	0.314	0.379	0.387	0.115	0.160	0.279	0.226	0.046
	SI3	0.350	0.163	**0.781**	0.224	0.514	0.084	0.350	0.343	0.275	0.234	0.268	0.233	0.086
FC	FC1	0.463	0.396	0.264	**0.776**	0.355	0.455	0.315	0.374	0.085	0.418	0.283	-0.057	-0.162
	FC2	0.390	0.595	0.209	**0.794**	0.219	0.244	0.268	0.313	0.255	0.321	0.201	0.124	-0.057
	FC3	0.416	0.494	0.250	**0.812**	0.215	0.401	0.219	0.347	0.030	0.372	0.315	0.079	-0.081
HM	HM1	0.380	0.287	0.600	0.184	**0.857**	0.278	0.430	0.417	0.246	0.144	0.259	0.210	0.080
	HM2	0.617	0.464	0.437	0.410	**0.889**	0.597	0.634	0.673	0.138	0.324	0.275	0.151	-0.036
	HM3	0.174	0.124	0.382	0.068	**0.614**	0.170	0.264	0.243	0.173	0.018	0.180	0.221	0.076
PV	PV1	0.472	0.302	0.179	0.409	0.436	**0.893**	0.344	0.370	-0.138	0.246	0.181	0.019	0.023
	PV2	0.484	0.266	0.232	0.414	0.450	**0.867**	0.303	0.360	-0.046	0.239	0.187	0.179	0.069
	PV3	0.526	0.417	0.317	0.474	0.486	**0.913**	0.348	0.425	-0.019	0.279	0.203	0.142	-0.066
	PV4	0.472	0.323	0.200	0.357	0.438	**0.919**	0.338	0.320	-0.084	0.179	0.130	0.036	-0.032
HB	HB1	0.555	0.415	0.378	0.272	0.540	0.280	**0.906**	0.667	-0.006	0.147	0.161	0.011	0.058
	HB3	0.562	0.334	0.400	0.334	0.549	0.339	**0.792**	0.583	0.198	0.288	0.246	0.166	-0.044
	HB4	0.613	0.480	0.365	0.304	0.534	0.371	**0.946**	0.736	-0.058	0.289	0.127	0.008	-0.086
BI	BI1	0.575	0.403	0.305	0.387	0.425	0.343	0.579	**0.856**	0.013	0.372	0.153	0.036	-0.123
	BI2	0.625	0.412	0.423	0.328	0.605	0.332	0.613	**0.891**	0.153	0.413	0.168	0.109	-0.096
	BI3	0.720	0.518	0.397	0.427	0.593	0.410	0.770	**0.897**	0.004	0.364	0.187	0.038	-0.055
IC	IC1	0.000	-0.004	0.285	0.010	0.195	-0.082	0.092	0.088	**0.739**	0.053	0.181	0.392	0.149
	IC2	0.034	0.082	0.187	0.144	0.151	-0.096	0.009	0.050	**0.888**	0.092	0.133	0.328	0.150
	IC3	0.059	0.083	0.160	0.199	0.204	-0.045	0.004	0.032	**0.936**	0.197	0.176	0.266	0.059
	IC4	-0.048	0.057	0.117	0.063	0.040	-0.229	-0.059	-0.080	**0.573**	0.092	0.144	0.076	0.002
UC	UC1	0.405	0.287	0.201	0.396	0.197	0.250	0.218	0.342	0.104	**0.917**	0.258	-0.130	-0.405
	UC2	0.410	0.343	0.217	0.470	0.272	0.249	0.280	0.453	0.165	**0.950**	0.247	-0.060	-0.360
LT	LT1	0.196	0.077	0.234	0.192	0.234	0.121	0.200	0.137	0.123	0.155	**0.764**	0.150	0.144
	LT2	0.239	0.243	0.276	0.313	0.244	0.271	0.140	0.192	0.114	0.263	**0.808**	0.090	-0.036

Constructs		PE	EE	SI	FC	HM	PV	HB	BI	IC	UC	LT	MF	PD
	LT3	0.215	0.154	0.184	0.186	0.225	0.065	0.185	0.088	0.124	0.140	**0.772**	0.085	0.095
	LT4	0.230	0.328	0.287	0.325	0.217	0.043	0.033	0.144	0.272	0.240	**0.656**	0.070	-0.062
MF	MF1	-0.026	-0.017	0.276	0.010	0.235	-0.026	0.092	0.087	0.424	-0.063	0.157	**0.860**	0.447
	MF2	0.001	0.013	0.270	0.058	0.191	0.082	0.059	0.064	0.382	-0.046	0.111	**0.930**	0.398
	MF3	-0.043	0.023	0.233	0.064	0.192	0.159	0.025	0.042	0.241	-0.141	0.115	**0.898**	0.558
	MF4	0.050	0.082	0.153	0.056	0.162	0.148	0.149	0.150	0.287	-0.046	0.057	**0.727**	0.338
PD	PD1	-0.025	-0.047	0.125	0.046	0.092	0.042	0.019	-0.009	0.167	-0.156	0.081	0.516	**0.792**
	PD2	-0.170	-0.198	0.024	-0.173	0.001	-0.018	-0.041	-0.120	0.103	-0.451	0.028	0.478	**0.981**

Note: PE: performance expectancy; EE: effort expectancy; SI: social influence; FC: Facilitating conditions; HM: hedonic motivation; PV: price value; HB: Habit; BI: behavioural intention; IC: individualism/collectivism; UC: uncertainty avoidance; LT: long/short term; MF: masculinity/femininity; PD: power distance; UB: use behaviour.

Appendix C. Questionnaire (chapter 4)

Constructs	Items	Source
Performance expectancy	PE1 - Mobile payment is useful to carry out my tasks.	(Venkatesh et al., 2012)
	PE2 - I think that using mobile payment would enable me to conduct tasks more quickly.	
	PE3 - I think that using mobile payment would increase my productivity.	
	PE4 - I think that using mobile payment would improve my performance.	
Effort expectancy	EE1 - My interaction with mobile payment would be clear and understandable.	
	EE2 - It would be easy for me to become skillful at using mobile payment.	
	EE3 - I would find mobile payment easy to use.	
	EE4 - I think that learning to operate mobile payment would be easy for me.	
Social influence	SI1- People who influence my behavior think that I should use mobile payment.	
	SI2- People who are important to me think that I should use mobile payment.	
	SI3- People whose opinions that I value prefer that I use mobile payment.	
Facilitating conditions	FC1 - I have the resources necessary to use mobile payment.	
	FC2 - I have the knowledge necessary to use mobile payment.	
	FC3 - Mobile payment is compatible with other systems I use.	
Hedonic motivation	HM1 - Using mobile payment is fun.	
	HM2 - Using mobile payment is enjoyable.	
	HM3 - Using mobile payment is very entertaining.	
Price value	PV1 - Mobile payment is reasonably priced. PV2 - Mobile payment is a good value for the money. PV3 - At the current price, mobile payment provides a good value.	
Innovativeness	I1 - If I heard about a new information technology, I would look for ways to experiment with it.	(Yi et al., 2006)
	I2 - Among my peers, I am usually the first to try out new information technologies.	
	I3 - In general, I am hesitant to try out new information technologies.	
	I4 - I like to experiment with new information technologies.	
Compatibility	C1 - Using mobile payment is compatible with all aspects of my life style.	(Moore & Benbasat, I., 1991)
	C2 - Using mobile payment is completely compatible with my current situation.	
	C3 - I think that using mobile payment fits well with the way I like to buy.	
	C4 - Using mobile payment fits into my life style.	
Perceived technology security	PTS1 - I would feel secure sending sensitive information across mobile payment.	(Cheng et al., 2006)
	PTS2 - Mobile payment is a secure means through which to send sensitive information.	
	PTS3 - I would feel totally safe providing sensitive information about myself over mobile payment.	
	PTS4 - Overall mobile payment is a safe place to send sensitive information	

Constructs	Items	Source
Behavioral intention to adopt	BI1 - I intend to use mobile payment in the next months.	(Bélanger & Carter, 2008; Venkatesh et al., 2012)
	BI2 - I predict I would use mobile payment in the next months.	
	BI3 - I plan to use mobile payment in the next months.	
	BI4 - I will try to use mobile payment in my daily life. BI5 - Interacting with my financial account over mobile payment is something that I would do. BI16 - I would not hesitate to provide personal information to mobile payment service.	
Intention to recommend	REC1 - I will recommend to my friends to subscribe to the mobile payment service, if it is available. REC2 - If I have a good experience with mobile payment I will recommend friends to subscribe to the service.	Self-developed

Appendix D. Demographic Information (chapter 4)

Demographic Information	#	%
Gender		
Male	121	40%
Female	180	60%
Age		
Until 20	59	19%
21 - 25	122	40%
26 - 35	47	16%
36 - 45	38	13%
Over 45	35	12%
Education		
12th Grade	67	22%
Bachelor's Degree	117	39%
Master Degree	91	30%
Doctorate Degree	26	9%

Appendix E. Survey (chapter 5)

Constructs	**Items** (UK)	#	Source
Performance expectancy (PE)	- I find mobile banking services useful in my daily life. - Using mobile banking services increases my productivity. - Using mobile banking services helps me accomplish things more quickly. - Using mobile banking services increases my chances of achieving things that are important to me.	PE1 PE2 PE3 PE4	(Venkatesh et al., 2003, 2012)
Effort expectancy (EE)	- Learning how to use mobile banking services is easy for me. - My interaction with mobile banking services is clear and understandable. - I find mobile banking services easy to use. - It is easy for me to become skilful at using mobile banking services.	EE1 EE2 EE3 EE4	(Venkatesh et al., 2003, 2012)
Social influence (SI)	- People who are important to me think that I should use mobile banking services. - People who influence my behaviour think that I should use mobile banking services. - Mobile banking services use is a status symbol in my environment.	SI1 SI2 SI3	(Venkatesh et al., 2003, 2012)
Facilitating conditions (FC)	- I have the resources necessary to use mobile banking services. - I have the knowledge necessary to use mobile banking services. - Mobile banking is compatible with other technologies I use. - I can get help from others when I have difficulties using mobile banking services.	FC1 FC2 FC3 FC4	(Venkatesh et al., 2003, 2012)
Hedonic motivation (HM)	- Using mobile banking services is fun. - Using mobile banking services is enjoyable. - Using mobile banking services is entertaining.	HM1 HM2 HM3	(Venkatesh et al., 2012)
Price value (PV)	- Mobile banking services are reasonably priced. - Mobile banking services are reasonably priced comparing with other banking channels. - Mobile banking services are a good value for the money. - At the current price, mobile banking services provide a good value.	PV1 PV2 PV3 PV4	(Venkatesh et al., 2012)
Habit (HB)	- The use of mobile banking services has become a habit for me. - I am addicted to using mobile banking services. - I must use mobile banking services. - Using mobile banking has become natural to me.	HB1 HB2 HB3 HB4	(Venkatesh et al., 2012)
Gamification impact (GI)	- If mobile banking were more fun/enjoyable I probably use it more often. - If using mobile banking would give me points, rewards and prizes (better interest rates, lower transactional rates …), I probably use it more often. - If mobile banking were more fun/enjoyable I probably advise others to use it.	GI1 GI2 GI3	From authors
Behavioural intention (BI)	- I intend to continue using mobile banking in the future. - I will always try to use mobile banking in my daily life. - I plan to continue to use mobile banking frequently.	BI1 BI2 BI3	(Venkatesh et al., 2003, 2012)
Use behaviour (UB)	What is your actual frequency of use of mobile banking services? i) Have not use; 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; x) Every day; xi)Several times a day.	UB	(Martins et al., 2014)

Appendix F. Respondents characteristics (chapter 5)

Measure	Value	Frequency	%
Gender	Male	256	78.5%
	Female	70	21.5%
Age	Below 35	68	20.9%
	Between 36 and 55	182	55.8%
	Over 56	76	23.3%
Education	Lower than bachelor	94	28.8%
	Bachelor	96	29.4%
	Master or higher	136	41.7%
Income (annual)	Less than 22.659 (EUR) *	131	40.2%
	Between 22.660 and 51.792 (EUR) *	103	31.6%
	More than 51.793 (EUR) *	55	16.9%
	I prefer not to answer	37	11.3%
Local of residence	Less than 500.000 habitants	79	24.2%
	More than 500.000 habitants	239	73.3%
	Don't know / I prefer not to answer	8	2.5%
Religion	Christian	227	69.6%
	None. agnostic or atheist	57	17.5%
	Other or I prefer not to answer	37	11.3%

*Note: Euro values considering 25/09/2014 exchange rate (1EUR = 3.0892 Real) (Exchangerates, 2014)

Appendix G. Survey (chapter 6)

Constructs	Items (UK)	#	Source
Facilitating conditions (FC)	- I have the resources necessary to use mobile banking services. - I have the knowledge necessary to use mobile banking services. - Mobile banking is compatible with other technologies I use. - I can get help from others when I have difficulties using mobile banking services.	FC1 FC2 FC3 FC4*	(Venkatesh et al., 2003, 2012)
Performance expectancy (PE)	- I find mobile banking services useful in my daily life. - Using mobile banking services increases my productivity. - Using mobile banking services helps me accomplish things more quickly. - Using mobile banking services increases my chances of achieving things that are important to me.	PE1 PE2 PE3 PE4	(Venkatesh et al., 2003, 2012)
Price value (PV)	- Mobile banking services are reasonably priced. - Mobile banking services are reasonably priced comparing with other banking channels. - Mobile banking services are a good value for the money. - At the current price, mobile banking services provide a good value.	PV1 PV2 PV3 PV4	(Venkatesh et al., 2012)
Effort expectancy (EE)	- Learning how to use mobile banking services is easy for me. - My interaction with mobile banking services is clear and understandable. - I find mobile banking services easy to use. - It is easy for me to become skilful at using mobile banking services.	EE1 EE2 EE3 EE4	(Venkatesh et al., 2003, 2012)
Social influence (SI)	- People who are important to me think that I should use mobile banking services. - People who influence my behaviour think that I should use mobile banking services. - Mobile banking services use is a status symbol in my environment.	SI1 SI2 SI3	(Venkatesh et al., 2003, 2012)
Hedonic motivation (HM)	- Using mobile banking services is fun. - Using mobile banking services is enjoyable. - Using mobile banking services is entertaining.	HM1 HM2 HM3	(Venkatesh et al., 2012)
Habit (HB)	- The use of mobile banking services has become a habit for me. - I am addicted to using mobile banking services. - I must use mobile banking services. - Using mobile banking has become natural to me.	HB1 HB2* HB3* HB4	(Venkatesh et al., 2012)
Disposition to trust (DT)	- I generally do not trust other people. - I generally have faith in humanity. - I fell that people are generally reliable. - I generally trust other people unless they give reason not to.	DT1* DT2 DT3 DT4	(Bélanger & Carter, 2008)
Trust of the Internet (TI)	- The mobile Internet has enough safeguards to make me feel comfortable using it to transact personal business with Banks. - I feel assured that legal and technological structures adequately protect me from problems on the mobile Internet. - In general, the mobile Internet is now a robust and safe environment in which to transact with Banks.	TM1 TM2 TM3	(Bélanger & Carter, 2008)
Trust of the bank (TB)	- I think I can trust banks. - Banks can be trusted to carry out mobile transactions faithfully. - I trust Banks keep my best interests in mind. - In my opinion, Banks are trustworthy.	TB1 TB2 TB3 TB4	(Bélanger & Carter, 2008)

Constructs	Items (UK)	#	Source
Perceived risk (PR)	- The decision of whether to use mobile banking services is risky. - In general, I believe using mobile banking services is risky. - Using mobile banking services subjects my checking account to potential fraud. - Using mobile banking services will cause me to lose control over the privacy of my payment information.	PR1 PR2 PR3 PR4	(Bélanger & Carter, 2008) (Featherman & Pavlou, 2003)
Behavioural intention (BI)	- I intend to continue using mobile banking in the future. - I will always try to use mobile banking in my daily life. - I plan to continue to use mobile banking frequently.	BI1 BI2 BI3	(Venkatesh et al., 2003, 2012)
Use Behaviour (UB)	Please choose your usage frequency for each of the following mobile banking services: a) Account balance inquiry b) Cash flow movements inquiry ** c) Term deposit d) Money transfer e) Service payments f) Mobile exclusive product acquisition g) Loans	 UB1 UB2** UB3 UB4 UB5 UB6 UB7	(Venkatesh et al., 2012)

Notes: * FC4, HB2, HB3, and DT1 were eliminated due to low loadings.
** UB2 removed due to high VIF.

Appendix H. Respondents characteristics (chapter 6)

		Portugal		Brazil		Mozambique	
Measure	**Value**	**Frequency**	**%**	**Frequency**	**%**	**Frequency**	**%**
Gender	Male	377	59.6%	256	78.5%	178	70.6%
	Female	256	40.4%	70	21.5%	74	29.4%
Age	Below 35	200	31.6%	68	20.9%	65	25.8%
	Between 36 and 55	361	57.0%	182	55.8%	147	58.3%
	Over 56	72	11.4%	76	23.3%	40	15.9%
Education	Lower than bachelor	263	41.5%	94	28.8%	90	35.7%
	Bachelor	272	43.0%	96	29.4%	109	43.3%
	Master or higher	98	15.5%	136	41.7%	53	21.0%
Income (annual)	Less than 4,688 (EUR)(MZ) * 22,659 (EUR)(BR) ** 29,999 (EUR)(PT)	348	55.0%	131	40.2%	80	31.7%
	Between 4,689 and 14,063 (EUR)(MZ)* 22,660 and 51,792 (EUR)(BR) ** 30,000 and 49,999 (EUR) (PT)	127	20.1%	103	31.6%	62	24.6%
	More than 14,064 (EUR)(MZ) * 51,793 (EUR)(BR) ** 50,000 (EUR)(PT)	64	10.1%	55	16.9%	56	22.2%
	I prefer not to answer	94	14.8%	37	11.3%	54	21.4%
Local of residence	Less than 500,000 habitants	457	72.2%	79	24.2%	43	17.1%
	More than 500,000 habitants	124	19.6%	239	73.3%	159	63.1%
	Don't know / I prefer not to answer	52	8.2%	8	2.5%	50	19.8%

Notes:
*Euro values considering 14/06/2014 exchange rate (1EUR = 42.6639 MT) (Freecurrencyrates, 2014)
**Euro values considering 25/09/2014 exchange rate (1EUR = 3.0893 Real) (Freecurrencyrates, 2014)