



Mobile banking use: A comparative study with Brazilian and U.S. participants



Rodrigo F. Malaquias^a, Yujong Hwang^{b,*}

^a Universidade Federal de Uberlândia, Brazil

^b DePaul University, USA & Kyung Hee University, Republic of Korea

ARTICLE INFO

Keywords:

Mobile banking
Emerging economy
Trust
Social influence
Structural equation model

ABSTRACT

As we can see in recent studies on mobile banking, there is an increasing number of papers addressing this new technology. Mobile banking contributes to the quality of life of people living in both developed countries, and also in emerging economies. In this context, we develop this paper in order to compare the determinants of mobile banking use between respondents from two countries with different levels of development: Brazil and the United States. Our theoretical model includes six variables as determinant factors of mobile banking use. In order to analyze path coefficients and test the six hypotheses, we employed a structural equation model. We also employed a quantitative test (multi-group analysis) to analyze the difference of path coefficients between the models of the two countries. The main results indicate similarities among the perceptions of the respondents that participated in the survey, but differences in coefficient magnitude.

1. Introduction

1.1. Motivation

Technological and internet development changed the way in which financial services are offered and used (Bhatiasevi, 2015; Laukkanen, 2016; Lee & Chung, 2009; Oliveira, Faria, Thomas, & Popovič, 2014), especially when we take into account mobile internet and mobile technologies (Bons, Alt, Lee, & Weber, 2012; Ha, Canedoli, Baur, & Bick, 2012; Sharma, 2017). In a set of new banking channels offered by banks (Calisir & Gumussoy, 2008), we can highlight mobile banking (Mohammadi, 2015). It consists of using mobile devices to contact banking services through wireless connection (Afshan & Sharif, 2016), and represents a worldwide phenomenon (Shaikh & Karjaluo, 2015) with important implications for current and future financial transactions (Kishore & Sequeira, 2016). Mobile banking “means that users adopt mobile terminals to access various payment services, such as account balance enquiry, transference, bill payment and financial management” (Zhou, 2012a, p. 1518; Zhou, 2012a; Zhou, 2012a, p. 1518). It has a considerable value for customers and for banks (Baabdullah, Alalwan, Rana, Kizgin, & Patil, 2019). Therefore, this technology can respond to some customers’ needs, such as performing banking activities without going to an ATM or bank branch.

Both customers and banks are benefited by mobile banking services,

such as online money transfers, automatic check payments, personal savings plans, bill payments, timely information, unlimited remote access, and immediacy, among others (Afshan & Sharif, 2016; Aker & Mbiti, 2010; Baptista & Oliveira, 2015, 2016; Laukkanen, 2016; Yuan, Liu, Yao, & Liu, 2014). Mobile payment services (Kapoor, Dwivedi, & Williams, 2015), mobile government (Shareef, Kumar, Dwivedi, & Kumar, 2016) and short messaging services of mobile phones (Shareef, Dwivedi, Kumar, & Kumar, 2017) are also among the benefits of mobile technologies. This growth in the use of mobile devices has a positive effect on the demand for mobile banking (Verissimo, 2016). Therefore, several studies have been developed in order to improve the public’s understanding of mobile banking adoption.

Promoting competition for innovative solutions in emerging economies, such as mobile banking, can contribute to the deepening of financial services (Cole, Sampson, & Zia, 2011). Furthermore, this technology can be effective in extending financial services to non-urban regions (Gurgand, Pederson, & Yaron, 1996). So, emerging technological innovations can reduce costs for banks and increase quality of services that they offer to customers (Cull, Demirgüç-Kunt, & Morduch, 2009), especially due to the lack of financial infrastructure in developing countries (Jack, Ray, & Suri, 2013), facilitating financial inclusion and economic growth (Kishore & Sequeira, 2016). The expansion of banking systems in emerging countries has also been an important contribution to economic development (Aker & Mbiti, 2010); therefore

* Corresponding author at: DePaul University, 1 E Jackson Blvd., DePaul Center 6039, Chicago, IL, 60604, USA.

E-mail addresses: rodrigo.malaquias@gmail.com (R.F. Malaquias), yhwang1@depaul.edu (Y. Hwang).

mobile applications for banking services deserve the attention of banks located in developing countries.

Recent reviews on mobile banking (Baptista & Oliveira, 2016; Shaikh & Karjaluoto, 2015) indicate previous studies which have addressed different countries (i.e. developed and developing regions) and sample sizes ranging from 8 to 3582. Despite a rich literature that we observe in this regard, we find an opportunity to address a formal comparison between the determinants of mobile banking adoption in a developed country versus an emerging economy, which motivated this study. According to Malaquias and Hwang (2016), cross-country differences should be considered in the agenda of technology challenges. Moreover, the differences in terms of level of development among countries also presents an effect on the variables that can facilitate or create obstacles to the adoption of new technologies. Some additional information regarding the countries selected to develop the study are provided in the following paragraphs.

In the case of this research, we chose to study the cases of Brazil and the United States, because these countries have different status of development and different indicators regarding Information and Communication Technology (ICT) adoption, as measured by IDI (ICT Development Index). “The IDI is a composite index that combines 11 indicators into one benchmark measure which can be used to monitor and compare developments in ICT between countries and over time” (ITUR [International Telecommunication Union Report], 2016, p. 7). Among 175 countries, the average IDI in 2016 was 4.94. In the same year of 2016, the United States was in the 15th position of the ranking (with an IDI of 8.17, the highest index among the 34 countries of the Americas region) and Brazil was in the 63rd position (with an IDI of 5.99, this is the 9th position among the 34 countries of the Americas region). In that report (ITUR, 2016), we can observe that there is also a difference in the percentage of households with internet between the countries (54.5 in Brazil and 82.2 in the USA).

Perceived cost represents an important feature that can affect mobile banking adoption (Ha et al., 2012). Brazil and the USA are part of the same continental mass; nevertheless, from ITUR (2016), we can observe differences in the cost of a Mobile-Cellular sub-basket, which would cost \$11.94 USD in Brazil and \$35.73 USD in the USA. The same can be observed in looking at the cost of 500MB prepaid mobile broadband, priced at \$7.48 USD in Brazil and \$38.11 USD in the USA. Moreover, the percentage of mobile phone owners with a bank account that use mobile banking is still below 50% in the USA, as low as 43% according to the 2015 survey (FED, 2016). However, 38% of consumers with bank account that participated in the 2015 survey use mobile banking (FED, 2016). In Brazil, considering the means of accessing banking services, the 2015 report indicates that only 21% of the transactions and service calls, with and without movement of funds, were developed through mobile banking, up from 10% in 2014 (Febraban, 2016). This figure shows that the rate of adoption of mobile banking is different in each of these countries, but that there is opportunity for improvements in both. The results motivate the following research question: what are the differences of the determinants of mobile banking use between Brazil and the United States?

1.2. Purpose and relevance

The aim of this paper is to compare the determinants of mobile banking use between Brazil and the United States. Being a worldwide phenomenon, it is of most interest to engage in comparative studies on mobile banking between developed and developing countries (Shaikh & Karjaluoto, 2015). Moreover, the relationship between the adoption of electronic banking and its antecedents can be moderated by the national culture (Zhang, Weng, & Zhu, 2018), which reinforces the relevance of new research in this field. The results of this research are also relevant for banks that operate internationally, because depending on the characteristics of the market in which the bank has branches, the strategy to increase the index of mobile banking adoption should be

different. Since we empirically test our quantitative model in two different countries and compare the path coefficients obtained in this analysis, the results of this paper are useful for advertising campaigns (Baptista & Oliveira, 2015) and marketing strategies (Malaquias & Hwang, 2016) implemented by banks and mobile banking developers. These initiatives can contribute to mobile banking adoption in different geographical areas.

The quantitative model in this paper considers the variables of TAM, which is a widely applied and the most influential model to understand the acceptance of information systems (Lee, Kozar, & Larsen, 2003; Venkatesh, 2000). Moreover, TAM is “a well-respected model of IT adoption and use” (Al-Gahtani, 2001, p. 38), a well-established and a parsimonious model (Dwivedi, Rana, Janssen et al., 2017; Venkatesh & Davis, 2000). Two other constructs are also present in the research model: trust and social influence, as well as gender and age as demographic characteristics. As stated by Bhatiasevi (2015), popular models extensively used in the past shall be subject to new investigations, in order to test similarities and differences of the results from the perspective of others contexts. In the case of this paper, we explore the difference in behavioral determinants by comparing two countries with different levels of economic development, and our results show that determinants are also different in magnitude, especially for the variables’ perceived ease of use and social influence.

The reactions of individuals to computers and their interactions are complex and multifaceted (Davis, 1989). Moreover, the understanding of factors related with the acceptance and use of information systems represent a major concern for research and practice (Dwivedi, Rana, Jeyaraj, Clement, & Williams, 2017). Therefore, our study can contribute to knowledge building in the information systems field. Furthermore, banks should expect a large number of customers adopting their mobile apps for banking services, in order to generate an acceptable rate of return on the investments in this technology (Lee & Chung, 2009, p. 385). In this way, our results also can contribute to improve this figure, as we show differences in mobile banking using determinants between two different countries.

2. Research model

The effective adoption of new technologies first requires acceptance by potential users, and different studies have been developed to improve the understanding about some factors, characteristics and attributes related to the acceptance of contemporary technologies. Research in the field of information systems has explored how and why individuals accept and adopt new technologies (Rana, Dwivedi, Williams, & Weerakkody, 2016). In the context of mobile banking, we can observe the same reasoning. Two key stakeholders are present in the channel structure of mobile banking: the users and the service providers (Shareef, Baabdullah, Dutta, Kumar, & Dwivedi, 2018). Factors such as system quality and satisfaction also can affect consumer attitudes (Dwivedi, Kapoor, Williams, & Williams, 2013). Several previous research examined the antecedents of customer satisfaction and behavioral intention to use mobile banking (Sharma, 2017; Sharma & Sharma, 2019). The service providers involved with mobile banking, such as telecommunication companies, financial institutions, software developers and banks, as well as IS researchers, should be interested in accessing the effectiveness of this technology (Lin, 2013).

According to Shaikh and Karjaluoto (2015), based on a search that resulted in 55 relevant publications about mobile banking adoption, the four most common antecedents used to understand mobile banking adoption are perceived ease of use, perceived usefulness, trust and social influence. The authors also show that user demographics are common in studies about mobile banking. In the case of this study, we use age and gender as demographic characteristics. In this way, following the main results of the paper written by Shaikh and Karjaluoto (2015), our theoretical model considers six determinant factors of mobile banking use, as shown in Fig. 1.

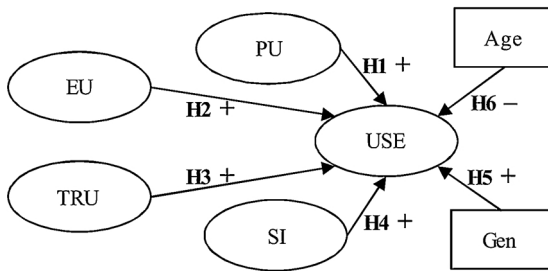


Fig. 1. Theoretical model and expected signs.

Notes: USE: represents the dependent variable, mobile banking use; PU: perceived usefulness; EU: perceived ease of use; TRU: trust in mobile banking; SI: social influence; Gen: respondent's gender; Age: respondent's age.

The source of the first and the second variables, perceived ease of use and perceived usefulness, is the theory of acceptance model (TAM), which has received a significant attention in the information systems literature (Luarn & Lin, 2005), as well as in studies on mobile banking (Ha et al., 2012). Potential determinants of these variables, perceived ease of use and perceived usefulness, were also explored in previous research (Raza, Umer, & Shah, 2017). Despite the recurrence of beliefs (Agarwal & Karahanna, 2000), TAM is a widely applied model to understand both the acceptance and usage of IT/IS (Sharma, 2017; Venkatesh, 2000), and there is significant empirical evidence in its support (Venkatesh, 1999). Previous studies also have proposed extensions of TAM, including other constructs such as computer self-efficacy, computer anxiety, social influence and the role of intrinsic motivation (Venkatesh, 1999, 2000; Venkatesh & Bala, 2008; Venkatesh & Davis, 2000).

In the development of TAM, Davis (1989) stated that from many variables that can influence the acceptance and use of a given system, two are especially important. The first, perceived usefulness, is related to the expectancy that the system will help the user to perform his/her job better. The other, perceived ease of use, states that even with a potential belief in the usefulness of a system, users can present a concern whether the system is or is not too hard to use. Between these two constructs, perceived usefulness tends to present higher effects on the use of a given system in comparison to perceived ease of use (Davis, 1989; Venkatesh & Davis, 2000). On one hand, perceived ease of use, or effort expectancy (as we can find in Dwivedi, Shareef, Simintiras, Lal, & Weerakkody, 2016; Rana, Dwivedi, Lal, Williams, & Clement, 2017; Venkatesh, Morris, Davis, & Davis, 2003 as a more comprehensive and similar concept), is a vital characteristic that affects the diffusion of a new technology (Bhatiasevi, 2015), both in organizational and non-organizational environments (Kishore & Sequeira, 2016). On the other hand, in the context of mobile banking, previous studies observed that perceived usefulness, or performance expectancy, represents one of the most relevant factors that explains behavior intention to use mobile banking (Alalwan, Dwivedi, Rana, & Williams, 2016; Baptista & Oliveira, 2015; Ha et al., 2012; Hanafizadeh, Behboudi, Koshksaray, & Tabar, 2014). Considering studies of mobile payment, the results indicating the relevance of performance expectancy are similar (Slade, Williams, Dwivedi, & Piercy, 2015).

Therefore, when developing mobile banking applications, developers need to consider customers' needs and make sure their applications function easily (Gu, Lee, & Suh, 2009; Hanafizadeh et al., 2014). Mobile banking applications should be easy to learn, as well as easy to use (Lin, 2011; Luarn & Lin, 2005). In this way, these characteristics are expected to increase the chances of mobile banking use. For example, a feedback mechanism to answer questions online through a customer service representative and face potential problems with using the app can also contribute to faster adoption of this technology (Bhatiasevi, 2015; Mohammadi, 2015). Based on these evidences and arguments, we present the two initial hypotheses of this study:

H1. Perceived usefulness has a positive effect on mobile banking use.

H2. Perceived ease of use has a positive effect on mobile banking use.

In the same line, mobile applications need to be trustworthy (Gu et al., 2009; Malaquias & Hwang, 2016), so they can attract and retain customers, particularly through convincing customers that the use of mobile banking involves low risk of financial losses. The security level of personal information is also an important feature. E-commerce operations involve a perception of risk, and mobile banking is in this context too (Malaquias & Hwang, 2016). "Perceived Risk refers to various types of risk that users consider to pertain to mobile banking, including hacking of data, possible stealing of handsets and unsuccessful transactions" (Ha et al., 2012, p. 221). Potential users of mobile banking will effectively use it when they expect a secure conclusion of their transactions and expect higher protection of personal information (Bhatiasevi, 2015). Consumers' trust in online vendors has a positive effect on the willingness to make mobile payments (O'Reilly, Duane, & Andreev, 2012). In the definition of trust, we need to consider that it helps consumers to overcome potential perceptions of risk and engage in behaviors that enable the sharing of personal data or information between them and the vendors (McKnight, Choudhury, & Kacmar, 2002) in the case of this study, between consumers and mobile banking apps available in mobile devices.

Customers have concerns with security and privacy, so they expect trusting technologies to develop their activities (Hanafizadeh et al., 2014; Wonglimpiyarat, 2014; Zhou, 2012a). In the case of mobile banking, trust involves security provided by banks, cell-phone procedures, and telecommunication operators (Hanafizadeh et al., 2014). Among the reasons of refusing to provide personal information in mobile banking applications, is the lack of trust in these systems for the purpose of data collection and storage (Luarn & Lin, 2005). Trust also affects users' perception of mobile banking satisfaction (Lee & Chung, 2009), and it increases the adoption of mobile banking by customers (Lin, 2011), being a crucial factor in this regard (Alalwan, Dwivedi, & Rana, 2017). Therefore, we argue that trust in mobile banking is positively related to the acceptance of such technology, and the third hypothesis of our research model is:

H3. Trust has a positive effect on mobile banking use.

Social influence considers that an individual perceives other important people's opinions about his or her own need to use a given system (Venkatesh et al., 2003). Venkatesh and Davis (2000), in the extension of TAM, referred to as TAM2, observed that the effect of interrelated social forces, such as subjective norm, voluntariness and image, was relevant to improve the understanding of intention to use and perceived usefulness. In the context of mobile banking, several studies have included this construct in their models. People from rural areas are also subject of social influence, since they need to rely on the opinion of third parties for the decision making process (Kishore & Sequeira, 2016). There is also another way of interpreting the role of social influence. Banks can promote marketing initiatives to disseminate mobile banking safety and benefits; these strategies could be more effective if they are conducted from current users to users' friends (Malaquias & Hwang, 2016). This is a measure that indirectly, through social influence, can contribute to the reduction of uncertainty (Malaquias & Hwang, 2016; Montezemi & Saremi, 2015).

Gu et al. (2009), in a web-based survey with 910 respondents from Korea, did not observe a significant relationship between social influence and perceived usefulness of mobile banking; a similar result was also observed by Alalwan et al. (2017) in a study of mobile banking with Jordanian bank customers. Gu et al. (2009) consider that mobile banking is a technology that responds to an individual necessity, within a voluntary environment, so the influence of others is not the major issue with using this technology. In the same line, Baptista and Oliveira (2015), in a survey with 252 respondents from Africa, did not observe a positive effect of social influence on behavioral intention to use mobile

banking. In comparison with full-time employees, [Bhatiasevi \(2015\)](#) found that students are more subject to social influence of relatives and extended relationships, so it is an important construct to include in research about mobile banking use. The sample of the study of [Bhatiasevi \(2015\)](#) includes 272 complete questionnaires from students, both undergraduate and graduate, who use banks and visit shopping malls, all from Thailand ([Bhatiasevi, 2015](#)). [Slade, Dwivedi, Piercy, and Williams \(2015\)](#) also observed that social influence can affect the intention of nonusers to adopt remote mobile payments; therefore, this variable could be important to understand the adoption of mobile banking too. Based on the arguments about the relevance of the construct of social influence, and considering that our sample includes undergraduate students, we present the following hypothesis:

H4. Social influence has a positive effect on mobile banking use.

Age and gender were included as demographic characteristics of respondents. Gender differences are present in a variety of processes that involve decision-making ([Venkatesh, Morris, Sykes, & Acherman, 2004](#)), and can influence the behavior of people in a wide variety of situations ([Venkatesh & Morris, 2000](#)), being useful in the context of the internet ([Colley & Maltby, 2008](#)) and online or mobile services ([Yuan et al., 2014](#)). According to [Laukkanen \(2016, p. 2434\)](#), gender “is one of the most studied consumer demographics in the electronic services context.” Computer anxiety, more prominent in women ([Venkatesh & Morris, 2000](#)), can generate an effect in the use of new technologies to perform activities, so it is expected that men tend to use mobile banking more intensively than women do. Moreover, the cognitive attitude toward online shopping is lower for women than it is for men ([Hasan, 2010](#)), and their risk perception in online shopping is higher than the risk perception of men ([Garbarino & Strahilevitz, 2004](#)).

Regarding age, young people could be less resistant in adopting new technologies, such as mobile banking ([Mohammadi, 2015](#)), because they can perceive lower levels of risk in mobile banking ([Luo, Li, Zhang, & Shim, 2010](#)). In the study of [Malaquias and Hwang \(2016\)](#), the authors observed that younger respondents tend to develop higher levels of trust in mobile banking than older respondents. Mature consumers tend to perceive higher levels of risks from new technologies; they also consider new technologies as more complicated to use ([Laukkanen, Sinkkonen, Kivijärvi, & Laukkanen, 2007](#)). Furthermore, in the studies of [Luo et al. \(2010\)](#) and [Laukkanen \(2016\)](#), among the socio-demographic variables, they included age and gender. In this way, the directions of our two hypotheses that address demographic characteristics are:

H5. Gender (male) has a positive effect on mobile banking use.

H6. Age has a negative effect on mobile banking use.

[Fig. 1](#) summarizes the theoretical model studied in this paper, and the expected signs between each variable and mobile banking use.

The path coefficients of [Fig. 1](#) are estimated in a sample with respondents from Brazil and from the United States, as we presented in the introduction of this study. Thus, we estimate a model for each country, and use a quantitative tool to verify whether there is any significant difference between the estimates. We expect a significant difference mainly due to development status and differences in ICT indicators.

In addition to the arguments available in the introduction of this paper, financial development is a relevant factor for economic growth ([Cole et al., 2011](#)), so it is reasonable to assume that countries more advanced in financial development have higher demand for financial innovations such as mobile banking. We hypothesize that the determinants of mobile banking use will have more intensive effects on Brazil than on the United States (US), because Brazil is a developing economy and has an enormous potential for mobile banking penetration ([Malaquias & Hwang, 2016](#)). In a more developed economy, due to the higher rates of mobile banking adoption, the determinants from

traditional theories should present lower effects, which is similar to the considerations of [Baptista and Oliveira \(2015\)](#), regarding the high level use of mobile phones in the geographic region of the survey.

3. Method and data

We used previous studies to develop our questionnaire for data collection. The source of items that comprise the constructs of this study are indicated in [Appendix A](#). A Likert scale with five points was employed to codify the responses, and the ranges vary from 1 (strongly disagree) to 5 (strongly agree). All respondents are undergraduate students in the field of management or business. Typically, there is a criticism about the use of responses from undergraduate students to develop studies in the field of information systems, because they can differ from the target population ([Agarwal & Karahanna, 2000](#)). Nevertheless, undergraduate students “often have convenient access to the Internet and the basic computer skills required for conducting various online activities [...]. Therefore, they have the basic computer skills and the necessary technology infrastructure to conduct mobile banking” ([Luo et al., 2010, p. 227](#)). Based on these considerations, we decided to conduct the research with undergraduate students, who are also current and potential users of mobile banking.

The respondents were invited to participate in the survey voluntarily. Students from the USA answered the questionnaire through an electronic survey, and Brazilian students answered the questionnaire through the paper-and-pencil method. We employed paper-and-pencil method following the previous study of [Malaquias and Hwang \(2016\)](#), who adopted this strategy to interact with participants in Brazil. We obtained a total of 375 usable questionnaires, 201 from Brazilian students and 174 from students from the USA. These were the results of 500 invitations, 200 sent to students in the USA and 300 to students in Brazil, which indicates a rate of response of 75%. Some students in the USA may have come from another country, but this fact was not controlled during the data collection, because we did not ask the nationality of the respondent. On the other hand, we consider that if the respondent lives in the USA, he or she is a potential user of mobile banking in that country.

The research questionnaire was available in English to collect data from students from the USA. Nevertheless, we needed to translate it to Brazilian Portuguese, which is the local idiom of the Brazilian students who participated in the survey. The questionnaire in English was translated to Brazilian Portuguese by the authors of the paper. Afterwards, we requested a Brazilian professor to verify if the items available in the questionnaire were compatible. This professor had experience with publication of papers in international academic journals, including papers that use questionnaires. Some minor suggestions were made and the revised version of the questionnaire was used to collect data as the final Brazilian Portuguese version.

Before hypotheses testing, we employed confirmatory factor analysis (CFA) in order to verify the reliability of measures. Expected indexes for good measurement are at least 0.5 for average variance extracted (AVE), and at least 0.7 for composite reliability (CR) and Cronbach’s alpha (CA). As we can observe in [Table 1](#), all indexes are above the thresholds, which indicate good convergent validity. It is also important to comment that all items presented significant loadings ($p < 0.01$) in their respective constructs. For the purpose of discriminant validity analysis, we estimate the root square of AVE, shown in [Table 2](#), with values in bold. As we can see in [Table 2](#), the correlation between all the constructs is statistically significant. Nevertheless, it seems that there is not a problem with specification, because none of the correlation coefficients is above the root square of AVE. The only correlation coefficient that is above 0.5 refers to the bivariate relationship between USE, the dependent variable, mobile banking use, and SI (social influence); as we hypothesized a significant relationship among these two variables (H4), and USE is the dependent variable of this study, this coefficient does not represent a concern with the validity

Table 1
Reliability of the constructs.

Const.	Items	Load. (Std.)	t-value (Loadings)	CR	AVE	CA
USE	use1	0.888	63.610	0.890	0.729	0.932
	use2	0.900	68.220			
	use3	0.928	80.450			
PU	pu1	0.777	29.340	0.853	0.662	0.858
	pu2	0.925	42.980			
	pu3	0.758	27.650			
TRU	tru1	0.827	29.190	0.813	0.598	0.825
	tru2	0.909	33.670			
	tru3	0.618	17.060			
SI	si1	0.861	39.830	0.823	0.612	0.862
	si2	0.941	48.100			
	si3	0.681	22.180			
EU	eu1	0.847	41.750	0.831	0.622	0.888
	eu2	0.908	51.460			
	eu3	0.801	35.130			

Notes: USE: represents the dependent variable, mobile banking use; PU: perceived usefulness; EU: perceived ease of use; TRU: trust in mobile banking; SI: social influence.

Table 2
Discriminant validity.

Factor	USE	PU	TRU	SI	EU
USE	0.854				
PU	0.464***	0.813			
TRU	0.373***	0.361***	0.773		
SI	0.513***	0.296***	0.235***	0.782	
EU	0.457***	0.497***	0.478***	0.333***	0.789

Notes: USE: represents the dependent variable, mobile banking use; PU: perceived usefulness; EU: perceived ease of use; TRU: trust in mobile banking; SI: social influence.

***significant at 1%.

**significant at 5%.

*significant at 10%.

of our model.

The ratio between chi-square and degrees of freedom of the model, which equal 3.591, in the CFA stage, shows an acceptable value, lower than 5.0 (Hair, Anderson, Tatham, & Black, 1998). It is recommended to evaluate this ratio together with other indexes, and the other goodness of fit statistics indicate have also indicated good values on the Comparative Fit Index - CFI and Tucker-Lewis Index - TLI, both above 0.9. Nevertheless, the root mean square error of approximation (RMSEA) is above the threshold, at 0.08, but we need to consider the confidence interval in this evaluation. In this way, RMSEA's lower bound indicates that the value of 0.08 is in the confidence interval of the measurement of the model, with the lower bound at 0.075 and the upper bound at 0.092. Thus, we consider that we can employ structural equation modeling to test the hypotheses and estimate path coefficients.

In order to compare the path coefficients of the two samples, we employed a multi-group analysis (Chin, 2000), also used by Lin (2011) in the context of mobile banking.

4. Results and discussion

According to survey results, the key constructs to understand mobile banking use with Brazilian participants are social influence, perceived usefulness and trust (Fig. 2). For respondents in the USA, the main constructs are perceived ease of use and trust (Fig. 3). Based on these results, we can observe that the performance of the research model differs among the two samples, since there are four significant relationships at 5% in the sample of Brazilian respondents and only two

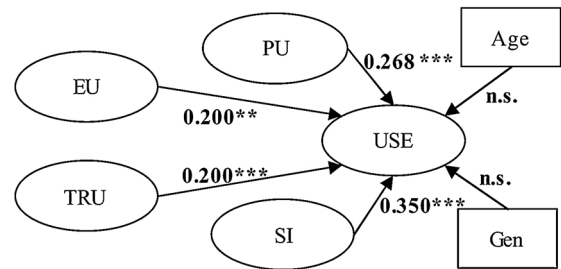


Fig. 2. Path coefficients for Brazilian respondents.

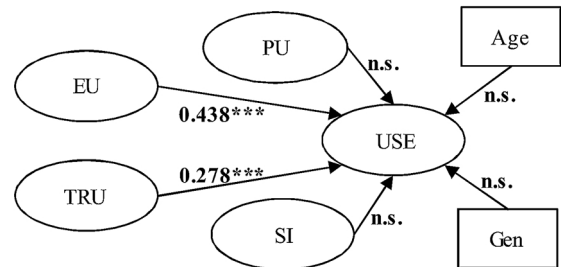


Fig. 3. Path coefficients for respondents from the USA.

significant relationships in the sample of US respondents. Table 4 summarizes the comparison of the signs between the observed coefficients and the expected directions, as hypothesized in the theoretical framework of this paper.

As Figs. 2 and 3 and Table 3 indicate, two hypotheses are fully supported in this study, namely the positive effect of perceived ease of use and trust on mobile banking use, since their respective coefficients were positive and statistically significant at 5% ($p < 0.05$). Independently of the country, the relevance of measures to face higher perception of security and privacy risks are useful for mobile banking developers to improve the adoption rate of this technology. Features such as easiness to learn, easiness to use, and easy functions (Gu et al., 2009; Hanafizadeh et al., 2014; Lin, 2011; Luarn & Lin, 2005) remain relevant in the opinion of the respondents who participated in this study. On the other hand, demographic characteristics, such as age and gender, did not make any significant effect on mobile banking use, among the participants of this research. According to the main results of this study, the use of mobile banking among both genders was equivalent. One possible reason to justify an absence of significant relationship between age and the dependent variable is the fact that our sample is mainly comprised of relatively young participants (18+), since the research was conducted with undergraduate students. Moreover, observing that some variables were not significant in all models, other factors could be considered in further studies to improve the understanding about the differences in mobile banking use among different countries.

This result is similar to that obtained by Gu et al. (2009); according to their findings, perceived usefulness, trust and perceived ease of use were the most important constructs to explain behavioral intention in mobile banking in Korea. Perceived usefulness and trust were among the main factors that explain MB adoption by Iranian bank clients (Hanafizadeh et al., 2014), which is partially in accordance with the findings of this survey.

Considering the studies of AlAlwan et al. (2016), Baptista and Oliveira (2015), Kishore and Sequeira (2016), Lin (2011), Oliveira et al. (2014) and Zhou, Lu, and Wang (2010), our results are not completely convergent, because those authors observed that perceived usefulness is one of the most important factors used to explain behavioral intention to use mobile banking; on the other hand, perceived ease of use (or effort expectancy) did not make a significant effect on the dependent

Table 3
Comparison of the observed signs with the expect signs.

Hyp.	Relationship	Expected Sign	All Sample	BR	US	Result
H1	PU === > Use	+	+ ^{***}	+ ^{***}	n.s.	Supported (Partially)
H2	EU === > Use	+	+ ^{***}	+ ^{**}	+ ^{***}	Supported
H3	TRU === > Use	+	+ ^{***}	+ ^{***}	+ ^{***}	Supported
H4	SI === > Use	+	+ ^{***}	+ ^{***}	n.s.	Supported (Partially)
H5	Gen === > Use	+	n.s.	n.s.	n.s.	Not Supported
H6	Age === > Use	-	n.s.	n.s.	n.s.	Not Supported
			n = 375	n = 201	n = 174	

Notes: Use: represents the dependent variable, mobile banking use; PU: perceived usefulness; EU: perceived ease of use; TRU: trust in mobile banking; SI: social influence; Gen: respondent's gender; Age: respondent's age.

[§]Significant at 10%.
^{***} Significant at 1%.
^{**} Significant at 5%.
^{n.s.} Not significant.

variable (Baptista & Oliveira, 2015; Oliveira et al., 2014; Yuan et al., 2014; Zhou et al., 2010), and the effect of perceived ease of use, observed by Kishore and Sequeira (2016), was lower than the effect of perceived usefulness. In this study, the positive effect of perceived ease of use on mobile banking use indicates that an increase in the scores of this construct tend to be related to an increase in the scores of USE; on the other hand, a decrease in the scores of perceived ease of use tend to be related to a decrease in the scores of USE. However, this is not necessarily evidence of a causal relationship. In other words, based on the results of the entire sample, users that tend to perceive mobile banking as easy to use also tend to use mobile banking more than their counterparts, with a significant coefficient at 1%). The positive coefficient of perceived usefulness, in the sample with all respondents and in the sample with Brazilian respondents, is also in line with the research of Raza et al. (2017), regarding the intention towards adopting mobile banking.

As we can see in Table 4, the higher difference between the estimates from the two models is in the effect of social influence.

We observe that in a place where there is higher adoption of mobile banking, social influence makes no significant difference to the use of this technology. This result is in line with Gu et al. (2009) and Alalwan et al. (2017). In this regard, Alalwan et al. (2017) comment that the participants of the research could be less interested in the recommendations and attitudes of reference groups in the process of formulation of their intention to adopt mobile banking (Alalwan et al., 2017). According to Venkatesh et al. (2003), the role of social influence is also controversial, as some studies consider it, and others do not. In contrast to Zhou et al. (2010), the studies of Oliveira et al. (2014) and Baptista and Oliveira (2015) did not indicate a significant relationship

between social influence and behavioral intention to use mobile banking, which is in line with the findings of the present study in the case of respondents from the USA.

One of the reasons that Baptista and Oliveira (2015) provide to explain a non-significant effect of perceived ease of use, effort expectancy, is the high level of mobile phone usage in the geographic region of the respondents. We use the same reasoning to interpret the path coefficient of the construct of perceived usefulness on the dependent variable of our study (USE) in the sample from the USA. We consider that, in the United States, participants in the survey had sufficient knowledge about the benefits and contributions of mobile banking to better performing their financial tasks. Nevertheless, perceived ease of use seems to remain an important factor to improve the adoption of this technology.

The effect of trust on mobile banking use is similar (Table 4, *t* statistic = -0.687, not significant at 10%) between the two surveys, and confirms the relevance of this construct, as pointed out by previous studies, such as Luarn and Lin (2005), Malaquias and Hwang (2016) and Oliveira et al. (2014).

5. Conclusion and implications

We develop this study considering that differences in indicators regarding ICT, as well as in the level of development of a financial system, could affect the acceptance and the use of innovative technologies. Therefore, the aim of this paper is to compare the determinants of mobile banking use between respondents from two countries: Brazil and the United States. Using a sample with 375 complete responses, our results indicate that trust and perceived ease of use are relevant factors

Table 4
Results for the quantitative test between path coefficients of the two samples.

Hyp.	Relations.	Observed Paths			BR x US T-Value
		All sample (n = 375) path	BR (n = 201) path	US (n = 174) path	
H1	PU === > Use	0.259 ^{***}	0.268 ^{***}	0.144 ^{n.s.}	1.020 ^{n.s.}
H2	EU === > Use	0.219 ^{***}	0.200 ^{**}	0.438 ^{***}	-1.991 ^{**}
H3	TRU === > Use	0.160 ^{***}	0.200 ^{***}	0.278 ^{***}	-0.678 ^{n.s.}
H4	SI === > Use	0.382 ^{***}	0.350 ^{***}	0.071 ^{n.s.}	2.611 ^{***}
H5	Gen === > Use	-0.012 ^{n.s.}	-0.092 ^{n.s.}	0.070 ^{n.s.}	-1.672 [*]
H6	Age === > Use	0.074 ^{n.s.}	0.095 ^{n.s.}	-0.022 ^{n.s.}	1.203 ^{n.s.}

Notes: Use: represents the dependent variable, mobile banking use; PU: perceived usefulness; EU: perceived ease of use; TRU: trust in mobile banking; SI: social influence; Gen: respondent's gender; Age: respondent's age.

^{***} Significant at 1%.
^{**} Significant at 5%.
^{*} Significant at 10%.
^{n.s.} Not significant.

to understand mobile banking use in both countries. On the other hand, social influence is a relevant construct in Brazil, but its effect is not significant among respondents from the USA. This is the main difference observed in our quantitative model.

Even in a country with higher levels of adoption of mobile banking, in comparison with Brazil, results indicate that respondents from the USA perceive ease of use as the main determinant of mobile banking use. This result is far from expected since US respondents are usually more proficient in the use of mobile banking. In Brazil, this variable presented a positive and significant relationship with the dependent variable, but the magnitude of the coefficient is lower, and the difference between the coefficients is also significant. The formal test that we employed to analyze the differences in path coefficients, and the differences observed in the coefficients of social influence and perceived ease of use are among the major contributions of this paper. The heterogeneous characteristics of customers in relation to their willingness to adopt mobile banking (Shareef et al., 2018) are reinforced by the results of this study, since there are differences in the path coefficients among the two samples. This evaluation indicates academic and practical implications.

Regarding academic implications, TAM is a useful theoretical framework used to understand the adoption of new technologies. It is a parsimonious, widely adopted, well-respected and well-established model (Al-Gahtani, 2001; Lee et al., 2003; Venkatesh, 2000; Venkatesh & Davis, 2000). This paper was developed using two constructs of TAM, perceived ease of use and perceived usefulness, and also two other constructs frequently used by literature as antecedents of mobile banking adoption, trust and social influence (Shaikh & Karjaluoto, 2015). We expect to advance the research about mobile banking because our results indicate that when the technologies are in the diffusion process, even in regions or countries with higher levels of adoption of such technology, perceived ease of use construct remains a significant and positive effect. It is also necessary to highlight features of the new technologies that indicate their usefulness and consider the influence of others, such as social influence in the case of Brazil. Aside from the theoretical value of traditional theories, the context in which they are used and evaluated seems to be an important issue in addressing the behavior of individuals. As we explored in this paper, this is especially due to the significant difference in the results for social influence. Thus, popular theories could be combined with other variables to better understand contemporary technologies, as in the case of mobile banking, which is a worldwide phenomenon (Shaikh & Karjaluoto, 2015).

In relation to practical implications, our results are relevant especially for strategies of multinational banks. Advertising campaigns and marketing actions (Baptista & Oliveira, 2015; Malaquias & Hwang, 2016) to improve the adoption of mobile banking in different locations should consider the variables presented by traditional theories, but the focus in each region need to be different. Some examples of these differences include the level of sensitivity to social influence. Attractive videos posted on social networks, such as YouTube and Facebook, could help in the diffusion of mobile banking (Alalwan et al., 2017), and the intensity of these actions can present different effects among different countries, as the main results of this study suggest. Nowadays, there are banks which have branches in the United States and Brazil, as well as in other countries. Since mobile banking can reduce operational costs for financial institutions, these strategies can help institutions to reach new customers using mobile banking. On the other hand, with better information of this banking channel, customers will be able to realize ubiquitous, immediate, and timely access of their banking accounts.

In this study, trust presented a significant effect on mobile banking use in both countries. This result is in line with the considerations of previous research (such as Alalwan et al., 2017; Shareef et al., 2018) and have practical implications, since banks should be sure that the channels of mobile banking are safe and secure.

Moreover, considering the decision maker's point of view, our

results together with previous studies indicate that some additional measures could be necessary to complement the investments made in new technologies, which is the case with mobile banking. This technology has a lot of advantages for banks and for customers, but its effective adoption involves behavioral factors which need attention to improve the success of its implementation. It is also important to note that mobile banking can facilitate the communication between each customer and the manager of their bank accounts, through private online chats, for example, directly linked to their personal data. This process may help financial institutions in developing some different strategies for responsiveness to their users.

There are four main limitations in this paper. The first is related to the analysis of only two countries with different levels of development, and different ICT indicators. The list of advanced economies includes more than thirty countries, and the list of developing economies is also larger, but even in these two economies we observe differences in path coefficients. Therefore, we recommend for future research the analysis of other economies in the same study, with the same questionnaire for data collection and the same period of analysis. In this way, these new studies can indicate insightful directions for the literature on the adoption of emergent technologies.

As the second limitation, we point out the analysis with a dataset that comprises the responses of undergraduate students. The consideration of student subjects and the analysis of only one information system within a homogeneous group are among the limitations of previous studies of TAM (Lee et al., 2003), since their characteristics and perception can differ from the target population (Agarwal & Karahanna, 2000). Therefore, this limitation can affect the generalizability of the results of this study. Despite the fact that an analysis with sample equivalent to this in mobile banking studies may be common, the consideration of other individuals in the surveys should complement these findings. Thus, our results are limited to the perception of undergraduate students that participated in this survey.

The third limitation is the survey with respondents of only two universities. Both Brazil and the United States are big countries and contain people from different levels of income, education and culture. In the case of students from the USA, as we commented in the method section, the research questionnaire did not include a question about the nationality of the respondent; therefore, some students from the USA may have come from another country, and this fact also may affect the generalizability of the results. The measurement of mobile banking use was based on previous research, as we can observe in Appendix A. Nevertheless, the options available in mobile banking are not limited to transferring money, making payments and conducting banking transactions. These activities also comprise checking account balance, receiving a message from the bank, finding bank branches in the same location, among others. So, the results may be limited to the use of mobile banking for the purpose of the three activities available in Appendix A, depicting the fourth limitation of this research.

We also indicate for further research the inclusion of other constructs in the quantitative model used in this paper, but we recommend that TAM or another well-established theory remain as the main cornerstone in the study, so the results could be compared using equivalent measures. Further research should also consider predicting modeling (Sharma, 2017) to analyze users' perception of mobile banking adoption.

Appendix A. Research questionnaire

Mobile banking use (USE)

I often use mobile banking to...

(use1) ...transfer money.

(use2) ...make payments.

(use3) ...conduct banking transactions.

Source: Zhou et al. (2010).

Perceived usefulness (PU)

Mobile banking...

- (pu1) ...makes it easier to do my banking transactions.
- (pu2) ...enables me to accomplish banking activities more quickly.
- (pu3) ...enhances the efficiency of my banking activities.

Source: Al-Somali, Gholami, and Clegg (2009), Gu et al. (2009), Oliveira et al. (2014) and Zhou et al. (2010).

Trust in mobile banking (TRU)**Mobile banking...**

- (tru1) ...seems trustworthy.
- (tru2) ...seems secure.
- (tru3) ...keeps its promise.

Source: Oliveira et al. (2014) and Zhou (2013).

Social influence (SI)

(si1) Those people that influence my behavior think that I should use mobile banking.

(si2) Those people that are important to me think that I should use mobile banking.

(si3) My friends and Family value the use of mobile banking.

Source: Oliveira et al. (2014) and Zhou et al. (2010).

Perceived Ease of use (EU)

(eu1) I find that mobile banking is easy to use.

(eu2) Learning how to operate mobile banking is easy for me.

(eu3) I would find it easy to get mobile banking to do what I want it to do.

Source: Davis (1989), Zhou (2012b) and Zhou et al. (2010).

References

- Afshan, S., & Sharif, A. (2016). Acceptance of mobile banking framework in Pakistan. *Telematics and Informatics*, 33, 370–387.
- Agarwal, R., & Karahanna, E. (2000). Time flies when you're having fun cognitive absorption and beliefs about information technology usage. *MIS Quarterly*, 24(4), 665–694.
- Aker, J. C., & Mbiti, I. M. (2010). Mobile phones and economic development in Africa. *Journal of Economic Perspectives*, 24(3), 207–232.
- Alalwan, A. A., Dwivedi, Y. K., & Rana, N. P. (2017). Factors influencing adoption of mobile banking by Jordanian bank customers: Extending UTAUT2 with trust. *International Journal of Information Management*, 37(3), 99–110.
- Alalwan, A., Dwivedi, Y. K., 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), 118–139.
- Al-Gahtani, S. (2001). The applicability of TAM outside North America: An empirical test in the United Kingdom. *Information Resources Management Journal*, 14(3), 37–46.
- Al-Somali, S. A., Gholami, R., & Clegg, B. (2009). An investigation into the acceptance of online banking in Saudi Arabia. *Technovation*, 19, 130–141.
- Baabdullah, A. M., Alalwan, A. A., Rana, N. P., Kizgin, H., & Patil, P. (2019). Consumer use of mobile banking (M-Banking) in Saudi Arabia: Towards an integrated model. *International Journal of Information Management*, 44, 38–52.
- 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.
- Baptista, G., & Oliveira, T. (2016). A weight and meta-analysis on mobile banking acceptance research. *Computers in Human Behavior*, 63, 480–489.
- Bhatiasevi, V. (2015). An extended UTAUT model to explain the adoption of mobile banking. *Information Development*, 1–16. Published online before print.
- Bons, R. W. H., Alt, R., Lee, H. G., & Weber, B. (2012). Banking in the Internet and mobile era. *Electronic Markets*, 22(4), 192–202.
- Calisir, F., & Gumussoy, C. A. (2008). Internet banking versus other banking channels: Young consumers' view. *International Journal of Information Management*, 28, 215–221.
- Chin, W. W. (2000). *Frequently asked questions – Partial least squares & PLS-Graph. Home page [on-line]*. Last update: 21 December 2004. Available at <http://disc-nt.cba.uh.edu/chin/plsfaq/plsfaq.htm>.
- Cole, S., Sampson, T., & Zia, B. (2011). Prices or Knowledge? What drives demand for financial services in emerging markets? *The Journal of Finance*, 66(6), 1933–1967.
- Colley, A., & Maltby, J. (2008). Impact of the Internet on our lives: Male and female personal perspectives. *Computers in Human Behavior*, 24, 2005–2013.
- Cull, R., Demirgüç-Kunt, A., & Morduch, J. (2009). Microfinance meets the market. *The Journal of Economic Perspectives*, 23(1), 167–192.
- Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), 319–340.
- Dwivedi, Y. K., Kapoor, K. K., Williams, M. D., & Williams, J. (2013). RFID systems in libraries: An empirical examination of factors affecting system use and user satisfaction. *International Journal of Information Management*, 33(2), 367–377.
- Dwivedi, Y. K., Shareef, M. A., Simintiras, A. C., Lal, B., & Weerakkody, V. (2016). A generalised adoption model for services: A cross-country comparison of mobile health (m-health). *Government Information Quarterly*, 33(1), 174–187.
- Dwivedi, Y. K., Rana, N. P., Janssen, M., Lal, B., Williams, M. D., & Clement, M. (2017). An empirical validation of a unified model of electronic government adoption (UMEGA). *Government Information Quarterly*, 34(2), 211–230.
- Dwivedi, Y. K., Rana, N. P., Jeyaraj, A., Clement, M., & Williams, M. D. (2017). Re-examining the unified theory of acceptance and use of technology (UTAUT): Towards a revised theoretical model. *Information Systems Frontiers*, 1–16.
- Febraban - Brazilian Federation of Banks (2016). *Relatório Anual 2015 [2015 Annual Report]* Retrieved from: <https://relatorioanual2015.febraban.org.br/en/index.htm>.
- FED - Board of Governors of the Federal Reserve System (2016). *Consumers and mobile financial services 2016* Retrieved from: <https://www.federalreserve.gov/econresdata/consumers-and-mobile-financial-services-report-201603.pdf>.
- Garbarino, E., & Strahilevitz, M. (2004). Gender differences in the perceived risk of buying online and the effects of receiving a site recommendation. *Journal of Business Research*, 57, 768–775.
- Gu, J.-C., Lee, S.-C., & Suh, Y.-L. (2009). Determinants of behavioral intention to mobile banking. *Expert Systems With Applications*, 36, 11605–11616.
- Gurgand, M., Pederson, G., & Yaron, J. (1996). Rural finance institutions in Sub-Saharan Africa: Their outreach and sustainability. *Savings and Development*, 20(2), 133–169.
- 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.
- Hair, J. F., Jr., Anderson, R. E., Tatham, R. L., & Black, W. C. (1998). *Multivariate data analysis* (5th edition). Prentice-Hall, Inc.
- Hanafizadeh, P., Behboudi, M., Koshksaray, A. A., & Tabar, M. J. S. (2014). Mobile-banking adoption by Iranian bank clients. *Telematics and Informatics*, 31, 62–78.
- Hasan, B. (2010). Exploring gender differences in online shopping attitude. *Computers in Human Behavior*, 26, 597–601.
- ITUR - International Telecommunication Union Report (2016). *Measuring the information society report, 2016* Retrieved from: <http://www.itu.int/en/ITU-D/Statistics/Pages/publications/mis2016.aspx>.
- Jack, W., Ray, A., & Suri, T. (2013). Transaction networks: Evidence from mobile money in Kenya. *The American Economic Review*, 103(3), 356–361.
- Kapoor, K. K., Dwivedi, Y. K., & Williams, M. D. (2015). Examining the role of three sets of innovation attributes for determining adoption of the interbank mobile payment service. *Information Systems Frontiers*, 17(5), 1039–1056.
- Kishore, S. V. K., & Sequeira, A. H. (2016). An empirical investigation on mobile banking service adoption in rural Karnataka. *Sage Open*, (January–March), 1–21.
- Laukkanen, T. (2016). Consumer adoption versus rejection decisions in seemingly similar service innovations: The case of the Internet and mobile banking. *Journal of Business Research*, 69, 2432–2439.
- Laukkanen, T., Sinkkonen, S., Kivijärvi, M., & Laukkanen, P. (2007). Innovation resistance among mature consumers. *Journal of Consumer Marketing*, 24(7), 419–427.
- 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, 385–392.
- Lee, Y., Kozar, K. A., & Larsen, K. R. (2003). The technology acceptance model: Past, present, and future. *Communications of the Association for Information Systems*, 12(1), 752–780.
- 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, 252–260.
- Lin, H.-F. (2013). Determining the relative importance of mobile banking quality factors. *Computer Standards & Interfaces*, 35(2), 195–204.
- Luarn, P., & Lin, H.-H. (2005). Toward an understanding of the behavioral intention to use mobile banking. *Computers in Human Behavior*, 21, 873–891.
- 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, 222–234.
- 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.
- McKnight, D. H., Choudhury, V., & Kacmar, C. (2002). Developing and validating trust measures for e-Commerce: An integrative typology. *Information Systems Research*, 13(3), 334–359.
- Mohammadi, H. (2015). A study of mobile banking loyalty in Iran. *Computers in Human Behavior*, 44, 35–47.
- Montezemi, A. R., & Saremi, H. Q. (2015). Factors affecting adoption of online banking: A meta-analytic structural equation modeling study. *Information & Management*, 52, 210–226.
- 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.
- 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, 689–703.
- Rana, N. P., Dwivedi, Y. K., Williams, M. D., & Weerakkody, V. (2016). Adoption of online public grievance redressal system in India: Toward developing a unified view. *Computers in Human Behavior*, 59, 265–282.
- Rana, N. P., Dwivedi, Y. K., Lal, B., Williams, M. D., & Clement, M. (2017). Citizens' adoption of an electronic government system: Towards a unified view. *Information Systems Frontiers*, 19(3), 549–568.
- Raza, S. A., Umer, A., & Shah, N. (2017). New determinants of ease of use and perceived usefulness for mobile banking adoption. *International Journal of Electronic Customer Relationship Management*, 11(1), 44–65.
- Shaikh, A. A., & Karjaluoto, H. (2015). Mobile banking adoption: A literature review. *Telematics and Informatics*, 32, 129–142.
- Shareef, M. A., Kumar, V., Dwivedi, Y. K., & Kumar, U. (2016). Service delivery through

- mobile-government (mGov): Driving factors and cultural impacts. *Information Systems Frontiers*, 18(2), 315–332.
- Shareef, M. A., Dwivedi, Y. K., Kumar, V., & Kumar, U. (2017). Content design of advertisement for consumer exposure: Mobile marketing through short messaging service. *International Journal of Information Management*, 37(4), 257–268.
- Shareef, M. A., Baabdullah, A., Dutta, S., Kumar, V., & Dwivedi, Y. K. (2018). Consumer adoption of mobile banking services: An empirical examination of factors according to adoption stages. *Journal of Retailing and Consumer Services*, 43, 54–67.
- Sharma, S. K. (2017). Integrating cognitive antecedents into TAM to explain mobile banking behavioral intention: A SEM-neural network modeling. *Information Systems Frontiers*, 1–13.
- Sharma, S., & Sharma, M. (2019). Examining the role of trust and quality dimensions in the actual usage of mobile banking services: An empirical investigation. *International Journal of Information Management*, 44, 65–75.
- Slade, E., Dwivedi, Y. K., Piercy, N. L., & Williams, M. D. (2015). Modeling consumers' adoption intentions of remote mobile payments in the UK: Extending UTAUT with innovativeness, risk and trust. *Psychology & Marketing*, 32(8), 860–873.
- Slade, E., Williams, M., Dwivedi, Y. K., & Piercy, N. (2015). Exploring consumer adoption of proximity mobile payments. *Journal of Strategic Marketing*, 23(3), 209–223.
- Venkatesh, V. (1999). Creation of favorable user perceptions: Exploring the role of intrinsic motivation. *MIS Quarterly*, 23(2), 239–260.
- Venkatesh, V. (2000). Determinants of perceived ease of use: Integrating control, intrinsic motivation, and emotion into the technology acceptance model. *Information Systems Research*, 11(4), 342–365.
- Venkatesh, V., & Bala, H. (2008). Technology acceptance model 3 and a research agenda on interventions. *Management Sciences*, 39(2), 273–315.
- Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management Science*, 46(2), 186–204.
- Venkatesh, V., & Morris, M. G. (2000). Why don't men ever stop to ask for directions? Gender, social influence, and their role in technology acceptance and usage behavior. *MIS Quarterly*, 24(1), 115–139.
- Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, 27(3), 425–478.
- Venkatesh, V., Morris, M. G., Sykes, T. A., & Acherman, P. L. (2004). Individual reactions to new technologies in the workplace: The role of gender as a psychological construct. *Journal of Applied Social Psychology*, 34(3), 445–467.
- Veríssimo, J. M. C. (2016). Enablers and restrictors of mobile banking app use: A fuzzy set qualitative comparative analysis (fsQCA). *Journal of Business Research*, 69, 5456–5460.
- Wonglimpiyarat, J. (2014). Competition and challenges of mobile banking: A systematic review of major bank models in the Thai banking industry. *Journal of High Technology Management Research*, 25, 123–131.
- Yuan, S., Liu, Y., Yao, R., & Liu, J. (2014). An investigation of users' continuance intention towards mobile banking in China. *Information Development*, 32(1), 20–34.
- Zhang, Y., Weng, Q., & Zhu, N. (2018). The relationships between electronic banking adoption and its antecedents: A meta-analytic study of the role of national culture. *International Journal of Information Management*, 40, 76–87.
- Zhou, T. (2013). An empirical examination of continuance intention of mobile payment services. *Decision Support Systems*, 54, 1085–1091.
- Zhou, T. (2012a). Understanding users' initial trust in mobile banking: An elaboration likelihood perspective. *Computers in Human Behavior*, 28, 1518–1525.
- Zhou, T. (2012b). Examining mobile banking user adoption from the perspectives of trust and flow experience. *Information Technology and Management*, 13(1), 27–37.
- Zhou, T., Lu, Y., & Wang, B. (2010). Integrating TTF and UTAUT to explain mobile banking user adoption. *Computers in Human Behavior*, 26, 760–767.

Rodrigo Fernandes Malaquias is a Full Time Professor at Universidade Federal de Uberlândia, Brazil. In 2012, he received his PhD in Business Administration from Escola de Administração de Empresas de São Paulo da Fundação Getulio Vargas (FGV-EAESP), Brazil. In 2015, he was a Visiting Research Scholar at DePaul University in Chicago, USA. His research includes mobile banking, finance, accounting, e-commerce, and cross-country studies.

Yujong Hwang is Associate Professor in the School of Accountancy and MIS, Driehaus College of Business at DePaul University in Chicago. He is also Professor (International Scholar) at Kyung Hee University in South Korea. He was Visiting Professor in the Kellogg School of Management at Northwestern University and received his Ph.D. in Business from the University of South Carolina. His research focuses on knowledge management, e-commerce, and human-computer interaction. He was ranked in Top 50 productive researchers in the world in 2005–2008 based on Top 6 IS journal counts. He has published over 60 articles in the refereed journals including *Journal of Management Information Systems*, *European Journal of Information Systems*, *IEEE Transactions*, *Computers in Human Behavior*, *Communications of the ACM*, *Information & Management*, *Decision Support Systems*, *International Journal of Information Management*, and *International Journal of Electronic Commerce*. He is Program Co-Chair of AMCIS 2013 and Senior Associate Editor of *European Journal of Information Systems*. He is Associate Editor of *Behaviour and IT* and *Journal of Electronic Commerce Research*.