1. Introduction

Mobile Banking (MB) technology has the potential to improve people’s quality of life and to bring efficiency to banks. Elwork and Gutkin (1985) wrote about the impact that computers would have upon society and sciences. Thirty years later, computers are more sophisticated, but there are still many topics on the agenda about technology challenges, including cross-country differences around the world.

One topic on this agenda is Mobile Banking (MB) adoption and usage. This technology allows people to perform bank transactions anytime and anywhere (Zhou, 2012a). MB benefits banks by promoting better efficiency and improved service quality, and it also benefits customers through time optimization, immediate information, instant connectivity, great convenience and interactivity (Akturan & Tezcan, 2012; Cruz, Filgueiras Neto, Muñoz-Gallego, & Laukkanen, 2010; Febraban, 2014; Gu, Lee, & Suh, 2009; Ha, Canedoli, Baur, & Bick, 2012; Zhou, 2012a; Zhou, Lu, & Wang, 2010).

With MB, users are able to access account balances, pay bills, and transfer funds through mobile devices, instead of visiting banks or using internet banking based on computer (Gu et al., 2009). Banks in different countries have been offering MB technology to their customers, but despite the widespread adoption of mobile devices, such as smartphones and tablets, the adoption rate of MB is still low (Akturan & Tezcan, 2012; Febraban, 2015; Gu et al., 2009; Lee & Chung, 2009; Zhou, 2012a; Zhou et al., 2010).

Trust is crucial for any business relationship (Palvia, 2009; Wang, Ngamsiriudom, & Hsieh, 2015), and it plays a critical role in e-commerce, because it reduces uncertainty (Gu et al., 2009; Li & Yeh, 2010; Wang et al., 2015). In the same way, building users’ initial trust is essential for mobile banking service providers (Zhou, 2012a). There are different factors that affect customer’s trust in MB. Some of them are personal innovativeness, task characteristics, social influence and risk perception.

Regarding trust in e-commerce, Kim and Benbasat (2006) stated that the adequate construction of trust-assurance arguments, which are disclosed on websites, is another factor that affects customers’ trust. Their empirical results confirm this assumption. The same reasoning is applied to MB: banks need to provide customers with compelling arguments in order to establish trust and acceptance of this technology. Thus, the environment in which people live can modify the relationship between trust in MB and the factors already identified by literature, which motivated the development of this study with Brazilian respondents.

Brazil is a country in which people adopt mobile devices. Data from 2014 shows that smartphone rate penetration in Brazil was 41%, and it is estimated that this rate will be around 75–80% in
Nevertheless, bank transactions through mobile devices consisted of about 12% of total bank transactions in 2014, so MB adoption rate is still low in Brazil. Even though most transactions via MB (96%) did not involve money operations, Brazilian banks have been investing in security and usability of their MB apps so as to improve these figures (Febraban, 2015).

Bank rate access is about 97% in developed countries like the United States, Germany and the United Kingdom, whereas it is about 60% in Brazil. According to Febraban, the main entity representing the Brazilian bank sector, this low rate of bank access represents a big potential of expansion for banks. Participation of the Brazilian financial sector in the total of investments in information technology (18%) is similar to that in developed countries (Febraban, 2014; 2015).

Brazil is also the biggest country in Latin America, and it has the largest and most complex bank system in the region (Nakane & Weintrob, 2005). However, in comparison with developed countries, Brazil has other characteristics, such as the following: i) lower levels of disclosure by banks; and ii) companies listed in the capital market with lower and more cross-sectional variations in disclosure (Alves & Cherobim, 2009; Britto, Rodrigues, & Marques, 2013; Lopes & Alencar, 2010; Malaquias & Lemes, 2013).

We observed that MB can leverage the penetration of banks in Brazil, hence, contribute to the growth of the bank rate access in the following years. The low rates of disclosure indicate additional characteristics that might affect trust in MB. Therefore, these characteristics turn this environment an appropriate place to verify the adherence of previous literature on trust in MB.

Given this scenario, we developed this study in order to explore potential determinants of trust in MB in Brazil. The sample comprised undergraduate students. We used factors previously documented and tested in other studies, and we included a new variable: undergraduate course area. This new variable was included in order to analyze the perception of trust by people who interact more with technology: students in the technology field. Since these students learn more details regarding technology during their undergraduate courses, they might have a different perception of trust in MB.

As pointed out by Davis (1989), the development and improvement of measure for key theoretical constructs is a priority in the field of information systems. Furthermore, the variable undergraduate course area is not necessarily a perception, and its measurement is very simple. As the extant research on mobile adoption focuses mainly on user perception (Zhou et al., 2010), we expect to contribute with future studies on this subject.

This study can help banks to improve the rate of MB adoption. Moreover, we argue that our results also have a "practical value" (Davis, 1989, p. 319), particularly for Brazilian banks. A large number of customers using MB could justify the investments that banks have made in this technology, thus increasing the rates of return (Lee & Chung, 2009). The understanding of the factors that affect user adoption of mobile banking services enables banks to target bottlenecks of this adoption and improve their services (Zhou et al., 2010).

2. Theoretical model and hypotheses

We intend to explore trust in MB with respondents who live in Brazil. In our model, we considered six relevant factors that other researchers already have studied: risk perception, age, gender, task characteristics, personal innovativeness and social influence. We also included a new variable in our model (undergraduate course area), in order to capture a potential difference in perception from people that study in the area of technology.

Trust represents a catalyst for exchange relationships between buyers and sellers (Pavlou, 2003; Wang et al., 2015). Due to the high degree of uncertainty and perceived risk in e-commerce operations, trust becomes an important factor for people to obtain confidence on an exchange partner (Li & Yeh, 2010; McKnight, Choudhury, & Kacmar, 2002; Moorman, Zaltman, & Deshpande, 1992; Palvia, 2009; Pavlou, 2003; Ribbink, van-Riel, Liljander, & Streukens, 2004).

Customers need to trust in MB to use it. Viruses and Trojan horses may exist in mobile terminals too; so, these problems increase users' concern about payment security, and decrease their trust in MB, which, in turn, can affect their usage intention and behavior (Zhou, 2012a). In the relationship between customers and MB terminals, if trust is not present, there is no adoption and no use of this technology (Zhou, 2012b).

Risk perception is one of the main barriers to MB adoption in Brazil (Cruz et al., 2010), the most important in China (Laforet & Li, 2005) and has a significant relationship with users' attitudes and intention to use MB in Iran (Mohammadi, 2015). This construct also has significant relationship with internet banking adoption (Yiu, Grant, & Edgar, 2007) and with customer's lack of interest in online commercial transactions (Liao, Liu, & Chen, 2011). The perception of risk is a significant factor affecting trust (Al-Gahtani, 2011) and affecting mobile banking adoption (Al-Jabri & Sohail, 2012; Ha et al., 2012; Mishra & Bisht, 2013). As risk perception can generate a negative effect on trust, the first variable that we included in our model was risk.

Risk perception involves the concern about: i) use of personal information without the knowledge or permission of the owner (Akturan & Tezcan, 2012; Lee, 2009; Luarn & Lin, 2005); ii) transference of money for third parties without knowledge and permission (Akturan & Tezcan, 2012; Hanafizadeh, Behboudi, Koshksaray, & Tabar, 2014; Luarn & Lin, 2005); and iii) vulnerability of mobile devices to hackers, Trojan horses and information interception (Zhou, 2011; 2012a; 2013). Banks need to guarantee high security transactions through MB, as well as they need to ensure reliability to their customers (Al-Jabri & Sohail, 2012; Ha et al., 2012).

The concern about an access to personal/financial information by an unauthorized third-party leads customers to distrust in the security of online systems (Kim, Ferrin, & Rao, 2008). In the case of MB, higher risk perception can make people avoid its adoption, especially when we observe the results of Sohail and Al-Jabri (2014), showing that non-users perceive higher levels of risk in MB when compared to the users of this technology. Al-Jabri and Sohail (2012) also found a negative effect of perceived risk in mobile banking adoption. In addition, Al-Gahtani (2011) and Liao et al. (2011) identified that perceived risk had a negative effect on trust to conduct online transactions. In this way, we hypothesized that people that perceives higher levels of risk in MB tend to feel less confident to adopt it.

H1. The relationship between trust and risk perception is negative.

It is usual to include demographics characteristics in models about technology use and adoption (Al-Gahtani, 2011; Luo, Li, Zhang, & Shim, 2010; Shaikh & Karjaluoto, 2015; Yu, 2012). As demographic variables, we used age and gender. Generally, men tend to be more willing to adopt new technologies than women; young people tend to be more willing to use new technologies than older ones (Akturan & Tezcan, 2012; Cruz et al., 2010). One of the reasons for the negative relationship between age and information technology adoption is related with physical characteristics, which change through time (Hawthorn, 2000; Wagner, Hassanein, & Head, 2010).

According to Laguna and Babcock (1997, p. 324), “older adults report more computer anxiety than young adults”, which also affect
their intention to use new technologies. Other factor related to age is that people present more positive attitudes toward computers when they are exposed to computers at younger ages (Korobili, Togia, & Malliaris, 2010). Perhaps this would be an alternative to make people less anxious with technology in the future, encouraging them since younger ages.

A typical user of online banking generally is highly educated and relatively young (Akturan & Tectan, 2012), which is also applicable to MB users. Cruz et al. (2010) found that, in Brazil, youngest people perceived MB as less complicated to use than older people. Akturan and Tectan (2012) observed that the effect of perceived security risk and perceived privacy risk on attitude towards mobile banking was not significant. The authors pointed out that this result is explained by the age of the respondents of their sample, which ranged from 18 to 25 years old. These results indicate that young people are less susceptible to the influence of risk perceptions towards technology, so they are supposed to present higher levels of trust in MB. We also expect that younger people will present a higher level of trust in MB than the older ones. Based on these arguments and findings, the second hypothesis of our study is:

**H2.** The relationship between trust and age is negative.

Gender plays a critical role in behavior (Venkatesh & Morris, 2000), which also represents a critical factor in implementing market segmentation (Goh & Sun, 2014). Men can interact better with technology (Anderson, 1996), and have more positive attitude toward computers than women (Korukonda, 2005). Studies about information technology adoption also employ gender as a moderating variable (Hwang, 2010; Venkatesh, Morris, Davis, & Davis, 2003).

Perceived usefulness and perceived ease of use of information technology are correlated with gender (Venkatesh & Morris, 2000). Hwang (2010) found that gender moderate the relationship between social norms, perceived usefulness and intention to use e-commerce. Females were more sensitive to social norms and males were more sensitive to perceived enjoyment (Hwang, 2010). There is also the argument that women have more anxiety with computers than men (Brosnan & Thorpe, 2006).

Al-Gahtani (2011) found that gender has a significant effect on trust and on perceived credibility, as antecedents to e-transaction, in Saudi Arabia. In this way, Saudi females perceive trust as a relevant concern to transact online, in comparison to their males counterparts (Al-Gahtani, 2011). Therefore, we expect that men will present higher levels of trust in MB in comparison to women.

**H3.** The relationship between trust and gender (male) is positive.

Previously pointed as a construct that was missing (or implicit) in previous models (Goodhue & Thompson, 1995), task technology fit has gained popularity and acceptance among information systems researches (Lee, Cheng, & Cheng, 2007). For example, Suh and Han (2002) and Hwang and Jeong (2014) suggested for future work to explore the impact of user task characteristics on user acceptance of technology. Recent papers have used this construct to understand MB adoption and attitude of the user toward MB (Oliveira, Faria, Thomas, & Popovic, 2014; Zhou et al., 2010).

An information technology will have a positive effect on individual performance when this technology is useful, and when it presents a good fit with the tasks that it supports (Goodhue & Thompson, 1995). This reasoning considers the perspective about how a new technology can contribute to optimize a specific job (Oliveira et al., 2014). In this way, the task technology fit model suggests that not only inherent characteristics of a given system will contribute to higher evaluations by users; the extent in which the system helps individuals in their tasks needs also has a significant influence (Goodhue, 1995).

Task characteristics can affect intention to use MB (Oliveira et al., 2014; Zhou et al., 2010) and trust. People that need to transfer money anytime and anywhere, that need to see their balance accounts and manage their accounts timely, tend to trust in technology to develop their activities. Somehow, they need to trust in technology to perform their activities.

Oliveira et al. (2014) used task characteristics and technology characteristics in their model, as antecedents of task technology fit. They observed that task technology fit presented a positive effect on performance expectancy on MB. Zhou et al. (2010) developed a study integrating the task technology fit model with the unified theory of acceptance and usage of technology to explain MB adoption. Their results supported the application of this approach to understand MB adoption, once task characteristics had a positive effect on the dependent variable. In this study, we expect a positive relationship between task characteristics and trust in MB.

**H4.** The relationship between trust and task characteristics is positive.

Personal innovativeness in the domain of information technology represents an individual characteristic reflecting a willingness to try out any new technology (Agarwal & Karahanna, 2000). This construct helps in the identification of individuals that will probably adopt some new information technologies earlier than another (Agarwal & Prasad, 1998). In the case of MB, personal innovativeness is a characteristic that contributes to the reduction of uncertainty (Montezemi & Saremi, 2015), and, thus, can show a positive effect on the perception of mobile technologies as ease of use (Lu, Yao, & Yu, 2005) and on trust (McKnight et al., 2002). Furthermore, personal innovativeness has a negative relationship with computer anxiety (Powell, 2013), a positive relation with adoption of information systems (Hwang, 2014) and a positive relationship with internet banking adoption (Yiu et al., 2007).

Despite Zhou (2012b) did not find a positive relationship between trust and personal innovativeness, evidences from previous researches indicate that personal innovativeness has a positive relationship with: disposition to trust (McKnight et al., 2002); intention to adopt mobile credit card (Tan, Ooi, Chong, & Hwe, 2014); and intention to adopt MB (Chitungo & Munongo, 2013). Based in these arguments and evidences, we consider that in Brazil people that like to try new technologies will be more willingness to trust in MB than their counterparts will.

**H5.** The relationship between trust and personal innovativeness is positive.

Social influence represents the degree to which an individual perceives that important others, especially friends and family, believe that he/she should use a new system (Baptista & Oliveira, 2015; Venkatesh et al., 2003). This is a relevant concept to explain technology adoption (Hwang, Al- Arbitat, & Shin, 2015; Venkatesh & Morris, 2000) and it has been used in studies about MB and online banking (Al-Somali, Gholami, & Clegg, 2009; Baptista & Oliveira, 2015; Chitungo & Munongo, 2013; Montezemi & Saremi, 2015; Oliveira et al., 2014; Sakeh & Karjaluoto, 2015; Zhou et al., 2010). Using the same argument proposed by Venkatesh et al. (2003), we consider that people that use MB influence people around in using MB too, especially if they are important references for the last.

Perhaps, there is a kind of trust transference in this case, in which people tend to trust in MB since other important people for them trust in it too. The same way that it is relevant to explore social influence in e-commerce (Lu et al., 2005), it is also relevant to explore this variable in MB context. If one has success in MB use, people that consider him/her important can try to use MB too, and trust in this technology. In the same way that personal
innovativeness, social influence contribute to the reduction of uncertainty (Montezemi & Saremi, 2015).

Goh and Sun (2014) observed that social norms have a significant effect over female users of Islamic MB, but do not have a significant effect for males. Tan et al. (2014) found a positive effect of social influence on intention to adopt mobile credit card. Differently of Goh and Sun (2014), the difference in the path coefficient between males and females was not statistically significant in the study developed by Tan et al. (2014). The results of Yu (2012) indicated that the main construct to explain the intention to adopt MB in Taiwan was social influence (the relationship was positive). Thus, our sixty hypothesis is:

H6. The relationship between trust and social influence is positive.

Industries seeks for professionals to manage emerging technologies (Nambisan & Wilemon, 2003). These professionals need to present minimal technical skills to interact with the development of e-commerce and with information technology expansion (Wilbon, 2003). Naturally, people that desire to act in this area need to like technology. Therefore, it seems reasonable to suppose that many students select academic majors according to their personalities (Pike, 2006).

In the case of the choice to studying computing, computer self-confidence is a major determiner (Dundrell, Haag, & Laithwaite, 2000). Computer self-confidence is a concept related with computer attitude, which has been showed as an important variable in the information system research (Lim, 2002). With participants enrolled in a core business undergraduate course in computers and information processing, Torkzadeh and Koufteros (1994) observed that computer training had a positive effect on computer self-efficacy. In this way, when the participants developed their first semester in an undergraduate course linked to technology, their computer self-efficacy was improved (Torkzadeh & Koufteros, 1994).

The results obtained by Lim (2002) indicated a positive relationship between computer confidence and user information system satisfaction. Thus, there are evidences that computer confidence is an interesting variable to study information systems adoption, and that undergraduate course in the area of technology can improve the computer skills of the students. Weisenfeld and Ott (2011) found that academic discipline has a significant relationship with risk perception about technology, in which technical students showed low levels of perceived technological risks.

In this sense, we argue that students of technology could present better knowledge about privacy and security in electronic environments, because they are presumed to know more details about technology and to have more level of computer self-efficacy. Since electronic environments need to be very safe for people to conduct their transactions, these students could have better levels of perception about trustworthiness in MB. Therefore, it could be expected that students in the area of technology will be more confident in technology, consequently their trust in MB would be higher than people that choose undergraduate courses that the focus is not technology. These arguments support our last hypothesis (H7) and Fig. 1 shows the research model.

H7. The relationship between trust and courses of technology is positive.

3. Research design

3.1. Data

The aim of this paper was to analyze trust in MB in Brazil. Undergraduate students from the southeast region of Brazil comprised our sample. This region has the highest number of bank branches in the country. Authors from previous studies also used data from undergraduate students (Chakraborty, Hu, & Cui, 2008; Hwang & Lee, 2014; Kim et al., 2008; Luo et al., 2010). These students are supposed to have the basic computer and internet skills to use MB, which involve wireless technology too (Luo et al., 2010). They also represent potential users of MB (Luo et al., 2010) and, in many cases, current users of this technology.

Appendix A contains the items of our questionnaire, main references and their descriptive statistics. Following previous studies (Luo et al., 2010; Yang, Pang, Liu, Yen, & Tarn, 2015; Zhou, 2012a), we adopted a 5-point Likert scale to estimate the measures of each item. The range was: from (1) strongly disagree to (5) strongly agree. A pre-test of the questionnaire involved three phases: the first with graduate professors that have large experience with survey; the second with master degree students; the third with undergraduates students. They suggested only little changes, which we performed.

We distributed 1176 questionnaires during the classes and we waited in loco for the responses, since we applied our questionnaire in a paper-and-pencil basis. At each visit, we invited all present students to participate into the study. The professors of each class helped us in explaining the relevance of adequate responses. We reinforced that the participation was voluntary, but once accepted we required attention in responses.

The return of usable questionnaires was 1077 (this represents a rate of 91.58 percent). Students of the following courses answered the questionnaire: accounting, management, economy, engineering, computing science and information systems. Courses of engineering, computing science and information systems were coded in our database as courses in the area of technology. In our sample, the average age was twenty-two years, fifty-one percent of students were male, and twenty-nine percent of participants develop their undergraduate courses in the area of technology.

3.2. Measurement and hypotheses testing

The use of Structural Equation Modeling (SEM) has been growing in the social sciences (Anderson & Gerbing, 1988). This method offer great potential for hypotheses testing and furthering theory development (Anderson & Gerbing, 1988). In order to test our quantitative model, we developed our analysis in two stages (Anderson & Gerbing, 1988): first, through Confirmatory Factor Analysis (CFA), we evaluated reliability of our five constructs, as well as their discriminant validity (Campbell & Fiske, 1959). The results of a study only will have validity if the authors used constructs that differ of another constructs in the same model (Campbell & Fiske, 1959). In the second stage, we estimated the
structural model and used SEM for hypotheses testing. Other authors, like Zhou et al. (2010), already adopted this procedure of two stages.

We evaluated the reliability of each construct through three indices: Composite Reliability (CR), Average Variance Extracted (AVE) and Cronbach’s Alpha (CA). The recommended values, for good measures, were at least 0.70, 0.50 and 0.70, respectively. Table 1 shows that all items loadings were statistically significant in each respective construct, as t-statistics indicated. For all cases, CR, VE and CA were above the threshold. In Appendix B we also showed that the loadings of items occurred in the respective construct, and no item loaded with high value in other construct. This procedure was adopted in previous studies (as Zhou et al., 2010; Hwang, 2014). We concluded that our five constructs showed convergent validity.

Discriminant validity permits to verify if two factors are measuring different aspects of the respondents. For good adjusts of discriminant analysis, we expect to obtain the root square of AVE superior to the correlation of the construct with other constructs of the model (Campbell & Fiske, 1959). As we can see on Table 2, our model has good indices for discriminant analysis, because the root square of AVE was higher than the correlations between the respective constructs with other constructs.

We structured Table 3 to show the goodness of fit of both CFA and SEM. Besides the high value of the chi-square statistic, this index is sensible to sample size, and we used a sample bigger than 1000. In this case, we should analyze the ratio between the chi-square statistic and the degrees of freedom (recommended value: <5). For all indexes, our model indicated adequate goodness of fit. Therefore, we are able to verify the results of hypotheses testing.

We used the figure of our theoretical model to show the path coefficients obtained with the quantitative analysis. Fig. 2 contains the results, as well as the r-square for the dependent variable. These seven variables can explain among thirty-nine percent of the variance of trust in MB.

When we compare Figs. 1 and 2, we can see that only the results for the variable Undergraduate course area (in courses of technology) was different from the theoretical revision. To facilitate the comparison of the path coefficients with the theoretical model, we elaborated Table 4, which contains expected and observed signs for each hypothesis. In the next section, we discuss our findings.

4. Discussion and implications

In the cases of H1, H2, H3, H4, H5 and H6, path analyses showed the same sign that previous studies indicated. We will discuss each one of these results in the following paragraphs.

### Table 1
Results of convergent validity.

<table>
<thead>
<tr>
<th>Const.</th>
<th>Items</th>
<th>Load. (Std.)</th>
<th>t-value (loadings)</th>
<th>CR</th>
<th>AVE</th>
<th>CA</th>
</tr>
</thead>
<tbody>
<tr>
<td>TSK</td>
<td>tsk1</td>
<td>0.693</td>
<td>38.820</td>
<td>0.871</td>
<td>0.696</td>
<td>0.858</td>
</tr>
<tr>
<td></td>
<td>tsk2</td>
<td>0.960</td>
<td>97.968</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>tsk3</td>
<td>0.830</td>
<td>65.352</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SOC</td>
<td>soc1</td>
<td>0.917</td>
<td>71.943</td>
<td>0.841</td>
<td>0.653</td>
<td>0.807</td>
</tr>
<tr>
<td></td>
<td>soc2</td>
<td>0.940</td>
<td>75.769</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>soc3</td>
<td>0.487</td>
<td>19.792</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PIN</td>
<td>pin1</td>
<td>0.757</td>
<td>38.973</td>
<td>0.802</td>
<td>0.576</td>
<td>0.797</td>
</tr>
<tr>
<td></td>
<td>pin2</td>
<td>0.686</td>
<td>32.854</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>pin3</td>
<td>0.828</td>
<td>44.862</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TRU</td>
<td>tru1</td>
<td>0.953</td>
<td>44.464</td>
<td>0.788</td>
<td>0.558</td>
<td>0.778</td>
</tr>
<tr>
<td></td>
<td>tru2</td>
<td>0.924</td>
<td>49.183</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>tru3</td>
<td>0.687</td>
<td>26.156</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RSK</td>
<td>rsk1</td>
<td>0.699</td>
<td>14.420</td>
<td>0.799</td>
<td>0.667</td>
<td>0.791</td>
</tr>
<tr>
<td></td>
<td>rsk2</td>
<td>0.743</td>
<td>14.939</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes: CR: composite reliability; AVE: average variance extracted; CA: Cronbach’s Alpha.

### Table 2
Results of discriminant validity.

<table>
<thead>
<tr>
<th>Factor</th>
<th>TSK</th>
<th>SOC</th>
<th>PIN</th>
<th>TRU</th>
<th>RSK</th>
</tr>
</thead>
<tbody>
<tr>
<td>TSK</td>
<td>0.834</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SOC</td>
<td>0.292***</td>
<td>0.808</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PIN</td>
<td>0.252***</td>
<td>0.127***</td>
<td>0.759</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TRU</td>
<td>0.509***</td>
<td>0.372***</td>
<td>0.263***</td>
<td>0.747</td>
<td></td>
</tr>
<tr>
<td>RSK</td>
<td>0.150***</td>
<td>0.105***</td>
<td>0.040***</td>
<td>0.081***</td>
<td>0.817</td>
</tr>
</tbody>
</table>

Notes: Diagonal line shows the root square of AVE. The other numbers represent the correlation between constructs. ***: p < 0.01; **: p < 0.05; *: p < 0.10.

### Table 3
Goodness of fit (CFA and SEM).

<table>
<thead>
<tr>
<th>Items</th>
<th>Recom.</th>
<th>CFA</th>
<th>SEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>chi-square</td>
<td>268.872</td>
<td>383.058</td>
<td></td>
</tr>
<tr>
<td>df.</td>
<td>62</td>
<td>89</td>
<td></td>
</tr>
<tr>
<td>chi-square/d.f.</td>
<td>&lt;5.00</td>
<td>4.3040</td>
<td></td>
</tr>
<tr>
<td>Standard, RMR</td>
<td>&lt;0.05</td>
<td>0.4040</td>
<td></td>
</tr>
<tr>
<td>GFI</td>
<td>&gt;0.80</td>
<td>0.9596</td>
<td></td>
</tr>
<tr>
<td>AGFI</td>
<td>&gt;0.80</td>
<td>0.9305</td>
<td></td>
</tr>
<tr>
<td>RMSEA</td>
<td>&lt;0.08</td>
<td>0.0554</td>
<td></td>
</tr>
<tr>
<td>RMSEA (Low, 90%)</td>
<td>0.0490</td>
<td>0.0498</td>
<td></td>
</tr>
<tr>
<td>RMSEA (Up, 90%)</td>
<td>0.0626</td>
<td>0.0612</td>
<td></td>
</tr>
<tr>
<td>CFI</td>
<td>&gt;0.90</td>
<td>0.9583</td>
<td></td>
</tr>
<tr>
<td>NFI</td>
<td>&gt;0.90</td>
<td>0.9467</td>
<td></td>
</tr>
<tr>
<td>NNFI</td>
<td>&gt;0.90</td>
<td>0.9363</td>
<td></td>
</tr>
</tbody>
</table>

### Fig. 2
Results of the theoretical research model.

About H1, we observed that risk perception has a negative relationship with trust in MB. This result reinforces the considerations that risk perception affects MB adoption in Brazil (Cruz et al., 2010), and in other countries (Al-Jabri & Sohail, 2012; Laforet & Li, 2005; Mohammadi, 2015). The high perceptions of risks may explain the low rate of MB adoption (nowadays, about 12% in Brazil). If people do not trust in MB, they will not use it (Zhou, 2012a; 2012b).

Financial institutions can offer MB to facilitate the daily activities of their customers and, with this, obtain some benefits like reduced need of physical branches. Nevertheless, financial institutions also need to ensure security and reliability to their customers (Al-Jabri & Sohail, 2012; Ha et al., 2012), so they can feel more confident to adopt this new technology. In this sense, Brazilian banks need to improve communication channels with customers, in order to inform them about how safe MB is. As risk perception affect MB adoption too (Al-Jabri & Sohail, 2012; Ha et al.,...
Table 4

Results of the hypotheses testing.

<table>
<thead>
<tr>
<th>Hyp. Relationship</th>
<th>Expected Relationship</th>
<th>Observed Relationship</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1 Risk ——— Trust</td>
<td>————</td>
<td>————</td>
<td>*** Supported</td>
</tr>
<tr>
<td>H2 Age ——— Trust</td>
<td>————</td>
<td>————</td>
<td>*** Supported</td>
</tr>
<tr>
<td>H3 Gender (male) ——— Trust</td>
<td>————</td>
<td>————</td>
<td>Supported</td>
</tr>
<tr>
<td>H4 Task Characteristics ——— Trust</td>
<td>————</td>
<td>————</td>
<td>Supported</td>
</tr>
<tr>
<td>H5 Personal Innovativeness ——— Trust</td>
<td>————</td>
<td>————</td>
<td>*** Supported</td>
</tr>
<tr>
<td>H6 Social Influence ——— Trust</td>
<td>————</td>
<td>————</td>
<td>Supported</td>
</tr>
<tr>
<td>H7 Undergr. Area (technology) ——— Trust</td>
<td>————</td>
<td>————</td>
<td>*** Rejected</td>
</tr>
</tbody>
</table>

Notes: *** p < 0.01; ** p < 0.05; * p < 0.10.

The results of this paper also indicate the relevance of the construct task activities in the study of MB technology (Goodhue, 1995; Goodhue & Thompson, 1995; Lee et al., 2007). It also re-inforces the considerations made by Suh and Han (2002) and Hwang and Jeong (2014), about the inclusion of this variable in the study of technology acceptance.

Students that like to try new technologies, in our sample, are likely to trust in MB too, which confirms H5 and our theoretical framework (Agarwal & Karahanna, 2000; Agarwal & Prasad, 1998; Hwang, 2014; McKnight et al., 2002; Montezemi & Saremi, 2015; Powell, 2013; Yiu et al., 2007). The willingness to adopt new technologies, in the domain of information technology, seems to be a substantial factor for MB use, since students need to trust in this technology first.

Previous researches also observed empirically that personal innovativeness is useful to understand the adoption of mobile credit card and MB (Chitungo & Munongo, 2013; Tan et al., 2014). This is an interesting find for Brazilian banks and for MB developers, because innovators can feel more confident to use new technologies naturally, which contributes to less perception of uncertainty regarding MB (Montezemi & Saremi, 2015).

The positive relationship observed between social influence and trust was positive, and it was the second most important factor to understand trust in MB. It confirms H6. The behavior of the path coefficient was similar to that observed by Yu (2012), once social influence was the main variable to explain MB adoption in Taiwan (Yu, 2012). Tan et al. (2014) also found a positive relationship between social influence and mobile credit card adoption.

According to our results, there are evidences that Brazilian students can trust in MB if people around them trust in this technology too. We also argue that there is a kind of trust transference among MB users (and potential users), since social influence had a positive effect on trust. Future studies could explore this potential trust transference with more details.

In this way, banks can use this information and promote marketing initiatives to encourage actual MB users to communicate MB benefits to friends. This action could be more effective and can contribute to the expansion of MB adoption in Brazil. Furthermore, this attitude can change the current use profile of MB in Brazil: 96% of MB transactions did not involve monetary operations (Febraban, 2015).

The seventh hypothesis of this study (H7) was rejected. Students in the undergraduate course of technology are presumed to know more details about technology, and to have higher computer self-confidence (Durndell et al., 2000; Torkzadeh & Kouferos, 1994), but this different level of knowledge, in Brazil, presented an effect that was opposed to the expected. We argue that this result is related with information asymmetry too. Brazilian students in the undergraduate area of technology can know more details about how secure e-commerce environments are. However, without adequate information from banks about security in MB, their trust in this technology tend to be lower than the trust of other students. If banks improve their disclosure levels about security in MB transactions, this perception could be reverted.

Since previous studies show that computer attitude is an important variable in the information system research (Lim, 2002), new studies about contemporary technologies should include this variable in the model. Social influence was a significant variable in our model. Therefore, we also argue that banks should develop strategies to improve the trust of the students in the field of technology, because friends of these students will probably be influenced by their opinion about MB technology.

Banks can and need to improve their disclosure levels on how...
MB works and how secure it can be. Nonetheless, this information has to be adequately explained, in accordance with the arguments presented by Kim and Benbasat (2006). For instance, banks could develop research projects in partnership with universities in order to disseminate details about MB security technology to undergraduate students.

5. Final remarks, limitations and further studies

MB is an emergent technology that can benefit both banks and users. In this study, traditional factors addressed in the literature explained Brazilian customers’ trust in MB. Nevertheless, we showed evidences that Brazilian university students in the technology field have a lower level of trust in MB than students in other areas. It is possible that the specific characteristics of Brazil help explain these results, as its companies and banks have low levels of disclosure, even though this is important to build trust in customers. However, disclosure is not the only variable that matters in this case; the adequate use and construction of arguments disclosed by banks about how secure MB can be is also a factor that banks need to observe.

Another point that emerged from our discussion was a potential kind of information asymmetry between customers. Students that use bank services more often may search for information about MB security in different sources; thus, they become better informed than their counterparts are. Hence, they realize that MB is trustworthy and use it. In this case, both the banks and customers are affected by low levels of disclosure about security on MB, because: customers may avoid adopting MB due to information that they do not have, and banks may not have the expected return of investments. In this case, better communication tools and communication channels would have a positive effect.

We expect to contribute with the literature through the inclusion of this new variable (undergraduate course area), and with the discussion about trust in an emerging economy. Researches should explore this relationship in other regions, in order to realize whether it is a characteristic of developing economies. Future studies should explore the relationship between undergraduate course area and information technology adoption, both for students and for graduates.

Banks also can use these results to develop strategies and reach more customers adopting MB. This technology can be determinant to the growth in the rate of bank penetration in Brazil, which is still only 60% nowadays. By offering people financial services, banks could promote a better quality of life, as well as achieve better efficiency.

In general, the most important topics to improve Brazilians’ trust in MB seem to be making an effort to:

i) Communicate with older people, introducing MB technology to them;
ii) Communicate with women, in order to reduce potential anxiety with technology;
iii) Communicate with current customers leading them to inform to their friends about security on MB, once social influence is an important issue to trust in MB; and
iv) Communicate with students and professionals, especially people working in the technology field, in order to disseminate functionalities, advantages, and security of MB.

There are three main limitations regarding this study. The first limitation concerns the sample, as the respondents are undergraduate students. Although previous studies also used equivalent samples, further research could focus on trust in MB in the opinion of Brazilian customers who already hold an undergraduate degree.

The second limitation is related to the region where the data was collected. Brazil is a country with a lot of diversity. The southeast of Brazil is the richest, most industrialized region and it has the largest number of bank branches in comparison with other regions. In further studies, researches could verify whether trust is constant between different Brazilian regions.

Our data is only cross-sectional, and the perception of the respondents was observed during a specific phase of their undergraduate course. This is the third limitation of this paper. Knowledge of technology may change until the end of the undergraduate program, especially in courses in the technology field. Consequently, students may change their perception of trust through this time.

Computers are important to people, and people behavior affects their interaction with computers. Not only can this relationship vary between different people, but it also varies in different regions of the world, so the questionnaire designed for this study should be used in other countries in order to improve understanding about information technology challenges.

Appendix A. Questionnaire and descriptive statistics.

<table>
<thead>
<tr>
<th>Questions (and main references)</th>
<th>Mean</th>
<th>Std. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal Innovativeness (adopted from Agarwal &amp; Karahanna, 2000; Zhou, 2012b; Hwang, 2014)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>pin1</td>
<td>If I heard about a new IT, I would look for ways to gain experience with it</td>
<td>3.691</td>
</tr>
<tr>
<td>pin2</td>
<td>Among my peers, I am usually the first to try out new information technologies</td>
<td>2.919</td>
</tr>
<tr>
<td>pin3</td>
<td>I like to experiment with new information technologies</td>
<td>3.864</td>
</tr>
<tr>
<td>Social Influence (adopted from Gu et al., 2009; Zhou et al., 2010; Beldad &amp; Kusumadewi, 2015)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>soc1</td>
<td>People who ...</td>
<td>2.281</td>
</tr>
<tr>
<td>soc2</td>
<td>... are important to me think that I should use Mobile Banking</td>
<td>2.225</td>
</tr>
<tr>
<td>soc3</td>
<td>... I know use Mobile Banking</td>
<td>3.038</td>
</tr>
<tr>
<td>Task Characteristics (adopted from Zhou et al., 2010; Oliveira et al., 2014)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>tsk1</td>
<td>I need to ...</td>
<td>2.265</td>
</tr>
<tr>
<td>tsk2</td>
<td>... manage my account anytime anywhere</td>
<td>3.033</td>
</tr>
<tr>
<td>tsk3</td>
<td>... acquire account information in real time</td>
<td>3.472</td>
</tr>
<tr>
<td>Risk Perception (adopted from Liao et al., 2011; Yang et al., 2015)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>rsk1</td>
<td>I worry about ...</td>
<td>3.577</td>
</tr>
<tr>
<td>rsk2</td>
<td>... my device connection being intercepted during financial operations</td>
<td>3.375</td>
</tr>
</tbody>
</table>

(continued on next page)
### Appendix B. Matrix from the factor analysis.

<table>
<thead>
<tr>
<th>Questions</th>
<th>TSK</th>
<th>SOC</th>
<th>PIN</th>
<th>TRU</th>
<th>RSK</th>
</tr>
</thead>
<tbody>
<tr>
<td>tsk1</td>
<td>0.808</td>
<td>0.184</td>
<td>0.092</td>
<td>0.058</td>
<td>0.018</td>
</tr>
<tr>
<td>tsk2</td>
<td>0.896</td>
<td>0.094</td>
<td>0.098</td>
<td>0.215</td>
<td>0.057</td>
</tr>
<tr>
<td>soc3</td>
<td>0.836</td>
<td>0.094</td>
<td>0.101</td>
<td>0.226</td>
<td>0.084</td>
</tr>
<tr>
<td>soc1</td>
<td>0.135</td>
<td>0.318</td>
<td>0.029</td>
<td>0.083</td>
<td>0.038</td>
</tr>
<tr>
<td>soc2</td>
<td>0.160</td>
<td>0.907</td>
<td>0.046</td>
<td>0.116</td>
<td>0.028</td>
</tr>
<tr>
<td>soc3</td>
<td>0.066</td>
<td>0.658</td>
<td>0.053</td>
<td>0.181</td>
<td>0.027</td>
</tr>
<tr>
<td>pin1</td>
<td>0.116</td>
<td>0.102</td>
<td>0.825</td>
<td>0.072</td>
<td>0.067</td>
</tr>
<tr>
<td>pin2</td>
<td>0.016</td>
<td>0.004</td>
<td>0.815</td>
<td>0.044</td>
<td>0.047</td>
</tr>
<tr>
<td>pin3</td>
<td>0.075</td>
<td>0.003</td>
<td>0.860</td>
<td>0.072</td>
<td>0.001</td>
</tr>
<tr>
<td>tru1</td>
<td>0.338</td>
<td>0.182</td>
<td>0.164</td>
<td>0.690</td>
<td>0.204</td>
</tr>
<tr>
<td>tru2</td>
<td>0.208</td>
<td>0.148</td>
<td>0.088</td>
<td>0.836</td>
<td>0.071</td>
</tr>
<tr>
<td>tru3</td>
<td>0.058</td>
<td>0.126</td>
<td>0.006</td>
<td>0.824</td>
<td>0.100</td>
</tr>
<tr>
<td>rsk1</td>
<td>-0.099</td>
<td>0.032</td>
<td>0.000</td>
<td>-0.051</td>
<td>0.990</td>
</tr>
<tr>
<td>rsk2</td>
<td>0.127</td>
<td>0.052</td>
<td>0.019</td>
<td>-0.017</td>
<td>0.890</td>
</tr>
</tbody>
</table>

Bold values signify P < 0.01.

### References


Suh, B., & Han, I. (2002). Effect of trust on customer acceptance of Internet banking.

Electronic Commerce Research and Applications, 1, 247–263.

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 journal counts. He has published over 35 articles in refereed journals including Journal of Management Information Systems, European Journal of Information Systems, IEEE Transactions, Communications of the ACM, Information & Management, Decision Support Systems, Computers in Human Behavior and International Journal of Electronic Commerce. He is Program Co-Chair of AMICS 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.