

## The influence of demographic characteristics of users on their decision to adopt mobile banking

### A influência de características demográficas dos usuários sobre sua decisão de adoção do mobile banking

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#### ABSTRACT

This study aimed to assess how the demographic characteristics (gender, age, income and education) of mobile application users influence their perceptions of the five constructs (relative advantage, complexity, compatibility, possibility of experimentation and visibility) listed by Rogers (1995) as determinants for adoption of innovations. The research was conducted through a survey using a structured questionnaire with 25 items applied to a sample of 62 users of mobile banking, chosen by convenience. The techniques used were statistical analysis of median perceptions of constructs, correlations between variables and multiple regression. Five multiple regressions were performed, one for each construct. In each, the four demographic variables were used as explanatory variables. Significant influence was not verified (at the 5% significance level) of demographic variables on perceptions of the five constructs, although at a less demanding level of significance (20%), influences would have been found of income on the perception of relative advantage, gender on the perception of compatibility, and income on the perception of complexity.

**KEYWORDS:** Mobile banking; Innovation diffusion; User perception; Demographic characteristics.

#### RESUMO

O presente estudo teve como objetivo avaliar como as características demográficas (gênero, idade, renda e escolaridade) dos usuários de aplicativos móveis influenciam as percepções dos cinco construtos (vantagem relativa, complexidade, compatibilidade, possibilidade de experimentação e visibilidade) elencados por Rogers (1995) como determinantes para adoção de inovações. A pesquisa foi conduzida por meio de um *survey* com a utilização de questionário estruturado com 25 questões aplicadas a uma amostra de 62 usuários de *mobile banking* escolhidos por conveniência. As técnicas estatísticas adotadas foram a análise das medianas das percepções dos construtos, as correlações entre variáveis e a regressão múltipla. Foram feitas cinco regressões múltiplas, uma para cada construto. Em cada uma delas, as quatro variáveis demográficas foram utilizadas como variáveis explicativas. Com relação aos resultados das regressões, não foi verificada influência significativa (ao nível de significância de 5%) das variáveis demográficas nas percepções dos cinco construtos embora, a um nível de significância menos exigente (20%), poderiam ter sido encontradas: influência da renda na percepção de vantagem relativa; do gênero na percepção de compatibilidade; e de renda na complexidade.

**PALAVRAS-CHAVES:** Mobile banking; Difusão da inovação; Percepção do usuário; Características demográficas.

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## 1 INTRODUCTION

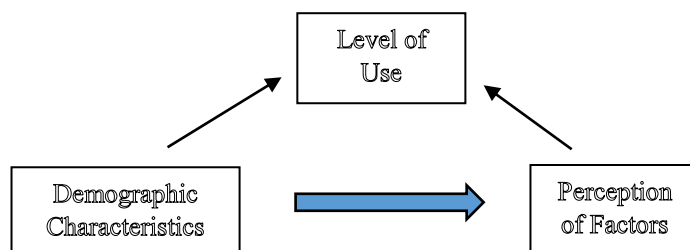
Companies with above average performance in their sectors generally try to innovate in their products and services for the purpose of maintaining or increasing their competitiveness. This is particularly true of the banking sector, where banks rely heavily on the internet and information technology to provide innovative services to their customers. Furthermore, the tendency these days is for people to use their cell phones for much more than mere communication, also using them as work tools.

Therefore, aiming to increase accessibility of customers and optimize banking functions, nearly all banks in Brazil (Santander, Banco do Brasil, Itaú, Bradesco, among others) have introduced a product/service innovation: the mobile banking application. This application is a high-technology innovation that brings many advantages to customers/users. With internet access via smartphone, it is possible to access bank accounts and carry out transactions from virtually anywhere.

According to Pavarini, Marchetti and Silva (2010), consumers' search for tools that are flexible and convenient, together with the increasing competitiveness among banks and their need to reduce costs, has made the environment propitious for launch of mobile banking applications.

Customers now have three options to use banking services without waiting in line at the teller window. The first is to use an automatic teller machine at a bank branch or other location; the second is to access the bank's website from a computer; and the third is to use a smartphone with the bank's mobile application. For Rogers (1995), the choice of the best option depends on how the user perceives the relative advantage, complexity, compatibility, possibility of experimentation and visibility of a product/service over a competing product/service.

A large portion of studies of user preferences try to relate the level of use of different products/services with: (i) demographic and psychographic characteristics of users and (ii) their perception of the factors listed by Rogers (1995). Here we start from the assumption that users' perceptions of these five factors can be related to demographic traits (income, gender, schooling, age), as illustrated by the thick arrow in Figure 1.



**Figure 1** – Level of use x demographic characteristics x perception of factors

Therefore, the aim of this article is to evaluate how the demographic characteristics (gender, age, schooling and income) of users of mobile applications influence their perceptions of the five constructs (relative advantage, complexity, compatibility, possibility of experimentation and visibility) listed by Rogers (1995) as determinants of the adoption of innovations.

To obtain the demographic characteristics of the users of mobile applications and measure their perception of the constructs, we used the measurement scales in Appendix A. In turn, we used the multiple regression technique to investigate the influence of the demographic characteristics (independent or explanatory variables) on users' perception of the constructs that influence the adoption of an innovation (dependent or explained variables).

Knowledge of this relationship (demographic characteristics X perception of the constructs) can help guide both banking institutions and suppliers of banking applications to make decisions about various initiatives to improve the perceptions of the advantages of mobile banking applications over automatic teller machines (at branches) and internet banking with respect to different groups of customers/users.

## 2 ADOPTION OF INNOVATIONS

### 2.1 Characteristics of innovation that can affect their adoption and diffusion

In a study of the adoption of mobile banking in Singapore, Jeong and Yoon (2013) identified five factors as being important concerns of consumers: perception of use; credibility; self-sufficiency of the application; financial cost; and security/privacy.

According to a survey conducted by Pádua and Prado (2006) about the adoption of innovations in high-tech products by young people, the motivation to buy and respective adoption of innovation varied from person to person, but it was possible to note that a large part of the respondents had more familiarity, prior knowledge and tendency to innovation, and these traits wound up influencing the adoption of the innovation studied.

For Rogers (1995), the adoption rate of an innovation is related to the speed with which it is adopted by individuals within a social system, and can be measured by the number of adopters in a given time interval. According to him, users' perceptions about five innovation attributes explains the innovation adoption rate, namely: relative advantage, compatibility, complexity, possibility of experimentation and visibility.

The **relative advantage**, according to Rogers (1995), is the degree to which an innovation is perceived as being better than others that have been developed. Financial and non-financial factors can underpin that advantage. The nature of the innovation determines what specific types of relative advantage are important to adopters, and the advantage can be economic or social, among others (Rogers, 1995, p. 212).

Another important attributed is **compatibility**, which according to Rogers (1995) can be defined as the degree to which an innovation is perceived as being consistent with past experiences, existing values and the needs of potential adopters. There are two distinct aspects of compatibility – existing skills and practices, and values and norms. The perception of compatibility of a new (or improved) product/service affects the uncertainty of the potential adopter and the diffusion of the product or service.

The results of the study by Moore and Bensabat (1991) suggest that the compatibility characteristic is positively correlated with relative advantage, according to the perception of consumers.

The third attribute on the mentioned list is the **complexity** of an innovation. It can be defined as the degree to which an innovation is perceived as being hard to understand or use. Any new idea can be classified as complex (Rogers, 1995).

In turn, the **possibility of experimentation** can be defined as the extent to which an innovation can be tried out within certain limits. The possibility of trying an innovation in advance allows users to “learn by doing”, leading to reduced uncertainties (Rogers, 1995).

Lastly, Rogers (1995) mentions the attribute **visibility**, defined as the degree to which the results of an innovation can be perceived and visualized by users that have not yet adopted it. In some innovations, the results of their use by an adopter can be more easily visualized than by other potential adopters.

The perception of customers about these five attributes directly influences the adoption rate. When a characteristic is perceived as advantageous by consumers, they spread this information to others, expanding the range of potential adopters (Rogers, 1995).

According to Santos, Veiga and Moura (2010), the convenience attribute is favorable to the use of an innovation. On the other hand, a perception of poor reliability is the factor that causes the greatest resistance from potential adopters. For the authors, it is necessary to disclose the advantages the innovation can bring, such as ease of use, capacity for adaptation, privacy and security.

The results of the study conducted by Abbade and Noro (2012) suggest the existence of positive pairwise correlations between security, knowledge and utilization of a given innovation. On the

other hand, Wee (2003) states it is impossible to develop an innovation that perfectly fits all attributes, because some of these characteristics are inversely proportional to each other.

## **2.2 Characteristics of users that can affect the adoption and diffusion of an innovation**

Rogers (2003, p. 11) states that the first perception of individuals about a new idea will determine their reaction to it. He also explains that an innovation can be desired by an individual in a determined situation but not by another individual in that situation or the same individual in a different situation. Each person has specific needs, which will be satisfied in different ways.

Garcia (2007), from investigating the behavior of virtual consumers, found that personal traits have a significant effect on consumers' attitudes, positively or negatively influencing their decisions. The results of the study by Porto (2012) also indicate that economic and demographic variables are important to understand the differences in behavior among consumers.

According to Pavarini et al. (2010), the personal characteristics that can influence the adoption and diffusion of innovation can be divided into two lines: demographic variables (economic class, gender, age, occupation, working in the field or inside the company); and psychological variables (tendency to innovate, interpersonal influence, risk perception, familiarity with a particular innovation).

For Kauffmann and Marchetti (2008), the demographic variables age, social class and gender can influence the adoption and diffusion of a new product/service. Abbade and Noro (2012) also mention that age, gender, schooling and income are user characteristics that can influence the adoption and diffusion of innovation. On the other hand, the results of the survey by Ramos, Pimenta and Rodrigues (2010) suggest no statistical difference exists between the sexes regarding adoption of innovation.

The reasons to explain consumers' motivation at the time of adopting an innovation can be divided into three groups: functional motivations, hedonistic motivations and social motivations. The functional motivations, connected to the quality, comfort, price and security, are among those that most influence the adoption of an innovation, followed by hedonistic motivations, which are satisfaction, pleasure, entertainment, excitation and experimentation. The least important motivations are social ones. This means that consumers are less motivated by social prestige, visibility and status (Saeed, Zameer, Awan & Ullah, 2014).

According to Medeiros, Cruz and Antoni (2013), there are four internal and external factors that act on consumers: cultural factors, social factors, personal factors and psychological factors. The cultural factors, according to Medeiros et al. (2013), have the strongest influence on consumers. These factors are subdivided into culture and social class, among others. The social factors are subdivided into reference groups, family and social position, among others, which influence thoughts, feelings and behaviors of consumers. The personal factors are connected to the particular traits of each individual, i.e., past and current experiences that interfere in their perception and buying decisions.

The personal factors can be subdivided into age and life-cycle stage, economic conditions, personality and occupation, among others (Medeiros, Cruz & Antoni, 2013). The psychological factors are subdivided into motivation, perception, beliefs and attitudes, among others. All these, according to the same authors, affect users' perception of the characteristics of the products/services they intend to adopt.

## **3 METHODOLOGY**

This study can be classified as a survey, with a quantitative approach and explanatory purpose. It is explanatory because the aim is to identify the characteristics (Malhotra, 2001) of users that can influence their adoption of innovation.

The population for the variables of interest is formed by all banking customers who use mobile banking services. The convenience sample was composed of 62 mobile banking users. We believe this small sample might have compromised the statistical significance of the results found, but it was not possible to obtain more respondents.

The survey could be answered by anyone having a bank account and also using any type of mobile banking application. No distinction was drawn between banks or types of mobile applications.

The study was operationalized by a single questionnaire containing 25 statements, which was posted at an exclusive website (Google Docs – Forms) for a period of 15 days.

We relied on the works of Moura, R. C., Cunha and Moura, L. E. L. (2010), Pavarini et al. (2010), Cristino (2012) and Puschel (2009) to prepare the statements (sentences) for users of mobile applications, related to the five constructs (relative advantage, complexity, compatibility, possibility of experimentation and visibility) that according to Rogers (1995) are determinants of the adoption rate of innovations.

To measure the users' perception about the constructs, we used a Likert scale with scores from 0 to 10, with 0 denoting total disagreement, 5 meaning indifference and 10 indicating total agreement. The 25 statements and the corresponding measurement scale are in Appendix A.

Initially we performed confirmatory factor analysis (Hair, Black, Babin, Anderson & Tatham, 2009) with the 25 variables (statements), in the expectation of the formation of groups of factors in line with the five constructs examined in this study (e.g., Q.14 to Q.17 referring to the Complexity construct, as can be observed in Appendix A).

If this had been the case, each factor could have been denoted by an equation, a function of the variables referring to the construct in question, with different weights obtained by the confirmatory factor analysis. Then, each factor would represent the underlying construct, obtained by the values of the variables (statements) related to it.

Unfortunately, however, possibly due to the small sample size, only four factors were obtained, and more seriously, the variables were not grouped as expected, with each factor being characterized by variables referring to different constructs, preventing obtaining a new variable (factor) to adequately represent each construct.

Because of this, and our interest in working with the constructs that Rogers (1995) believes are determinants of the adoption rate of innovations instead of factors obtained from the grouping of the same variables, but in a different way, we obtained the values of the respondents' perceptions regarding each construct from the medians of the values attributed by them to the statements related to each construct. We used the median because these numerical values do not represent quantities, but only relative positions, which could cause a distortion if the mean had been used.

We believe there may be a limitation here by considering for each construct the median of the pertinent statements, because this procedure winds up attributing the same weight to each of them, which might not correspond to reality.

With respect to the demographic characteristics (gender, age, schooling and income), the respondents were classified according to Table 1.

**Table 1** – Classification of the demographic characteristics

Gender	Range	Age	Range	Schooling	Range	Income	Range
Male	1	18 - 25	1	Incomplete Primary School	1	1 to 5 times min. wage	1
Female	0	26 - 35	2	Complete Primary School	2	6 to 10 times min. wage	2
		36 - 45	3	Incomplete Middle School	3	11 to 15 times min. wage	3
		46 - 60	4	Complete Middle School	4	16 or more times min. wage	4

Older than 61	5	Incomplete College or in Course	5
		Complete College	6
		Incomplete Graduate Study or in Course	7
		Complete Graduate Study	8

Source: Prepared by the authors (survey data).

To verify the influence of the demographic factors (independent or explanatory variables) on the users' perception of the constructs that influence the adoption of innovation (dependent or explained variables), we used five multiple regressions, one for each construct (relative advantage, complexity, compatibility, possibility of experimentation and visibility). In each one, the explanatory variables were the four indicated in Table 1.

Because of this, another limitation of this study must be mentioned: the last three variables were treated as quantitative, although they had been modeled in ordinal form. This does not apply to gender, which was modeled by means of a dummy variable.

## 4 PRESENTATION AND TREATMENT OF THE RESULTS

### 4.1 Profile of the respondents

In the first part of the analysis of the results, the personal characteristics are presented (categorical variables, age, income, schooling and gender), indicating the profile of the 62 respondents.

As shown by Table 2, the majority of the respondents were males.

**Table 2** - Gender of the respondents

Gender		
Total	62	Percentage
(0) Female	26	41.94%
(1) Male	36	58.06%
		<b>100.00%</b>

Source: Prepared by the authors (survey data).

Regarding age range, Table 3 shows that the respondents were mainly young people (66% of the respondents were between 18 and 35 years old).

**Table 3** – Age ranges of the respondents

Age		
Total	62	Percentage
(1) 18 – 25	22	35%
(2) 26 – 35	19	31%
(3) 36 – 45	8	13%
(4) 46 – 60	13	21%
(5) 61 and older	0	0%
		<b>100%</b>

Source: Prepared by the authors (survey data).

With respect to schooling (Table 4), none of the respondents had educational level below incomplete college or in course (35%); 37% had undergraduate degrees; 5% had incomplete graduate study or were studying for an advanced degree; and 23% had complete graduate level study. So, all of the respondents at least had some undergraduate college study or were currently attending college.

The high schooling index might have been influenced by the fact the questionnaire was posted on the internet, more easily accessed by people with higher educational achievement.

**Table 4** – Schooling level of the respondents

Schooling		
Total	62	Percentage
(1) Incomplete Primary School	0	0%
(2) Complete Primary School	0	0%
(3) Incomplete Middle School	0	0%
(4) Complete Middle School	0	0%
(5) Incomplete College or in Course	22	35%
(6) Complete College	23	37%
(7) Incomplete Graduate Study or in Course	3	5%
(8) Complete Graduate Study	14	23%
		<b>100%</b>

Source: Prepared by the authors (survey data).

The income distribution of the sample was relatively low, concentrated in the range from 1 to 5 times the minimum monthly wage, as can be seen in Table. The minimum wage value used was R\$ 724.00, as specified by Decree 8,166 of December 23, 2013 (Brasil, 2013). This result might have been influenced by the age profile of the respondents, most of them young (up to 25 years) and many attending university.

**Table 5** – Income level of the respondents

Income		
Total (multiples of minimum monthly wage)	62	Percentage
(1) 1 to 5	26	42%
(2) 6 to 10	15	24%
(3) 11 to 15	11	18%
(4) 16 or more	10	16%
		<b>100%</b>

Source: Prepared by the authors (survey data).

In summary, the respondents were, in the majority, males, between 18 and 25 years old, with undergraduate college degrees and income between 1 and 5 times the monthly minimum.

## 4.2 Medians of the perceptions about the constructs

Table 6 presents the medians of each of the five aspects of mobile banking: relative advantage, complexity, compatibility, possibility of experimentation and visibility, in relation to internet banking and ATM use. It is important to stress that the highest values represent, according to the way the statements were formulated, higher relative advantage, **lower** complexity, higher compatibility, higher possibility of experimentation and higher visibility. Note that the complexity construct is the only one for which lower perception is associated with higher values on the scale.

In general, the perceptions about the constructs were more for agreement with the statements on the questionnaire, which can explain the high adoption rate of the mobile application.

**Table 6** - Medians of the perceptions about the constructs

	<b>Medians</b>
Relative advantage	7.00
Compatibility	7.75
Complexity	9.00
Possibility of experimentation	5.00
Visibility	6.50

Source: Prepared by the authors (survey data).

### 4.3 Correlations between the variables

The correlation coefficients in Table 7 reveal, although with a weak level ( $0.15 < r < 0.40$ ):

- A positive correlation between gender and the variables compatibility and complexity (men had higher scores for these two constructs);
- A positive correlation between schooling and complexity;
- A positive correlation between income and the variables relative advantage and complexity.

**Table 7** – Pairwise correlations between the variables

	Gender	Age	Schooling	Income	RV	Compatibility	Complexity	Experimentation	Visibility
Gender	1,00								
Age	0,17	1,00							
Schooling	- 0,04	0,62	1,00						
Income	0,36	0,73	0,52	1,00					
RV	0,09	0,13	0,06	0,20	1,00				
Compatibility	0,18	0,04	0,11	0,13	0,76	1,00			
Complexity	0,17	0,14	0,18	0,19	0,73	0,77	1,00		
Experimentation	0,10	- 0,03	- 0,10	- 0,03	0,54	0,54	0,50	1,00	
Visibility	0,03	0,00	- 0,07	0,03	0,73	0,66	0,67	0,69	1,00

Source: Prepared by the authors (survey data).

### 4.4 Multiple regressions

To verify the influence of the demographic factors (independent variables) on the users' perceptions about the constructs that influence the adoption of innovation (dependent variables), we used multiple regression analysis, carrying out five regressions, one for each innovation construct.

The coefficient of determination  $R^2$  (adjusted R-squared), with value between 0 and 1, measures the fit of a standard statistical model. The adjusted R-squared value will indicate to what extent the dependent variable is explained by the independent variables included in the model. The higher the adjusted R-squared value, the more explanatory power the model has, meaning the better the model fits the sample.

#### 4.4.1 Relative advantage

The multiple regression of the explanatory variables indicated that the perception of the relative advantage construct cannot be explained only by the demographic characteristics, due to the very low adjusted R-squared value (0.02). None of the variables were significant, at 10%, according to the p-values found.



However, after removing the variables that were more markedly interfering in the analysis, leaving only the income level variable, most strongly correlated with relative advantage, the p-value (0.12) indicated this variable nearly attained statistical significance at 10% (Table 8).

**Table 8** - Regression - Relative advantage

Summary Output	
Regression Statistics	
Multiple R	0,20
R square	0,04
Adjusted R square	0,02
Standard Error	2,67
Observations	62,00

ANOVA					
	df	SS	MS	F	Significance F
Regression	1,00	17,58	17,58	2,47	0,12
Residual	60,00	426,31	7,11		
<b>Total</b>	<b>61,00</b>	<b>443,89</b>			

	Coefficients	Standard error	t Stat	p value	95% lower	95% upper
Intercept	5,66	0,72	7,88	0,00	4,23	7,10
4 - Respondent's Income Level	0,48	0,30	1,57	0,12	0,13	1,09

Source: Prepared by the authors (survey data).

#### 4.4.2 Compatibility

Like what occurred with the relative advantage construct, we found that the perception of the compatibility construct cannot be explained only by the demographic characteristics, due to the very low adjusted R-squared (0.01). None of the variables were significant at 10%, according to the p-values found.

Nevertheless, after removing the variables that were interfering more markedly and keeping only the gender variable, more strongly correlated with compatibility, its p-value (0.15) indicated that this variable almost showed statistical significance at 10% (Table 9).

**Table 9** - Regression – Compatibility

Summary Output	
Regression Statistics	
Multiple R	0,181405928
R square	0,032908111
Adjusted R square	0,016789912
Standard Error	2,69891195
Observations	62

ANOVA					
	df	SS	MS	F	Significance F
Regression	1	14,8718121	14,87181	2,041674278	0,158226767
Residual	60	437,0475427	7,284126		
<b>Total</b>	<b>61</b>	<b>451,9193548</b>			

	Coefficients	Standard error	t Stat	p value	95% lower	95% upper	95% lower	95% upper
Intercept	6,326923077	0,529300181	11,95337	1,62724E-17	5,268165078	7,385681075	5,268165078	7,385681075
1 - Respondent's Gender	0,992521368	0,694618965	1,428872	0,158226767	-0,396923435	2,38196617	-0,396923435	2,38196617

Source: Prepared by the authors (survey data).

### 4.4.3 Complexity

As happened with the previous two constructs, the perception of the complexity construct cannot be explained only by the demographic characteristics due to the extremely low adjusted R-squared value (0.00). Again, according to the p-values, none of the variables were significant at 10%.

However, after removing the variables hampering the analysis the most and keeping only the income variable, more strongly correlated with compatibility, the p-value (0.15) indicated this variable almost reached 10% significance (Table 10). We also found that the respondents with more schooling perceived the mobile application as being less complex.

**Table 10** - Regression – Complexity

Summary Output	
Regression Statistics	
Multiple R	0,190920662
R square	0,036450699
Adjusted R square	0,020391544
Standard Error	2,538221891
Observations	62

ANOVA					
	df	SS	MS	F	Significance F
Regression	1	14,62319741	14,6232	2,269776903	0,13716605
Residual	60	386,5542219	6,44257		
<b>Total</b>	<b>61</b>	<b>401,1774194</b>			

	Coefficients	Standard error	t Stat	p value	95% lower	95% upper	95% lower	95% upper
Intercept	6,89734681	0,684129075	10,08194	1,56812E-14	5,528884911	8,265808709	5,528884911	8,265808709
4 - Respondent's Income Level	0,436934091	0,290017594	1,506578	0,13716605	-0,14318747	1,017055653	-0,14318747	1,017055653

Source: Prepared by the authors (survey data).

### 4.4.4 Possibility of experimentation and visibility

Finally, the perceptions of the constructs possibility of experimentation and visibility cannot be explained only by the demographic characteristics due to the very low adjusted R-squared values (0.05 and - 0.011 respectively). In this case, even after removing the variables with high p-values, no remaining variable was anywhere near being significant, as shown in Tables 11 and 12.

**Table 11** - Regression - Possibility of experimentation

Summary Output	
Regression Statistics	
Multiple R	0,101899997
R square	0,010383609
Adjusted R square	-0,006109997
Standard Error	2,511256709
Observations	62

ANOVA					
	df	SS	MS	F	Significance F
Regression	1	3,970223325	3,970223	0,629553607	0,430645777
Residual	60	378,3846154	6,30641		
<b>Total</b>	<b>61</b>	<b>382,3548387</b>			

	Coefficients	Standard error	t Stat	p value	95% lower	95% upper	95% lower	95% upper
Intercept	5,153846154	0,49249796	10,46471	3,72254E-15	4,168703557	6,138988751	4,168703557	6,138988751
1 - Respondent's Gender	0,512820513	0,646322136	0,793444	0,430645777	-0,780016248	1,805657274	-0,780016248	1,805657274

Source: Prepared by the authors (survey data).

**Table 12 - Regression – Visibility**

Summary Output	
Regression Statistics	
Multiple R	0,072679511
R square	0,005282311
Adjusted R square	-0,011296317
Standard Error	2,523833636
Observations	62

ANOVA					
	df	SS	MS	F	Significance F
Regression	1	2,029536433	2,029536	0,31862174	0,574541334
Residual	60	382,1841732	6,369736		
<b>Total</b>	<b>61</b>	<b>384,21371</b>			

	Coefficients	Standard error	t Stat	p value	95% lower	95% upper	95% lower	95% upper
Intercept	7,004857316	1,766650708	3,965049	0,00019805	3,471029753	10,53868488	3,471029753	10,53868488
3 - Respondent's Schooling Level	-0,15958308	0,282715189	-0,56447	0,57454133	-0,725097657	0,405931496	-0,725097657	0,405931496

Source: Prepared by the authors (survey data).

## 5 ANALYSIS OF THE RESULTS

In the five multiple regressions, the R-squared values (coefficients of determination) were low for all the constructs. In other words, the survey results indicate that the demographic characteristics (gender, age, schooling and income) are not the only variables that affect the perception of users, specifically regarding the mobile banking innovation.

Although the multiple regression model applied cannot be considered a good predictor, all the same the analysis of the individual impact of each of the demographic variables on the constructs, by means of the p-values found, can help shed light on the phenomenon of interest. In this respect, the next paragraphs discuss the results found.

In relation to the perception of **relative advantage** of using the mobile application instead of internet banking or ATM, the results suggest that the construct is influenced by income, in the same direction as indicated by Pavarini et al. (2010), Abbade and Noro (2012) and Medeiros et al. (2013). The respondents with higher income tended to perceive greater relative advantage. The positive correlation between these variables, as seen in Table 7, also points in this direction. Customers with higher income level tend to value the application because of the easier access to banking services.

With respect to the perception of **compatibility** of the mobile application in relation to the other two channels, the results suggest that mobile banking is viewed more favorably by males. The positive correlation between these variables, as shown in Table 7, also points in this direction.

These results suggest that men are more willing to use innovative products or services, always trying to stay abreast of the latest technological novelties, as also suggested by Pavarini et al. (2010). The higher the perception of compatibility of an innovation is, the higher will be the relevance of adopting that innovation. Mobile services are extremely personal, so they must be in conformity with each individual's lifestyle. Customers are free to choose whether or not to use a mobile application. The results also suggest that the application is perhaps not that compatible with the values, needs and experiences of the women in the sample. To a certain extent this result is congruent with the profile of the research subjects, mainly men. On the other hand, that result does not agree with findings of Ramos et al. (2010), who found no statistical difference between the sexes in the adoption of innovation.

Regarding the perception of **complexity** of using the mobile application instead of the other two channels, the results suggest that the construct is influenced by income, in the direction also indicated by Pavarini et al. (2010), Abbade and Noro (2012) and Medeiros et al. (2013). In our sample, the respondents with higher incomes perceived the application as being less complex. The positive correlation between these variables, as shown in Table 7, also points in this direction. The moderate correlation (0.52 in Table 7) between income and schooling suggests that the higher educational level of the respondents with higher income contributed to reduce the perceived complexity of the mobile application.

Finally, with regard to the perceptions of possibility of experimentation and **visibility** of the mobile application compared to the other two channels, the results suggest they are not affected by variations of gender, income, schooling or age. The low correlation values (see Table 7) between the two dependent variables and four explanatory (demographic) variables add support to these results.

## 6 CONCLUSIONS

The respondents in this survey were mostly men, between the ages of 18 and 25 years, with college degrees and income between 1 and 5 times the minimum monthly wage. This profile indicates that young people tend to use mobile banking more than older people, because they tend to have more familiarity with information and communication technologies, as also suggested by Pavarini et al. (2010) and Pádua and Prado (2006).

Of the constructs, the highest median score (9.00) was for perception of **complexity**. This result suggests that the respondents perceived the mobile banking application as less complicated than using internet banking or automatic teller machines. At the other end, the lowest median (5.00) was that of the perception of **possibility of experimentation**, which can indicate there is room for managerial initiatives by banks to increase the possibility of experimentation with mobile applications by their customers, such as by offering more information, and even training, to customers. The low standard deviation of this construct reinforces the previous argument. With respect to the other three constructs, the results showed that users of mobile applications perceive this option, in relation to internet banking and ATM, as being more advantageous (median 7.00), more compatible (median 7.75) and giving higher visibility (median 6.50).

With respect to the results of the regressions, we did not find a significant influence (at 5%) of the demographic variables on the perceptions of the five constructs, although at a less stringent significance level of 20% (not commonly used in academic works), influences existed: (i) of income on the perception of relative advantage - respondents with higher incomes perceived the application as being more advantageous in relation to internet banking or ATM than those with lower incomes; (ii) of gender on the perception of compatibility - men stated that the mobile application was more compatible to their needs than internet banking or ATM more so than the women respondents; and (iii) of income on complexity - respondents with higher income levels perceived the application as being less complex than internet banking or ATM than did respondents with low incomes.

The results suggest actions can be taken to increase use of mobile banking applications in relation to using automatic teller machines or internet banking, such as: (i) efforts to communicate the **relative advantages** of the mobile application to people with lower income levels; (ii) actions to make the application more **compatible** with the needs of women customers; and (iii) actions to make the application friendlier (less **complexity**) to people with lower incomes.

Additionally, the low adjusted R-squared values indicate that variations in perception were weakly explained by the variations in the demographic factors. These findings point in the same direction as those reported by Medeiros et al. (2013) that cultural, social, personal and psychological factors can better explain the variations in perceptions than demographic factors. Pavarini et al. (2010) also suggest that other factors, such as psychological behavior and past experiences, among others, also influence the perception of adopting innovation. In this same direction, the results of the survey of Ramos et al. (2010) suggest no significant difference exists between the sexes regarding adoption of innovation.

Mention must be made of the limitations of this study, because it was restricted to 62 respondents of a convenience sample. This size is small, but not necessarily unsuitable, in particular because there was no approximation or relaxation of the premises for the tests to be applied. The negative consequence is the need for more robust evidence to obtain significant results, which was not achieved in this study.

For future research we suggest repeating this survey with a larger sample and with inclusion of other non-demographic variables. A larger sample can allow the confirmatory factor analysis to group the statements in their respective constructs and with those “almost” significant and make the “almost” significant explanatory variables truly significant.

Studies can also be performed comparing users with non-users regarding the influence of demographic and non-demographic factors on the perceptions of the relative advantage, complexity, compatibility, possibility of experimentation and visibility of mobile banking compared to internet banking and ATM usage.

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## APPENDIX A

### QUESTIONNAIRE ABOUT USERS' PERCEPTIONS OF MOBILE BANKING

AGE SCALE				
18 TO 25	26 TO 35	36 TO 45	46 TO 60	61 AND OVER
1	2	3	4	5

GENDER SCALE	
MALE	FEMALE
1	2

SCHOOLING SCALE							
INCOMP. PRIMARY	COMPL. PRIMARY	INCOMP. MIDDLE	COMPL. MIDDLE	INCOMP. COLLEGE OR IN COURSE	COMPLETE COLLEGE	INCOMP. GRADUATE STUDY OR IN COURSE	COMPL. GRADUATE STUDY
1	2	3	4	5	6	7	8

INCOME SCALE (IN TERMS OF MULTIPLES OF THE MINIMUM MONTHLY WAGE)			
FROM 1 TO 5	FROM 6 TO 10	FROM 11 TO 15	16 OR MORE
1	2	3	4

Report in the right-hand column the numbers related to your age, gender, schooling and income, according to the above scales.		
Q.1	Age	
Q.2	Gender	
Q.3	Schooling level	
Q.4	Income	

<p><b>The statements that follow refer to banking transactions carried out by a mobile application (instead of using internet banking from a residential computer or automatic teller machines in bank branches or other locations). Mark in the appropriate space of the last column your degree of agreement with the statements, on a scale of 0 (total disagreement) and 10 (total agreement).</b></p>										
<b>LIKERT SCALE</b>										
<b>DISAGREE</b>					<b>AGREE</b>					
0	1	2	3	4	5	6	7	8	9	10
<b>RELATIVE ADVANTAGE:</b>										
<b>Q.5</b>	Using the mobile banking application is relatively less expensive than using internet banking or ATM.									
<b>Q.6</b>	With mobile banking I can make transactions and consultations faster than through the other 2 channels.									
<b>Q.7</b>	Mobile banking is more practical than the other 2 channels.									
<b>Q.8</b>	Mobile banking is more available than the other 2 channels.									
<b>Q.9</b>	Mobile banking is more secure against fraud than the other 2 channels.									
<b>COMPATIBILITY:</b>										
<b>Q.10</b>	My lifestyle helps me identify more with the mobile application than with the other 2 channels.									
<b>Q.11</b>	Mobile banking fits better with the way I like to relate with my bank than the other 2 channels.									
<b>Q.12</b>	With mobile banking, I can more easily access the banking services I normally use that with the other 2 channels.									
<b>Q.13</b>	Mobile banking is more compatible with my daily activities than the other 2 channels.									
<b>COMPLEXITY:</b>										
<b>Q.14</b>	The first use of the mobile banking application is simpler than with the other 2 channels.									
<b>Q.15</b>	The installation of the banking application is simpler than with than the other 2 channels.									
<b>Q.16</b>	The functionalities offered by mobile banking are easier to understand than the functionalities of the other 2 channels.									
<b>Q.17</b>	The functionalities offered by mobile banking are easier to use than those of the other 2 channels.									
<b>POSSIBILITY OF EXPERIMENTATION:</b>										
<b>Q.18</b>	The costs (financial and non-financial) of using the mobile banking application in my cellphone are lower than those of the other 2 channels.									
<b>Q.19</b>	Banks offer more adequate training or information to their customers about mobile banking than for the other 2 channels.									
<b>Q.20</b>	It is easier to experiment (before acquiring) with mobile banking than the other 2 channels.									
<b>Q.21</b>	I have more opportunities to experiment with different functionalities of mobile banking in relation to the other 2 channels.									
<b>VISIBILITY:</b>										
<b>Q.22</b>	It is easier to describe to other people the advantages of using the mobile banking application than the other 2 channels.									



<b>Q.23</b>	Using mobile banking is a sign of higher status (greater prestige) than the other 2 channels.	
<b>Q.24</b>	I see more people using the mobile banking application than using the other 2 channels.	
<b>Q.25</b>	When my friends/other customers see me using mobile banking, they are stimulated to use this service more than when they seem me using the other 2 channels.	