

**UNIVERSIDADE ESTADUAL DO OESTE DO PARANÁ
PROGRAMA DE PÓS-GRADUAÇÃO EM ADMINISTRAÇÃO (PPGAdm)
MESTRADO PROFISSIONAL**

**WESTERN PARANÁ STATE UNIVERSITY
PROFESSIONAL MASTER'S IN ADMINISTRATION**

**INCLUSÃO DIGITAL E FINANCEIRA PELO *M-BANKING* COMO
OPORTUNIDADE DE NEGÓCIOS PARA UM BANCO DIGITAL: O CASO DA
CAIXA ECONÔMICA FEDERAL E A ACEITAÇÃO E USO DO APLICATIVO
CAIXATEM**

**DIGITAL AND FINANCIAL INCLUSION THROUGH M-BANKING AS A
BUSINESS OPPORTUNITY FOR A DIGITAL BANK: THE CASE OF CAIXA
ECONÔMICA FEDERAL AND THE ACCEPTANCE AND USE OF THE
APPLICATIVE CAIXATEM**

[TRADUÇÃO INGLESA]

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CASCATEL/PR

2022

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APPLICATIVE CAIXATEM**

Dissertation presented in partial fulfilment of the requirements for the degree of **Master of Science in Administration** in the Department of Administration, Western Paraná State University.

Dissertation Supervisor: Vinicius Abílio Martins, PhD.

Dissertação apresentada ao Programa de Pós-Graduação em Administração (PPGAdm) – Mestrado Profissional da Universidade Estadual do Oeste do Paraná, como requisito parcial para obtenção do grau de **Mestre em Administração**.

Orientador: Dr. Vinicius Abílio Martins.

CASCADEL/PR

2022

International Cataloging-in-Publication Data
UNIOESTE Library System

Santos, Gilmar Veriato Fluzer dos

Digital and financial inclusion through m-banking as a business opportunity for a digital bank: the case of Caixa Econômica Federal and the acceptance and use of the applicative Caixatem/ Gilmar Veriato Fluzer dos Santos; Supervisor Vinicius Abilio Martins ; [Translation of Dhandara Capitan], 2022. 111 f.

Dissertation (Master's of Degree – Campus of Cascavel) – Western Paraná State University, Center for Applied Social Sciences, Graduate Program in Administration, 2022


[English version of: Inclusão digital e financeira pelo m-banking como oportunidade de negócios para um banco digital: o caso da Caixa Econômica Federal e a aceitação e uso do aplicativo Caixatem]

1. Digital and financial inclusion. 2. Digital banking. 3. UTAUT Model. 4. Factor analysis. 5. Structural equation modeling. I. Martins, Vinicius Abilio. II. Capitan, Dhandara. III. Title.

GILMAR VERIATO FLUZER DOS SANTOS


Inclusão digital e financeira pelo M-Banking como oportunidade de negócios para um banco digital: o caso da Caixa Econômica Federal e a aceitação de uso do aplicativo CAIXA Tem

Dissertação apresentada ao Programa de Pós-Graduação em Administração em cumprimento parcial aos requisitos para obtenção do título de Mestre em Administração, área de concentração Competitividade e Sustentabilidade, linha de pesquisa Sustentabilidade, APROVADO(A) pela seguinte banca examinadora:

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To the Paraná state society, as a form of contribution, in this world where we have too many rights and too few duties. In which where there is culture, art, science, and technology in abundance, notwithstanding light, truth, love, and gratitude among men is scarce.

I leave this small contribution as an instrument to awaken such values in each of us.

ACKNOWLEDGEMENTS

In the great human existence, each person gives their life a special meaning, according to their purposes. This meaning lies in self-discovery, in individual choices and decisions, in order to value what is important or not for your evolutionary path.

In these two and a half years of journey, with remote classes and without personal contact with colleagues and teachers due to a virus, I discovered that technology has its benefits, but nothing replaces the human factor of conversation, affection, knowledge exchange, a gathering. All in all, it was a valuable lesson, which served to improve research, deepen scientific knowledge, and discover technological resources that had not yet been explored. It was another window that opened in this great era of information and technological innovation, in which I tested my limits and, with them, my understanding of what it means to be an agent of transformation in such an unequal society when it comes to digital access and inclusion.

I went through difficult times, in terms of health and mourning the death of my dear mother, Iolanda, but nothing could stop my will to move forward and win. I'm eternally thankful to my mother and my two families, and God only knows the amount of love and gratitude I have for them.

None of this would be possible without the dedication, wisdom and understanding of all the Professors and the Coordination at PPGAdm, to whom I express my deep gratitude, especially to my advisor, Prof. Vinícius Martins, who was responsible for getting me this far. To Prof. Edison Leismann, distinguished advisor who almost immediately transferred me to Prof. Martins and Prof. Loreni Brandalise, with whom it all started. I also extend this acknowledgement to my teammates and other students, who provided me with moments of great partnership and wisdom.

Not least, my thanks to the Professors of the examination committees, Ronaldo Bulhões, Cláudio Rojo and Vanderlei Santos (Udesc), for the partnership and wise notes for the refinement of this work.

To my work company CAIXA and my colleagues, who supported and understood the importance of this study, and to my dear wife and life partner Paula, to whom I am indebted for the moments of deprivation and absence we went through, in which her messages of support were decisive. To my little Scoty, my buddy, who provided me enough joy in the last few days to persist when everything seemed impossible.

Finally, to Heavenly Father, our great master and the reason for our existence, whose love and mercy I keep in my heart.

“The ignorant man pronounces, the wise man questions and reflects”

- Aristotle

RESUMO

Santos, Gilmar Veriato Fluzer dos (2023). *Inclusão digital e financeira pelo m-banking como oportunidade de negócios para um banco digital: o caso da Caixa Econômica Federal e a aceitação e uso do aplicativo CaixaTem*. Dissertação de mestrado profissional, Universidade Estadual do Paraná, Cascavel, PR, Brasil.

Este estudo teve o objetivo de analisar os fatores que influenciam a aceitação e o uso do m-banking e do aplicativo CaixaTem para serviços financeiros, e se permitem à Caixa Econômica Federal a criação de um Banco Digital inclusivo e sustentável. Para isso, se utilizou de uma pesquisa de campo realizada com 300 entrevistados na cidade de Cascavel/PR, cujo instrumento possibilitou aplicar métodos estatístico-descritivos, análises e modelos fatoriais de regressão para o alcance dos objetivos e dos resultados. A base teórica da pesquisa foi a Teoria Unificada de Aceitação e Uso da tecnologia – UTAUT, devidamente testada e consolidada na literatura, ao utilizar as variáveis (construtos) expectativa de desempenho, influência social, credibilidade percebida, custo financeiro percebido, condições facilitadoras e intenção comportamental e sua influência no comportamento de uso. Os resultados encontrados permitiram concluir que a totalidade dos construtos do modelo tiveram as hipóteses aceitas em suas relações, exceção feita à variável credibilidade percebida, que não apresentou influência significativa no constructo intenção de uso. Além disso, foi possível confirmar o oportunismo da criação de um Banco Digital (*fintech*) para a instituição, pelo fato de o CaixaTem representar um ativo já em operação e com uma base potencialmente lucrativa, embora os resultados obtidos na intenção de uso sejam maiores que o uso real do aplicativo. A inclusão digital e financeira ao público de baixa renda também foi promissora, principalmente se forem consideradas a sua enorme base de clientes, o potencial de expansão de contas inativas e a oferta de microcrédito à população, sobretudo para o consumo, em que pese sua subutilização e limitações operacionais neste mercado, como mostraram os resultados da análise dos modelos.

Palavras-chave: Inclusão digital e financeira; Banco digital; Modelo UTAUT; Análise fatorial; Modelagem de equações estruturais.

ABSTRACT

Santos, Gilmar Veriato Fluzer dos (2023). *Digital and financial inclusion through m-banking as a business opportunity for a digital bank: the case of Caixa Econômica Federal and the acceptance and use of the applicative CaixaTem*. Professional Master's Degree, Western Paraná State University, Cascavel, PR, Brasil.

This study aimed to analyze the factors that influence the acceptance and use of m-banking and CaixaTem application for financial services, and whether they allow Caixa Econômica Federal to create an inclusive and sustainable Digital Bank. To this end, a field research was carried out with 300 respondents in the city of Cascavel/PR, whose instrument made it possible to apply statistical-descriptive methods, factor regression analysis and models to reach the objectives and results. The theoretical basis of the research was the Unified Theory of Acceptance and Use of Technology – UTAUT, duly tested and consolidated in the literature, by using the variables (constructs) performance expectancy, social influence, perceived credibility, perceived financial cost, facilitating conditions and behavioral intention and its influence on the behavior of use. The results found lead to the conclusion that all constructs in the model had their hypotheses accepted in their relationships, with the exception of the variable perceived credibility, which showed no significant influence on the intention to use construct. Furthermore, it was possible to confirm the timeliness of creating a Digital Bank (fintech) for the institution, due to the fact that CaixaTem represents an asset already in operation and with a potentially profitable base, although the results obtained in the intention to use are higher than the actual use of the application. The digital and financial inclusion of the low-income public was also promising, especially if one considers its massive customer base, the potential for expansion of inactive accounts and the offer of microcredit to the population, especially for consumption, despite its underutilization and operational limitations in this market, as shown by the results of the model analysis.

Keywords: Digital and financial inclusion; Digital banking; UTAUT Model; Factor analysis; Structural equation modeling.

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LISTA OF ABBREVIATIONS AND ACRONYMS

AFE	Exploratory Factor Analysis
AVE	Average Variance Extracted
BCB/BC	Central Bank of Brazil
CMN	National Monetary Council
FEBRABAN	Brazilian Federation of Banks
FGTS	Length of Service Guarantee Fund
FINTECH	Financial Technology
FMI	International Monetary Fund
IBGE	Brazilian Institute of Geography and Statistics
IDH	Human development Index
IPEA	Institute for Applied Economic Research
MA	Broad Microcredit
MEE	Modelagem de Equações Estruturais
MPO	Oriented Productive Microcredit
PIB	Gross Domestic Product
PIS	Social Integration Program
PLS	Partial Least Squares
PNAD	National Household Sample Survey
SCD	Direct Credit Society
SEM	Structural Equation Modeling
SEP	Peer-to-Peer Lending Society
SERASA	Advisory Services S.A.
SPSS	Statistical Package for the Social Science
TAM	Technology Acceptance Model
TWB	The World Bank
UFA	Universal Financial Access
UTAUT	Unified Theory of Acceptance and Use of Technology
WBG	World Bank Group

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1 INTRODUCTION

The restrictive measures imposed by the Covid-19 pandemic (2020/21) forced countries to adopt economic stimulus programs and specific interventions to minimize the negative effects on their economies, in the fiscal sphere, in monetary policy and in the protection of people and companies (Institute for Applied Economic Research [IPEA], 2020; Nogueira, Rocha, & Akerman, 2020, Wilkins, Gilchrist, & Phillimore, 2021).

In Brazil, this scenario led the government to use its social protection system and to create mechanisms so that the effects of this crisis, especially for the most fragile, were mitigated (Ministério da Cidadania, 2021). Hence, the government used two measures: emergency aid, implemented by a public bank – Caixa Econômica Federal – on three fronts (Bolsa Família (Supplemental Nutrition Assistance Program), FGTS and Emergency Salary Benefit) and digital technology, through a smartphone application (CaixaTem), with more than 120 million accounts compulsorily opened. Data from the organization itself indicate that this is the greatest financial and digital inclusion in the history of Brazil (Caixa, 2020).

In a recent article published by the International Monetary Fund – IMF, Sahay *et al.* (2020) found direct relationship between the growth of the Gross Domestic Product (GDP) of countries and the increase in financial inclusion through digital finance. This suggests, according to the authors, that digital financial inclusion can play an important role in mitigating the economic and social impact of the current Covid-19 health crisis, including on low-income families. This role can be carried out by fintechs¹.

“In most countries, fintech for financial inclusion started with ‘spending’ and is rapidly transforming to ‘lending’” (Sahay *et al.*, p. 13, 2020). The authors admit that Covid-19 allows the granting of targeted credit, including government assistance to companies and families. This process started and is concentrated in China, the USA and the UK, but is growing rapidly in other countries such as India and Kenya (Sahay *et al.*, 2020).

Quoting the Disruptive Innovation Theory, Christensen, Raynor and McDonald (2015) state that digital technology has proven to be an important form of growth driven by innovation, which important business leaders and executives have as a guideline. Alt, Beck and Smits (2018) explain that it offers disruptive potential for the financial industry and goes beyond a

¹ Technological innovation in financial services that could result in new business models, applications, processes or products with an associated material effect on the provision of financial services (Sahay *et al.*, 2020).

simple linear evolution of existing technologies. Puschmann (2017) states that the disruption caused by fintechs represents a milestone in information technology, which can generate new intra and inter-organizational business models. This pattern tends to continue and get consolidated in the market, in which large organizations must consider fintechs as partners and not as competitors.

The consolidation of this digital medium can be confirmed in the intention of use by users, present in the research of Venkatesh and Davis (2000), Pires and Costa Filho (2008), Moreira, Chaves and Bignetti (2019) and Longaray et. al. (2020). The acceptance model of this technology, studied by these authors, has already been widely tested in the literature and is the object of methodological research in this work.

In this perspective, given the unforeseen events caused by the pandemic and its negative impact on the economy of families, what would be a fiscal threat due to an emergency indebtedness may represent an opportunity for the public bank, since private institutions, such as fintechs, would not be able to meet a demand of such magnitude. Experiences in this direction have been successfully tested and approved in some countries, such as Kenya, India and Bangladesh (Jack & Suri, 2011; Lima, 2017; Barik & Sharma, 2019).

Considering this context, the requirements imposed by the shock of the pandemic make technological innovation and financial inclusion complementary initiatives in the adoption of public policies by governments. This provides, in the medium and long terms, in addition to mitigating the social crisis, the possibility of accelerating economic growth in countries, as noted in the World Bank report (2020).

However, the various studies that investigate this topic do so in a segmented way, without identifying demands for significant and emergency banking inclusion in large countries, such as Brazil. Therefore, there is a research gap to be developed in order to assess the financial opportunity that a public bank would have when entering this process of banking and digital innovation, with the aim of leveraging its business and, at the same time, fulfilling its social function in a scenario of health crisis and economic recovery caused by the pandemic.

1.1 RESEARCH PROBLEM

The emergency banking provided by the pandemic forced the Brazilian government to massively enter digital technology and enable access to a population whose socioeconomic profile, for the most part, was excluded from this environment.

However, the studies available in the literature that address the phenomenon of fintechs, their innovative character and their relationship with other financial institutions (Silva *et al.*,

2020; Bueno, 2019; Camelo, Mendes & Leite, 2020) do not yield relevant production on the subject of digital banking by public banks and the financial inclusion of the population in a massive way. With the exception of India, which is experiencing rapid progress in digital and financial inclusion (Barik & Sharma, 2019), no other country has the potential for financial and digital inclusion equal to the Brazilian profile (The Economist, 2018).

In this sense, the main objective of financial inclusion has become the creation of savings and the provision of credit, and no longer a simple opening of a bank account (Barik & Sharma, 2019). In the line of microfinance², Sahay *et al.* (2020) argue that financial services are faster, more efficient and cheaper than traditional financial services and increasingly accessible to low-income families and small businesses. These authors analyzed the digital financial services of 52 countries and found that they are growing rapidly at a speed that varies according to region or country. There was significant growth in digital inclusion between 2014 and 2017, while traditional banking inclusion has stalled or declined.

Soederberg (2013) considers that financial inclusion has been a topic of global development and strongly supported in world forums to promote growth and stability, in addition to being an important instrument for reducing poverty. However, financial inclusion itself may be at risk as digital services accelerate in the post-Covid era, driven by unequal access to telecommunications and potential unemployment, which can lead to a digital divide (Sahay *et al.*, 2020).

Therefore, it is clear that there may be a great connection between the social function of a public bank and its innovative capacity in this technological transformation, as observed in India, where the government took important initiatives, such as the implementation of the Pradhan Mantri Jan Dhan Yojana (PMJDY), a financial inclusion program open to Indian citizens, which aims to expand access to financial services such as bank accounts, remittances, credit, insurance, and pensions (Barik & Sharma, 2019). Despite this advance, the authors argue that these bankarization efforts have yet to attract the rural poor, the disadvantaged, and the marginalized areas of society to obtain basic banking services.

Sahay *et al.* (2020) contextualize that, with the development of fintechs around the world, policymakers are facing issues relevant to inclusive growth, financial stability and regulation. The authors quote a principle established by the G-20, of the need for countries to

² A microfinance system means providing citizens with a variety of financial services, including loans, savings and insurance, especially for the low-income population. (Caldas, 2003).

"provide a favorable and proportionate legal and regulatory framework for digital financial inclusion" (p. 39).

As for Brazil, representatives of more than 50 companies were interviewed, focusing on regions and countries that have active fintechs (see Sahay *et al.*, p. 44, 2020), but none on Brazilian grounds. This suggests that Brazilian fintechs, despite being present in the market and in constant growth, still have an insignificant number in view of the potential they have as competitors of traditional banks (Silva *et al.*, 2020).

Despite this, studies indicate that the acceptance of this technology by users is consolidated, such as the TAM model – Technology Acceptance Model, developed by Davis (1989), which has already been the object of study by several authors and perfected for the present day (Venkatesh & Davis, 2000; Venkatesh *et al.*, 2003; Venkatesh & Bala, 2008; Akturan & Tezcan, 2012). The model aims to explain the determining causes of acceptance of a new technology, such as mobile banking, for example, and the behavioral reaction of users to its use (Pires & Costa Filho, 2008). The essence of this model, according to the authors, lies in the fact that it establishes a basis for mapping the impact of external factors on those internal to the individual, such as beliefs, attitudes and behavioral intentions.

External factors are supported by two concepts, linked to beliefs, which are fundamental to measure the success of the model: perceived usefulness and perceived ease of use, for which, according to Lai (2017), this structure developed by Davis (1989) is the most used in predicting the adoption of information technology and its digital means, as it has been widely tested with different samples in different situations, proving to be a valid and reliable model in terms of users' intention to use it.

Thus, with regard to the adoption of mobile banking (m-banking), Püschel, Mazzon and Hernandez (2010) analyzed different theories regarding the influencing factors in the intention to use this technology, concluding that the most important factors that influence the decision of m-banking adoption are: attitude (influence on intention), facilitated control of technology (influence on perceived behavioral control) and self-efficacy (also influence on perceived behavioral control).

The association of these 8 theory models (see Moreira, Chaves, & Bignetti, 2019) resulted in the creation of UTAUT – Unified Theory of Acceptance and Use of Technology. This model has become strategic as a management tool since, in addition to verifying the most relevant factors that influence the intention to use mobile banking, it also allows the analysis of moderators, who can amplify or restrict the effects of these factors, or constructs (Moreira, Chaves, & Bignetti, 2019; Yu, 2019).

The consolidation of this digital medium can be confirmed in the intention of use by users, present in the research of Venkatesh and Davis (2000), Pires and Costa Filho (2008), Moreira, Chaves and Bignetti (2019) and Longaray *et al.* (2020). The acceptance model of this technology, studied by these authors, has already been widely tested in the literature and is part of the technical production of this work, whose tested instrument, the CaixaTem application, was used as an instrument to verify the ability to influence user's behavior, as suggested in the study by Moreira, Chaves and Bignetti (2019).

Therefore, this study proposes to fill an important gap in banking technological innovation, by opening a window of opportunity for both sides: for Caixa Econômica Federal, as a member of FEBRABAN – Brazilian Federation of Banks, in the sense of evaluating the adoption of this technology by promoting digital banking and, on the other hand, for users, in order to verify the sustainability conditions they would have, from a microfinance point of view, as an instrument of digital and financial inclusion.

1.1.1 Research question

What factors influence the intention to use m-banking and the CaixaTem application for financial services, to the point of giving Caixa Econômica Federal the opportunity to create an inclusive and sustainable Digital Bank?

1.2 OBJECTIVES

1.2.1 General objective

Analyze the factors that influence the acceptance and use of m-banking and the CaixaTem application for financial services, giving Caixa Econômica Federal the opportunity to create an inclusive and sustainable Digital Bank.

1.2.2 Specific objectives

- 1) Identify, along with a local sample of users (Cascavel/PR), which factors are decisive for the acceptance and use of the CaixaTem application and its sustainability in the provision of financial services (microfinance).
- 2) Measure the perception of customer-users regarding the factors:
 - a) Performance expectations;
 - b) Social influence;
 - c) Perceived credibility, perceived financial cost, and facilitating conditions; and

d) Behavioral and use intention regarding the acceptance of CaixaTem.

3) Analyze the influence of the factors mentioned in item 2, on the intention and behavior of using the CaixaTem application, verifying the opportunity to create a Digital Bank.

1.3 JUSTIFICATION AND CONTRIBUTION OF TECHNICAL PRODUCTION

Digital and financial inclusion is not only an exercise of citizenship, but also an important mechanism for economic prosperity, as found in a regional report by the IMF (2019), which concludes that expanding the population's access to the Internet by 10% in sub-Saharan Africa could boost real per capita GDP growth by up to 4 percentage points.

The IMF report (2019) informs that the experience with the Covid-19 crisis highlights the importance of promoting digital services for those who are the most in need. Fiscal policy should include investments in digital infrastructure, such as access to electricity, mobile, and internet coverage, digital identification, among others (IMF, 2019). In this sense, emerging countries, such as Brazil, must choose their priorities in digital financial inclusion according to their circumstances:

For countries where traditional access is low, there is room to improve financial inclusion through fintech, regardless of the level of use. On the other hand, for countries where traditional use is low, financial literacy and familiarity with financial services are essential to support financial inclusion, regardless of the level of access (SAHAY *et al.*, 2020, p. 41).

In the case of Brazil, the National Household Sample Survey (PNAD) carried out by the Brazilian Institute of Geography and Statistics (IBGE), with data collected at the end of 2018, shows that 45.9 million people did not have access to the Internet in Brazil. The survey also points out that 14.9 million households still do not have access to the Internet. IBGE found that three factors justify not accessing the Internet – lack of knowledge to know how to use it; lack of interest; and unavailable service, especially in the North region (PNAD/IBGE, 2020).

On the other hand, 99.2% of people use a cell phone and 45.5% only have this device as a means of accessing the internet, with the majority using the internet to send or receive text, voice or image messages through applications, which would place the country, according to the authors' citation, in the first category.

Microcomputers are still used by 48.1% of people (PNAD/IBGE, 2020).

In addition, it was observed that the average per capita real income of households where the Internet was used (R\$ 1,769) was almost double the income of those who did not use the Internet (R\$ 940). The great difference between these two yields was observed in every region of the country (PNAD/IBGE, 2020, p. 6).

In this same path, Pascotini (2014) and Cordeiro (2012), in similar studies, warn of the abandonment of the banking sector in less favored regions and populations, both in terms of banking and microcredit, notably in the north and northeast of Brazil, when they state that banks favor locations with better economic and social indicators.

In view of this situation, and in order to meet the main objective of this work, it was necessary to identify this trend locally, carrying out an experiment with part of the population of Cascavel/PR, in order to quantify the use of these applications and confirm the potential for offering services and financial products they would have with citizens. Hence, empirical work was carried out, based on the theory discussed in the following chapter, in order to determine the feasibility of this instrument on two fronts: in the intention of using m-banking and the CaixaTem application, in order to satisfy the objectives of this research.

In other words, this would provide an opportunity for intervention in this segment, with adequate public policies and greater banking by a public entity, in this case Caixa Econômica Federal, by allowing these populations to reach higher living standards, better quality jobs and more opportunities for everyone. This is aligned with the social responsibility of the Academy, as a public institution designed to return to society the expenditure on education, thus contributing to the training and professional improvement of its students.

These data, therefore, give a dimension of the importance of the financial and digital inclusion of these populations and justifies the accomplishment of this work.

1.4 DISSERTATION'S STRUCTURE

The work was structured in seven chapters, starting with the introduction of the theme, its contextualization and the research problem, the objectives, the justification, and its contribution. It continues in chapter two, with the theoretical and practical foundations that guided the study and the formulation of hypotheses, aiming to fulfill the objectives.

The methodology is explained in chapter three, with the techniques and the research instrument used, the treatment of data based on the UTAUT theory, the statistical and factor analysis and the applied modeling, informing the software used.

The fourth chapter describes, analyzes, and discusses the results in five sections, which studies the profile of the interviewees, performs the descriptive, factorial, structural and measurement analyzes of the models, as well as the construction of hypotheses and their results.

The work ends with the conclusions, complemented with the practical contributions of the study, contextual limitations and suggestions for future studies.

2 PRACTICAL AND THEORETICAL REFERENCES

This section presents the theoretical and empirical foundations that support the research and allow an in-depth understanding of the objectives of this dissertation, structured in the following topics: the first part contextualizes the relationship between banking and economic growth, its importance, and the positive evidence of this relationship. The second deals with the phenomenon of Fintechs, their disruptive-innovative capacity and the regulatory issue. Part three addresses financial inclusion and the services offered in this market, such as microcredit, and analyzes the sustainability of this process.

In part four, the potential of this market as an opportunity for the Digital Bank is contextualized, and the last part deals with the impact of Covid-19 on digital transactions, complementing the data in the previous section, with the intention of providing subsidies for the public bank in the face of the digital asset that it conquered during the post-pandemic period.

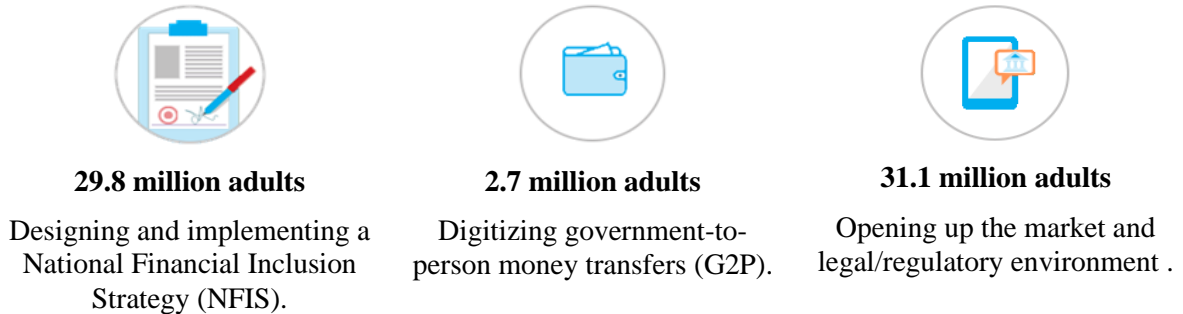
2.1 BANKING AND ECONOMIC GROWTH

Facilitated access to a bank account for the excluded or underbanked population has become an indispensable factor in the development of a country, as one of the basic conditions for economic growth (Barik & Sharma, 2019). According to these authors, there is already empirical evidence in this direction, confirming that financial inclusion has a significant effect in improving many economic indicators, such as poverty, inequality, Human Development Index (HDI) and economic growth, which can be seen in the works by Laha (2015); Lenka and Sharma (2017); Park and Mercado (2018); Zhang and Posso (2019).

Banking exclusion has become a concern of the World Bank (TWB), which has developed the UFA – Universal Financial Access project, together with five partner institutions (WBG – World Bank Group), whose objective is to promote the banking and financial inclusion of underprivileged adults and informal workers in member countries (The World Bank, 2020). In this regard, the WBG has committed to help enable 400 million adults to be reached with transaction accounts through knowledge, technical, and financial support.

In monitoring Brazil's progress, the data presented (2014) shows that the total opportunity for the country amounts to 53.2 million adults, of which 49.2 million are unbanked, out of a total of 154.3 million. Figure 1 contextualizes this opportunity, segmenting the financially active adults without a bank account that can be reached through specific interventions, separating by financial inclusion strategies (NFIS), government transfers (G2P) and the prospecting of adults in this regulated market.

Figure 1
Country opportunities considering financially active (segmented) unbanked adults.

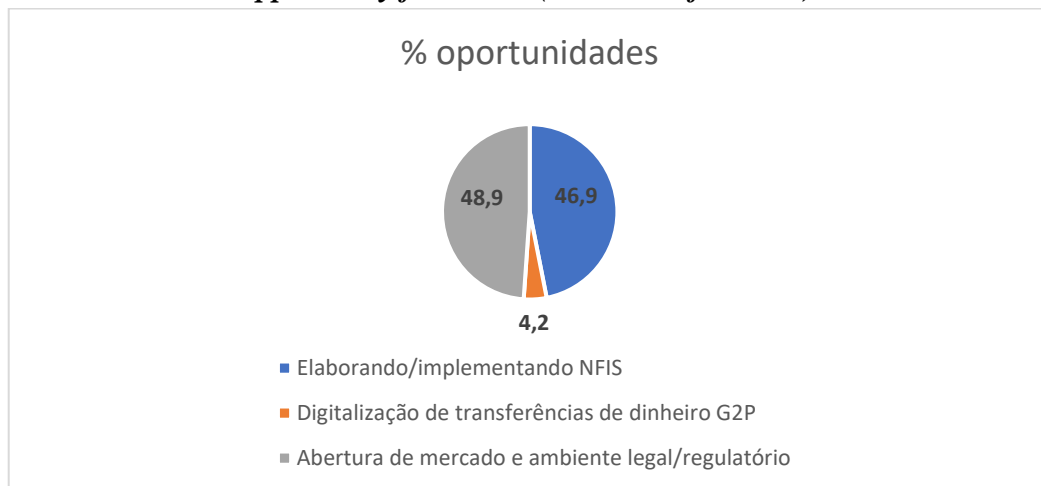


Note. Source: UFA – World Bank in: <https://ufa.worldbank.org/en/country-progress/brazil#1> (2020)

In terms of total opportunity (in percentages), the Bank Group's projected reach is based on engagement activities linked to project goals, restrictions on unbanked adults, and assignment of financial inclusion strategies.

This range, represented in Figure 2, was projected with 2020 as the final year, which was not updated until the completion of this research.

Figure 2
Projected reach in total opportunity for Brazil (calculated for 2020).



Note. Source: UFA – World Bank. <https://ufa.worldbank.org/en/country-progress/brazil#1> (2020).

However, the WBG notes that interventions cannot always be added together simply to create country opportunity, as the three may overlap. The analysis does not consider these overlaps for the Total Opportunity for each country – therefore it may be less than the sum of the 3 interventions alone.

It is worth mentioning that the projected reach of the WBG is based on engagement activities linked to project goals, restrictions on unbanked adults, and assignment of financial inclusion strategies (The World Bank, 2020).

In this way, it can be inferred from these data that a window of opportunity opens up for Brazil, in the perspective of promoting a broad digital banking system, adding instruments of financial inclusion, shopping and credit. With this purpose, Leismann and Carmona (2010) demonstrated the importance of microfinance in economic development and in the positive credit/GDP ratio of several countries, when used as an instrument to improve the income of the less privileged classes.

It is clear, therefore, that large-scale banking can represent a substantial gain in the growth and development of a country, both from the point of view of economic and social sustainability, especially if it is accompanied by digital technology, whose path is shown to be irreversible nowadays.

2.2 FINTECHS PHENOMENON

Fintechs have been receiving special attention from government and international authorities as an instrument to contain the crisis caused by the Coronavirus and economic recovery. In its Outlook for the Global Economy report, the World Bank Group (WBG) argues that, in the short term, policymakers can encourage the adoption and the accelerated development of fintechs in order to improve the secure delivery of money and payments to a broad group of vulnerable citizens and, as a result, help mitigate rising inequality (World Bank, 2021).

In the technological and functional aspect, they have become a powerful agent of transformation in the relationship of customers with traditional banks, whether as a means of exchange, credit or payments, by incorporating habits that change the dynamics, strategy and business model in the financial industry (World Bank, 2018; Melo, 2018; Bueno, 2019; Silva *et al.*, 2020). The evolution and consolidation of fintechs as digital and financial medium are contextualized in the following chapters.

2.2.1 Disruptive evolution

The disruption promoted by fintechs in the financial industry has revolutionized the way customers, innovation and entrepreneurial spirit are perceived by players in this market (Alt, Beck, & Smits, 2018). This transformation is shared by Sousa (2018) and Silva *et al.* (2020) by

showing that they represent a lasting and differentiated phenomenon in relation to the competition, and the external environment where they are inserted brings more opportunities than threats. Thus, its business model can be characterized as an ally for large corporations, not a competitor.

By analyzing, in five dimensions, the growth and impact of these startups on the economies of emerging countries, Barros (2020) found that they can bring growth and investments that generate cooperation with already consolidated banks, in addition to providing different, agile services with less bureaucracy. In the same perspective, Barreto *et al.* (2019) state that fintechs have revolutionized the banking system, by absorbing a large part of the public that yearns for technological innovations and agility in service. The market invasion they provoked forced traditional financial institutions to reinvent themselves to remain competitive.

This disruptive innovation, or the destruction of a conventional business model, is creative insofar as, in the perception of the customer and the market, it is a new technology that emerges like a wave, randomly and consciously empowering those who have the power of choice (Schumpeter, 1982). This process is part of what the eminent author would classify as an evolution of capitalism, in the sense that it alters its dynamics by the competitive force of competition.

However, like all technological innovations, fintechs need regulation to grow more freely and consolidate themselves as an instrument of effective innovation. This is what Silva *et al.* (2020) state, who identified the acceptance of large institutions in the application of their business model; however, they come up against regulatory and bureaucratic issues. The contextualization of this problem is the purpose of the next chapter.

2.2.2 Operation, Standardization and Regulation

It is up to the Central Bank of Brazil – BC to authorize, standardize and regulate fintechs in Brazil. The concept that the Bank attributes to them is that they are innovative companies that make intense use of technology, with the potential to create business models. These operate through online platforms and offer innovative digital services in the financial market (BC, 2021).

In Brazil, there are several categories of fintechs: credit, payment, financial management, loan, investment, financing, insurance, debt negotiation, foreign exchange, and multiservices. Two types of credit fintechs may be authorized to operate in the country: the Direct Credit Company (SCD) and the Peer-to-peer Lending (SEP). Both have the function of

intermediating creditors and debtors through negotiations carried out electronically. These operations must be included in the Central Bank's Credit Information System (BC, 2021).

To start their operations, fintechs that want to operate as SCD or SEP must request authorization from the Central Bank (BC). They have been regulated since April 2018 by the National Monetary Council (CMN), through Resolutions 4,656 and 4,657. In the operation authorization process, in addition to obtaining information about the owners, the BC needs to: prove the origin of the respective financial movement of the resources used in the enterprise by the controllers and verify if there is compatibility of the economic and financial capacity with the size, nature and the purpose of the enterprise (BC, 2021).

The business model of Direct Credit Company (SCD) is characterized by carrying out credit operations, through an electronic platform, with its own resources. That is, this type of institution cannot raise funds from the public (BC, 2021).

Customers must be selected based on consistent, verifiable and transparent criteria, covering relevant aspects for assessing credit risk, such as economic and financial situation, degree of indebtedness, ability to generate results or cash flows, punctuality and delays in payments, sector of economic activity and credit limit (BC, 2021).

In addition to carrying out credit operations, SCDs may provide the following services: credit analysis for third parties, collection of credit from third parties, distribution of insurance related to operations granted by them through an electronic platform and issuance of electronic money (BC, 2021).

SEP performs peer-to-peer credit operations, known in the market as peer-to-peer lending. In these electronic operations, fintech intervenes in the relationship between creditor and debtor, carrying out a classic financial intermediation operation, for which fees can be charged. Unlike the SCD, the SEP can raise funds from the public, as long as they are entirely and exclusively linked to the loan operation (BC, 2021).

In this case, the fintech acts only as an intermediary for contracts agreed upon creditors and borrowers. The resources are from third parties that only use the infrastructure provided by the SEP to connect creditor and borrower. In this type of operation, the exposure of a creditor, per SEP, must be a maximum of R\$ 15 thousand (BC, 2021).

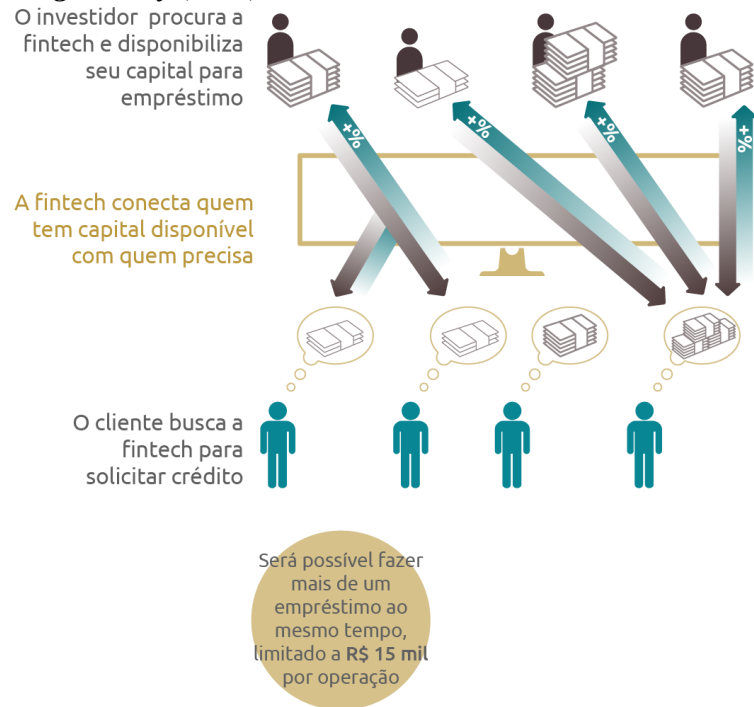
Additionally, SEP can provide other services such as credit analysis and collection for clients and third parties, and issuance of electronic money (BC, 2021).

Potential recipients of loans must be selected based on criteria such as economic and financial situation, level of indebtedness, sector of economic activity and punctuality or late payments, among others (BC, 2021).

Figure 3 summarizes the systematics of the SEP model, represented by direct loan operations between people mediated by electronic platforms, called peer-to-peer (P2P) in the international literature. P2P lending platforms promote direct connection between investors and borrowers through an organized, transparent and secure environment from a technological, legal and marketing point of view (BC, 2020).

Figure 3

Peer-to-peer Lending Society (SEP).



Note. Source: Banco Central do Brasil (Fintechs)³. <https://www.bcb.gov.br/estabilidadefinanceira/fintechs>.

According to BC (2021), the benefits of fintechs are:

- Increased efficiency and competition in the market of credit;
- Speed and efficiency in transactions;
- Less bureaucracy in accessing credit;
- Creation of conditions to reduce the cost of credit; and
- Innovation.

When it comes to regulation, there has been progress by the monetary authority towards standardizing and regulating the sector, in order to adapt its operation to the reality of the Brazilian market and guarantee a business environment with greater efficiency and security.

³ Translation: Investors look for a fintech and make their lending capital available. Fintech connects those with available capital and the ones who need it. The client looks for a fintech to ask for credit. It is possible to carry out more than one loan at the same time, but limited to R\$ 15,000 per operation.

Five standards were issued after the 2018 resolutions (see p. 12), to enable the authorization and operationalization processes of fintech platforms (BC, 2021).

These measures became necessary to keep up with the soaring growth of this market, which in 2020 grew by more than 34% compared to the previous year, reaching the number of 828 financial startups, and received US\$ 939 million in investments (Noomis, 2020). Therefore, the evolution of regulation follows rules that aim at the quantitative and qualitative growth of the segment through the coordinated action of public, private, and non-governmental entities. The integration of the diversity of objectives (profitability, sustainability, social, productive, and financial inclusion) is the challenge to be faced by normative improvement and institutional articulation (BCB, 2020). The potential of this market and its bankarization is discussed in item 2.4 - Banking Market Perspectives.

2.3 DIGITAL INCLUSION AND FINANCIAL SERVICES

In Brazil, the aforementioned growth was not accompanied by a public policy project or incentives by the government, as occurred in some countries such as India and South Africa, for example (Barros, 2020). It is worth mentioning the pioneering M-PESA in Kenya called “mobile money”, an SMS money transfer system that has included thousands of individuals and allowed them to deposit, send and withdraw funds using their cell phones (Jack & Suri, 2011).

However, the crisis caused by the Coronavirus pandemic forced the government to bank thousands of individuals to receive emergency aid and other benefits, such as the FGTS, through a digital application, CaixaTem, operated by Caixa Econômica Federal, one of the objects of this study.

This compulsory inclusion, in the order of 120 million accounts (CAIXA, 2020), gave the public bank – and consequently the government – the opportunity to establish a policy of inclusion and financial assistance never before seen in the country, combined with the fact that it was identified a population of 22 million people without access to benefits, due to the fact that they do not have a CPF, or have irregularities with the Federal Revenue Service of Brazil – RFB (RFB, 2020). This number is significant, bearing in mind that the government has defined the CPF as the main key for identifying citizens in all public policies (RFB, 2020).

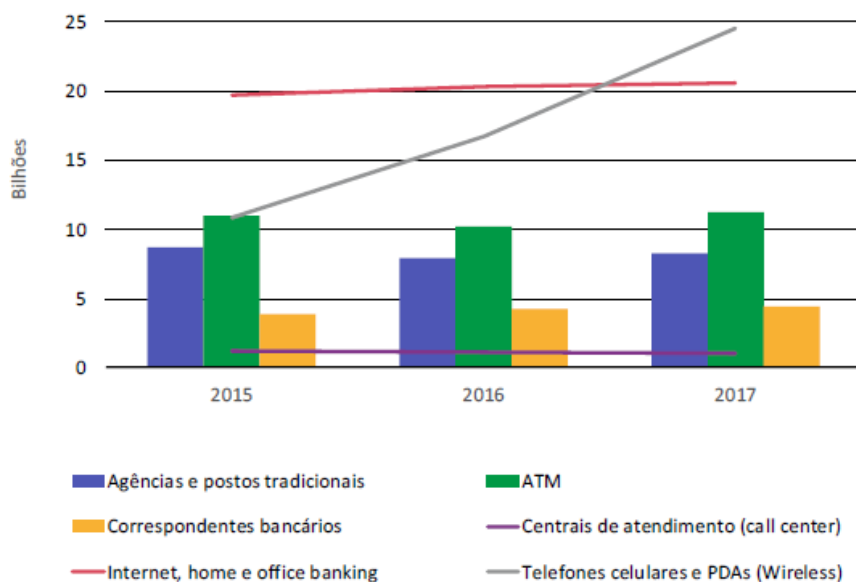
Some of this inclusive banking has already been addressed in item 2.1, on the perspective of an international body, the World Bank. At the domestic level, the Central Bank of Brazil – BCB, in its 2018 Financial Citizenship Report (with data from 2017), found that the percentage of the population with a banking relationship remained stable between 2015 and 2017, totaling 86.5% of Brazilian adults with a bank account. The number of people with credit

operations also remained stable, with a slight fluctuation from 45% to 44%, depending on the income range (BCB, 2018).

One of the means of measuring this inclusion is the number of transactions carried out in non-face-to-face channels, the so-called remote ones (home/office banking, call centers, smartphones and PDAs – Wi-Fi). There was a significant expansion from 2015 to 2017, and they now account for 66% of total transactions carried out. In this regard, operations via smartphone should be highlighted, which grows sharply, to the point of surpassing those carried out via computer (BCB, 2018).

Graph 1 shows the evolution of transactions via cell phones and PDAs (Wireless), in comparison with face-to-face and non-face-to-face channels:

Graph 1
Number of transactions in each access channel.



Note. Source: Banco Central do Brasil. Relatório de Cidadania Financeira, 2018. <https://www.bcb.gov.br/pt-br/#!/n/RELINCFIN> (2018).

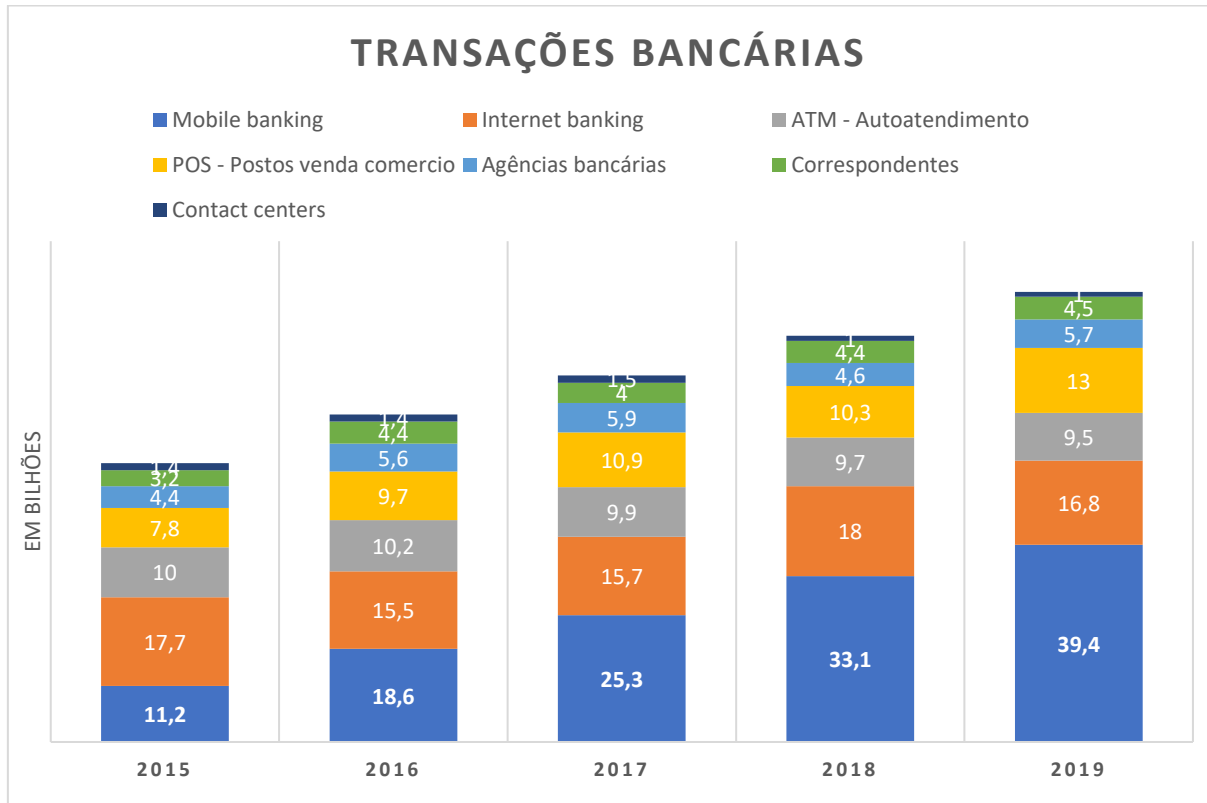
Despite the significant increase in transactions on digital channels, physical service is still responsible for most of these operations, accounting for 64% of the total (28% banking correspondents and 36% internet banking). Transactions via mobile phone, until 2017, accounted for 14%. However, in a survey conducted in 2020 by the company Deloitte, together with the Federation of Brazilian Banks – FEBRABAN, it was revealed that digital channels were responsible for 63% of transactions. Mobile banking (cell phones), alone, accounted for 44% of operations carried out across the country in the period (Deloitte, 2021).

The Deloitte-Febraban survey had the participation of 22 financial institutions, which represent 90% of the assets of this industry in Brazil. In addition, the study, already in its 28th

edition, presented two phases of data collection: a quantitative one, via a form, and a qualitative one, via in-depth interviews.

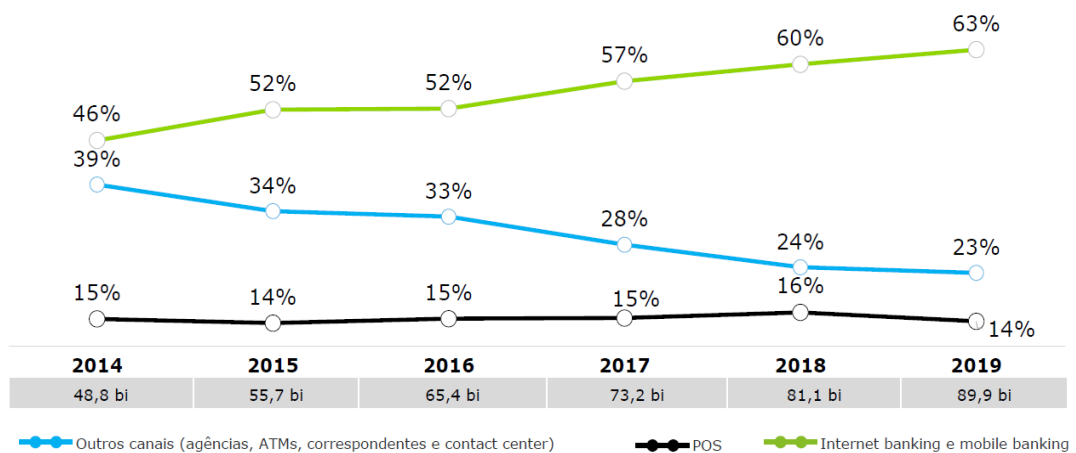
Therefore, a robust and consistent growth of this channel can be seen each year, which reached 30% from 2017 to 2019. This performance is accompanied by investments in technology by the banking sector, which grew 48% compared to the previous year, whose budget was R\$ 24.6 billion (Deloitte, 2021).

The bars shown in Graph 2 show the update of the 2020 Deloitte-Febraban survey. Out of a total of 89.9 billion operations in 2019, 39.4 billion (44%) were transactions made through mobile banking, which confirms the preference of the Brazilian consumer through this channel as a banking and financial means (Deloitte, 2021).

Graph 2**Evolution of the number of bank transactions from 2015 to 2019.**

Note. Source: Adapted from Deloitte (2021), FEBRABAN survey on banking technology 2020. <https://www2.deloitte.com/br/pt/pages/financial-services/articles/pesquisa-febraban-tecnologia-bancaria.html>

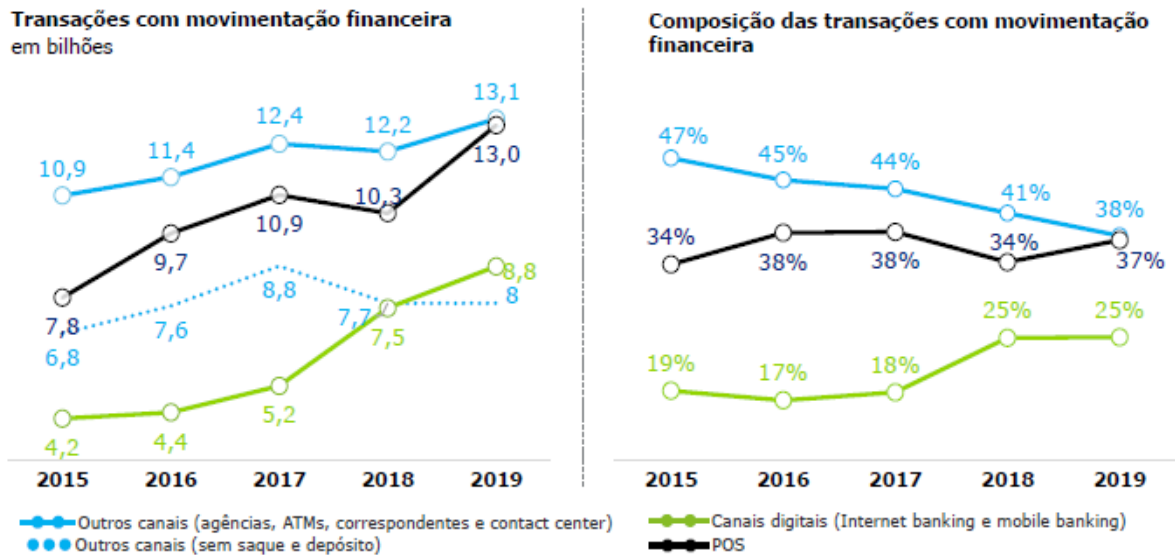
There is a tendency, therefore, for operations via mobile banking to soon represent half of bank transactions, since out of every ten transactions, more than six take place through digital means, as shown in Figure 4.

Figure 4**Composition of bank transactions by type of channel.**

Note. Source: Deloitte (2021). Pesquisa FEBRABAN de tecnologia bancária 2020.

When transactions with financial transactions are added in this context, there is a growth of digital channels compared to traditional ones, both in financial volume and in transactions, as shown in Figure 5:

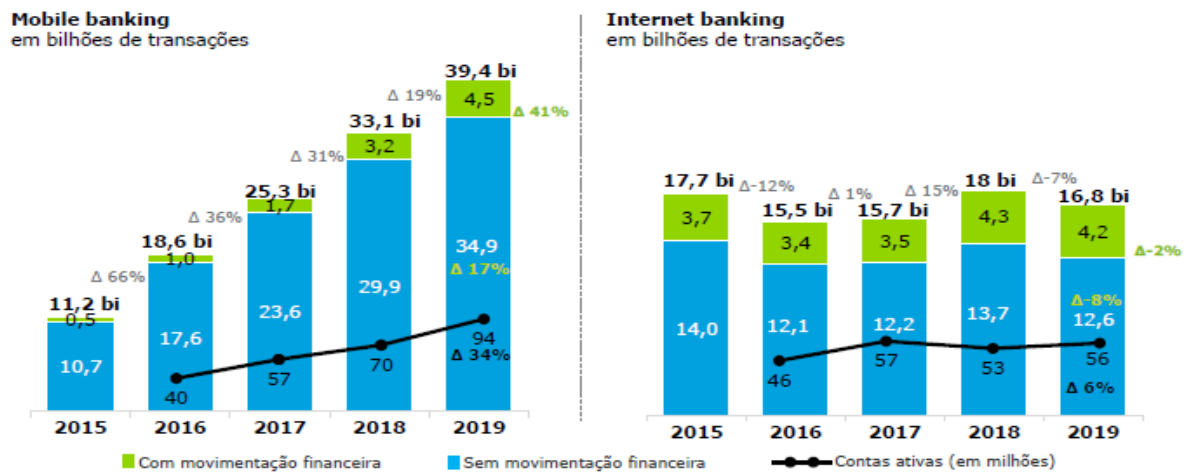
Figure 5
Transactions with financial movement in various channels.



Note. Source: Deloitte/FEBRABAN survey on banking technology 2020.

Given this, it is clear that there is a tendency for digital channels to catch up and even surpass traditional channels in terms of financial services. This prognosis can be confirmed when transactions with financial transactions between the two digital channels, mobile banking and Internet Banking (Figure 6) are analyzed, with emphasis on the first, which grew 41%, a percentage that probably increased in 2020 due to the coronavirus pandemic – Covid-19.

Figure 6
Comparison of mobile banking and Internet Banking financial transactions.



Note. Source: Deloitte/FEBRABAN survey on banking technology 2020 (Deloitte, 2021).

Bearing this in mind and given this context, an interesting window of opportunity opens up and a very attractive market niche for the public company to undertake, in the sense of absorbing this contingent and transforming them into digital customers. The scenario envisaged for this opportunity is contextualized in the following chapter.

2.4 BANKING MARKET PERSPECTIVES

The digital inclusion provided by the immense banking promoted by Caixa Econômica Federal brings in its scope the possibility of adding financial services, in addition to providing each citizen with notions of financial citizenship, especially in the low-income population, until then excluded from this process (BCB, 2018; Oliveira, 2018; Camelo, Mendes, & Leite, 2020).

The dilemma that arises in this context is how to reconcile this financial inclusion with the profitability required for the institution that, although it is an operator of public policies, must protect itself from possible losses. There is also an important fiscal factor for the government, which lies in the possibility of recovering part of the resources spent in the pandemic to provide emergency assistance to citizens through benefits. This possibility would become real with the migration of this numerous client portfolio to a digital platform in the form of a Bank, a large Fintech, which would be transformed into a subsidiary and then offered to the market for a possible sale.

In this context, there are some successful experiences in Brazil and in the world of inclusion and banking, in which institutions have preserved the profitability of operations and maintained their financial solvency, as reported in the works of Camelo, Mendes and Leite (2020) and Barros (2020). Mariz (2017), in his thesis, identified a significant characteristic of financial inclusion with a focus on credit and electronic payments: money held by families showed, surprisingly, a positive correlation with electronic means, which suggests distrust of consumers with the banking sector and, in turn, establishes a relationship with the degree of informality present in the economy.

This trend can be seen in the data presented in Figure 7, which shows the growth of Mobile Banking in all types of transactions in the 2018-19 comparison, with emphasis on deposit operations, insurance, and investments.

Figure 7
Comparison of transaction growth in digital channels 2018-2019 (in %).

Em milhões de transações	Mobile			Internet		
	2018	Δ	2019	2018	Δ	2019
Saldo e extratos	22.176	23%	27.331	5.571	-7%	5.195
Consulta de investimento	86	59%	137	22	98%	43
Contratação de investimento	16	114%	35	31	54%	48
Transferência / DOC / TED	894	43%	1.280	601	-7%	561
Contratação de crédito	359	47%	528	87	91%	166
Contratação de seguros	0,45	133%	1,0	0,4	359%	2,0
Depósito (cheque virtual)	1,8	327%	7,7	n.d.		n.d.
Pagamento de contas	1.625	39%	2.257	1.604	2%	1.630

Note. Source: Deloitte/FEBRABAN survey on banking technology 2020 (Deloitte, 2021).

Regarding microcredit, Pugeti (2014), when studying the operational sustainability of Brazilian institutions for this product, concluded that most of them are operationally sustainable, with emphasis on those with greater equity and that maintain some type of partnership with government institutions and public policies, such as Caixa Econômica Federal.

However, from the point of perspective of the consumers and economic well-being, some studies are contradictory and inconclusive, such as Lima (2017) and Ferreira (2018), who found, in the first, improvements in some segments, but those with extreme poverty, microcredit further aggravated the situation, promoting the inability to pay and the consequent indebtedness of families. In the second case, in which they studied the impact of microcredit on reducing poverty and social inequality, the authors concluded that, although a positive correlation was found between the volume of total credit granted and the employment and income index of the municipalities, the results of the econometric tests were inconclusive for microcredit as an effective tool in generating employment and income and in promoting financial inclusion.

One of the reasons for the frustration of these results may be the perception of risk by banking institutions, by raising interest rates for this segment due to the lack of guarantees, thus burdening operations (Lima, 2017).

In this regard, there is a challenge for the operating agents in the sense of serving these populations, considering that, although they are banking and making digital transactions, they are not being satisfactorily included in the access to microcredit. This fact has concerned the monetary authority, since the democratization of access to credit is one of the main objectives of the Central Bank of Brazil for the coming years (BCB, 2020).

In its 2020 special studies, aimed at micro-entrepreneurs and micro-enterprises benefiting from these operations, the Bank argues that this segment faces structural limitations in accessing the credit market due to the high information asymmetry between enterprises and financial institutions, the lack of guarantees and greater vulnerability, characteristic of microbusinesses.

However, the improvement of regulation, incorporating new technologies, can allow a significant reduction in the costs of microcredit operations, at their origins. The reduction in operating costs, combined with the development of the National System of Guarantees, encourage the expansion of the credit offer for micro-entrepreneurs and micro-enterprises, essential for the development of the segment, which represents most companies and houses the majority of jobs in the country (BCB, 2020).

One of the most important indicators to measure the success of these actions is the level of default, a behavioral factor that can also be contextualized for the low-income public. In this study, the BCB calculated the average default rate as a function of income in these two segments for two types of credit: the Broad Microcredit (MA), aimed at financing productive activities of natural or legal persons, and the Oriented Productive Microcredit (MPO), which is a form of credit directed by banks and Savings Banks, which must allocate part of the funds from demand deposits for such purpose.

The results, demonstrated in Table 01, reveal a relative stability of the default rate in most of the analyzed income ranges, although with a reduction in the lowest and highest range, leading to a drop in the average rate. There is a significant dispersion of this indicator between income groups, with the lowest income groups showing higher rates than the others, both for the MA and for the MPO. However, there was a significant reduction in the default rate in all income segments. In 2019, the default rate of MPO operations was lower than the average of the National Financial System - SFN in that year (3.0%). Such data suggest a better selection of borrowers by the financial institutions that grant the MPO and may indicate the effectiveness of the specific methodology required for this modality (BCB, 2020).

Table 1
MA and MPO average default rate

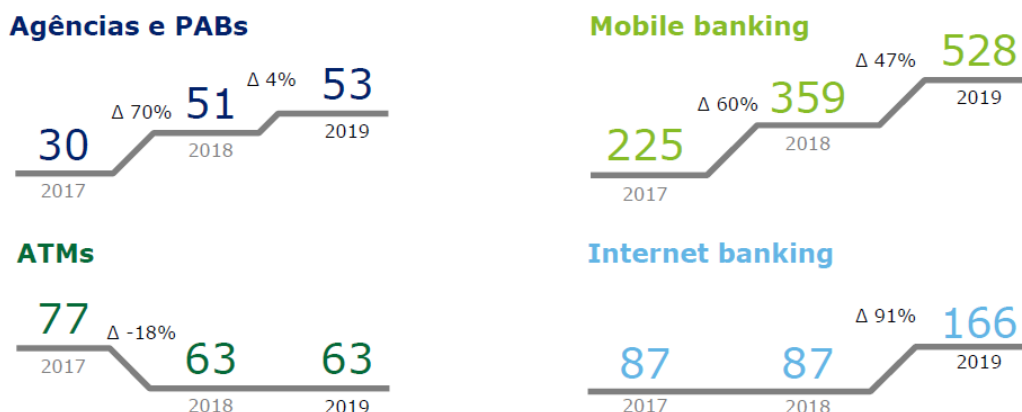
	Year	Below 01 MW	between 1 MW and 2 MW	between 2 MW and 3 MW	between 3 MW and 5 MW	between 5 MW and 10 MW	between 10 MW until the legal limit	Mean
Broad microcredit (MA)	2018	8,8	7,9	6,00	4,9	3,9	4,2	5,3
	2019	7,3	7,9	6,3	4,9	3,8	3,7	4,7
Oriented Productive Microcredit (MPO)	2017	7,9	6,1	5,3	4,7	4,5	3,8	5,4
	2018	5,1	4,4	3,5	2,7	2,4	2,6	3,3
	2019	4,9	3,9	2,9	2,3	1,9	1,9	2,8

Note. Source: Adapted from Special Study no.79/20 – BCB, 2020, p. 4 e 6.

The disadvantage of this methodology lies in the fact that the operational cost may increase at the origin and the follow-up of the operations. However, this cost can be reduced thanks to technological advances and digitalization in customer relationships, with a final positive effect on the financial result of institutions. Technology can also increase the quality of information about potential customers, expand access to technical assistance and financial education, preventing greater selectivity from occurring to the detriment of the most vulnerable strata (BCB, 2020).

In any case, the offer of credit contracts has been expanded in digital channels year after year, since 2017, in comparison with physical channels, which proves the advance of the digital relationship with the population, as shown in Figure 8.

Figure 8
Evolution of credit contracting in physical and digital channels (2017-2019).



Note. Source: Deloitte/FEBRABAN survey on banking technology 2020 (Deloitte, 2021).

The growth of digital technology in the hands of the population shown in Figure 8 is accompanied by the number of active accounts with mobile banking, which increased by 34% in 2019 and with the expansion of digital account openings, which obtained, from 2018 to 2019, a growth 66% in mobile banking and 121% in internet banking (Deloitte, 2021). What contributed to this digital advance, in addition to all the factors mentioned above, was Resolution No. 3919/2010 established by the Central Bank, which states that every Brazilian citizen has the right to open a current account at any bank with no fees. Thus, all national banks are required to make a current account available to individuals free of charge, which favored the emergence and growth of fintechs, consolidated in 2020 with the advent of the pandemic, whose impact will be addressed in the following chapter.

2.5 IMPACT OF COVID-19 ON DIGITAL TRANSACTIONS

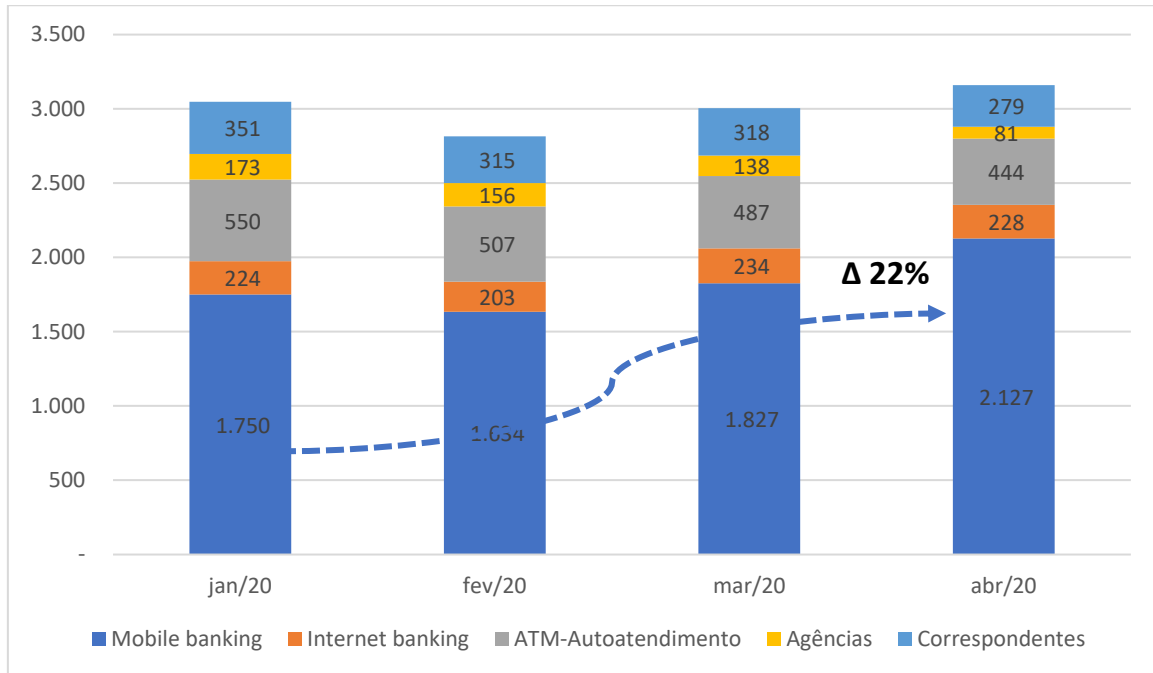
When Drucker (1995) stated that the biggest change in recent years in the area of innovation would be intentional, technically and socially organized, taught and learned, he certainly did not foresee that his theory would be confirmed by the behavioral and financial dynamics of individuals when subjected to adversities of a pandemic, such as Covid-19 in 2020.

The impact of the pandemic on people's behavior with regard to the way they relate to their finances through a digital medium and, at the same time, adopting measures to prevent contagion, was so significant that it raised this digital relationship to a new level. In a sample carried out with 16 banks, between January and April 2020, banking transactions carried out by

individuals on Mobile grew by 22%; Agencies fell 53%; and at ATMs the drop was 19%, as shown in Figure 9.

Figure 9

Transactions carried out by individuals (in millions).

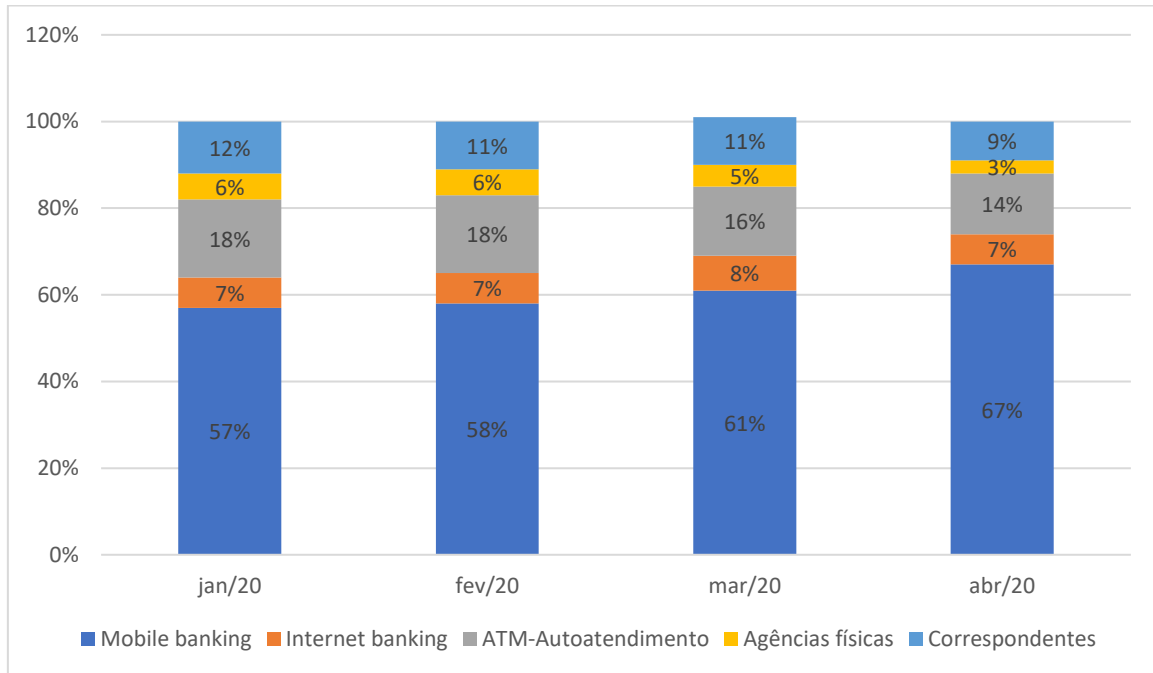


Note. Not all bank transactions were considered. Sum of the following: Balances, transfers, credit contracting, investment consultation, deposits, bill payments, withdrawals, mobile recharge.

Source: Deloitte/FEBRABAN survey on banking technology 2020 (Deloitte, 2021).

In the composition of transactions carried out by individuals, digital channels accounted for 74% of the total of 3.16 billion transactions surveyed in April 2020. Figure 10 also shows, in percentages, that the 10 p.p. compared to January was driven by Mobile Banking.

Figure 10
Breakdown in % of transactions carried out by individuals.



Note. Source: Deloitte/FEBRABAN survey on banking technology 2020 (Deloitte, 2021).

In this context, it was found that in digital channels the volume of transactions carried out by individuals grew 19% between January and April; in traditional channels there was a 25% drop in these operations. This shows a significant growth in digital transactions, with emphasis on financial transactions in Mobile Banking in the comparison between the monthly average of 2019 and April 2020, as illustrated in Figure 11.

Figure 11
2019-20 average monthly comparison of transactions on digital channels.

Mobile banking				Internet banking			
	Média mensal 2019	Δ	Abril 2020		Média mensal 2019	Δ	Abril 2020
Saldos e extratos	2.092	-19%	1.702	Saldos e extratos	164,2	-3 %	159,6
Transferências	91,8	24%	114	Transferências	11,0	49%	16,4
Contratação crédito	43,8	61%	70,7	Contratação crédito	13,3	1%	13,4
Consulta de investimento	10,4	105%	21,3	Consulta de investimento	2,3	48%	3,4
Pagamentos	155,1	33%	206,9	Pagamentos	29,7	-6%	28,0

Note. Source: Deloitte/FEBRABAN survey on banking technology 2020.

In fact, the data shown in Figures 9, 10 and 11 point to a trend that appears to be irreversible, which the restrictions imposed by the Covid-19 pandemic only anticipated.

2.6 2.6 UNIFIED THEORY OF TECHNOLOGY ACCEPTANCE AND USE – UTAUT

The UTAUT model has been one of the most used to measure the predisposition towards technology, as it best captures the beliefs, attitudes, and intentions to enable its adoption (Bernardi Jr., 2008). It is one of the most complete ones, since it encompasses several of its antecedent models, with the main factors of each one of them, in order to explain the acceptance and use of technology (Moreira, Chaves, & Bignetti, 2019).

Bhatiasevi (2016), in an empirical study on the application of the UTAUT model in Thailand, showed that the modeling result, through structural equations, presented a positive relationship with the factors performance expectation, social influence, perceived credibility, perceived convenience and behavioral intention to use mobile banking. The author also mentions that it is important for banks and mobile application developers to understand consumer behavior.

With regard to the precedents of the UTAUT model, Bhatiasevi (2016) argues that in recent decades many studies have prospered by providing theoretical frameworks and models on the acceptance of information technology (IT) and information systems (IS). Out of these, the Technology Acceptance Model (TAM) is the most common to describe individuals' acceptance of information systems, according to the study by Lee *et al.* (2003). Other consolidated predictive models are the Theory of Reasoned Action (TRA), the Theory of Planned Behavior (TPB), the Social Cognitive Theory (SCT) and the Extended Technology Acceptance Model (TAM2).

However, despite the TRA, TPB, SCT and TAM2 models significantly contributing to the adoption of IT, they have major weaknesses and limitations (Qingfei *et al.*, 2008), which were reviewed, integrated, and synthesized in a unified theoretical model, the UTAUT (Venkatesh *et al.*, 2003).

Figure 12 presents the definitions and theories used for each of the constructs applied in this study, based on the research by Moreira, Chaves and Bignetti (2019). These authors chose the constructs performance expectation, social influence, facilitating conditions, perceived credibility, perceived financial cost, and behavioral intention, as they were the ones that most influenced the adoption of technology, based on the studies by Venkatesh *et al.* (2003) and Yu (2012).

Figure 12
Definition of constructs and associated theories.

Construct	Definition	Base-theories	References
Performance expectation	Degree to which the individual believes that the use of technology will yield performance gains in their work.	Perceived Utility (TAM), Relative advantage (IDT), Extrinsic motivation (MM), Work adjustment (MPCU), Results expectation (SCT)	Venkatesh <i>et al.</i> (2003), Yu (2012)
Social influence	Degree of influence suffered by the individual through the opinions of people in his social life for the adoption of the new technology.	Subjective norm (TRA, TAM2, TPB, DTPB), Social Factors (MPCU), Image (IDT)	Venkatesh <i>et al.</i> (2003), Yu (2012)
Facilitating Conditions	Degree of belief about the existence of adequate organizational and technical infrastructure to support the use of technology.	Perceived behavioral control (TPB/DTPB), Facilitating Conditions (MPCU), Compatibility (IDT)	Venkatesh <i>et al.</i> (2003), Yu (2012)
Perceived Credibility	Individual security, risk, trust, and privacy concerns that may influence intent to use the technology.	-	Yu (2012)
Perceived Financial Cost	Refers to any financial cost incurred on the use of technology, such as: service fees charged by banks and basic fees for connecting to m-banking (wi-fi).	-	Yu (2012)
Behavioral Intention	Degree of influence that behavioral intention has on the behavior regarding technology use.	-	Venkatesh <i>et al.</i> (2003), Yu (2012)

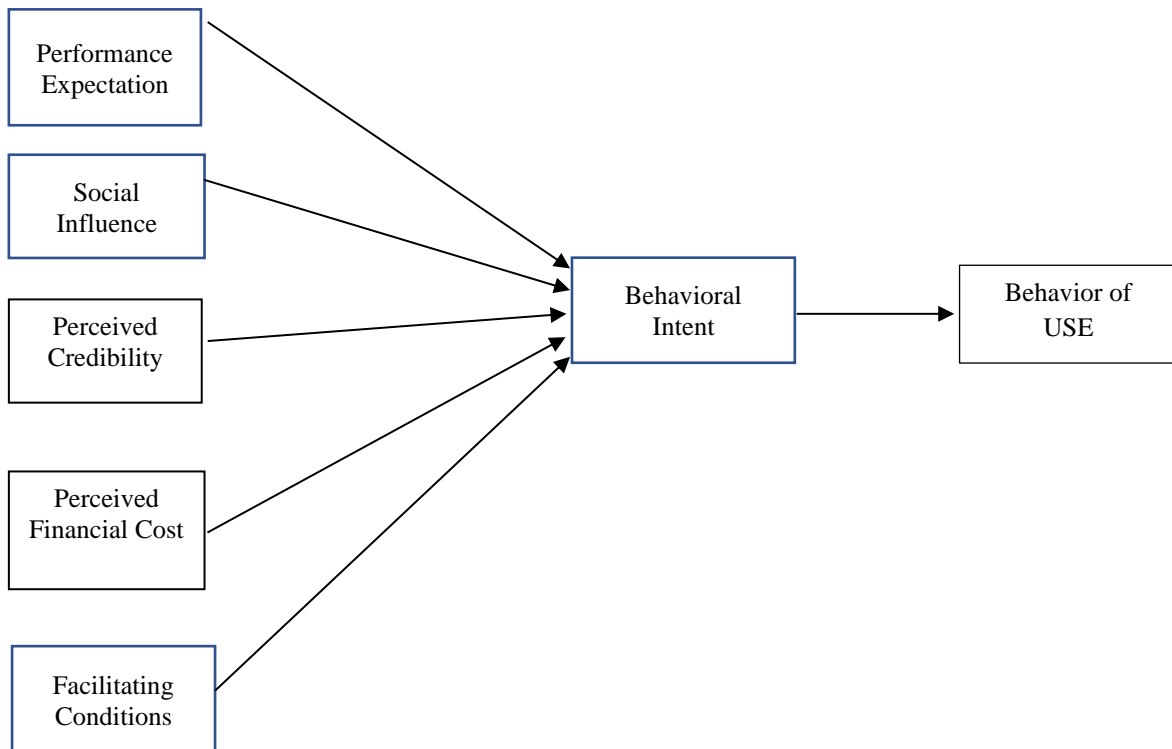
Note. Source: Moreira, Chaves, & Bignetti (2019).

Thus, the author of this work chose these two studies, Venkatesh *et al.* (2003) and Yu (2012) due to the fact that the first was the original model, which combined the other models and created the UTAUT; and the second, for being the most cited study (312 citations) focusing on the theory and theme (adoption of m-banking and the CaixaTem application) chosen for this research. It should be noted that in addition to the aforementioned constructs, Venkatesh *et al.* (2003) also proposed moderating effects, such as age, gender, experience and willingness to use. However, as the inclusion of these effects would make this study more complex, it was

decided to exclude them, without, however, affecting the objectives and the result of the present research.

Figure 13 graphically represents the (simplified) proposal of this study, after the contextual analysis on the acceptance and use of m-banking and the CaixaTem application, as well as the review of the UTAUT model employed.

Figure 13
Proposed structure of the research model.



Note. Source: Adapted from Moreira, Chaves & Bignetti (2019).

Based on this structure, hypotheses were formulated, and a methodology was designed in order to analyse, in a statistical and factorial way, the impacts that influence the adoption of m-banking and the CaixaTem application on the intention of use and on the behavior of users.

2.7 FORMULATION OF HYPOTHESES AND THEORETICAL BASIS

Relying on the analysis of the UTAUT model applied in the studies by Venkatesh *et al.* (2003), Yu (2012), Moreira, Chaves and Bignetti (2019), in addition to Ramos, Ferreira, Freitas and Rodrigues (2018) and Radnan and Purba (2016), the six hypotheses presented in Figure 14 were developed and represented graphically, in Figure 15. Each one of them is supported by the results found in these studies and were designed to investigate what are the factors that

influence the intention and behavior of using mobile banking and, in a complementary way, the frequency of use of the mobile banking CaixaTem app in the surveyed population, in relation to m-banking in general.

Figure 14

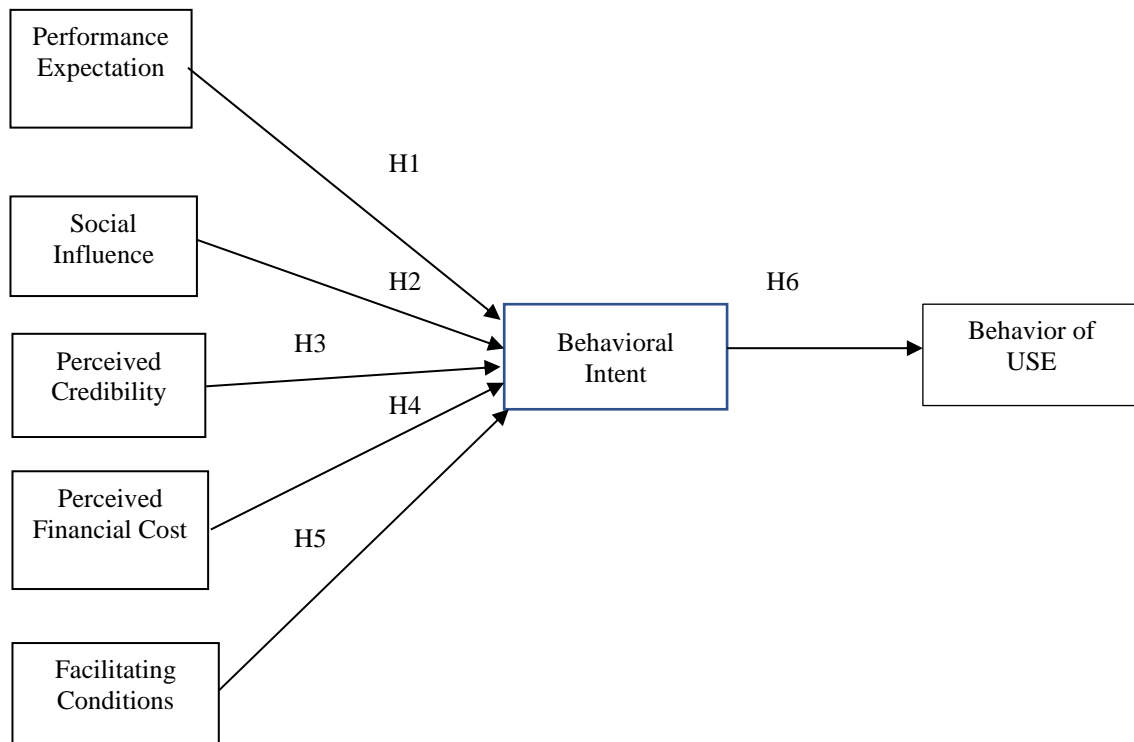
Hypotheses by Constructs.

Construct	Hypotheses
Performance Expectation	H ₁ : The performance expectation positively influences the intention to use the banking application.
Social Influence	H ₂ : Social Influence positively influences the intention to use the banking application.
Perceived Credibility	H ₃ : Perceived credibility positively influences the intention to use the banking application.
Perceived Financial Cost	H ₄ : The Perceived Financial Cost positively influences the intention to use the banking application.
Facilitating Conditions	H ₅ : The Facilitating Conditions positively influence the behavior of using the banking application.
Behavioral Intent	H ₆ : The Behavioral Intention positively influences the behavior of using the banking application.

Note. Source: Elaborated by the author (2022), adapted from Moreira, Chaves & Bignetti (2019).

Figure 15 graphically represents the hypotheses of this study, where each arrow (path) represents a hypothesis to be verified.

Figure 15
Graphical representation of hypothesis analysis.



Note. Source: Elaborated by the author (2022), adapted from Moreira, Chaves & Bignetti (2019).

Therefore, the proposal to revisit the UTAUT model and its theoretical basis in order to confirm them through the results found in this work, enabled the formulation of the hypotheses presented in Figures 14 and 15, where each arrow represents a hypothesis in the internal structure of model. In this sense, it is possible to enable the application of the model in both dimensions – banking application and CaixaTem – to understand its adoption and verify whether these hypotheses will be supported or not. This analysis is presented and discussed in Chapter 4, with the evaluation of measurement models and structural equations. The next chapter discusses the methodological matrix used in this research.

3 METODOLOGY

3.1 RESEARCH DESIGN

The characterization of the research is descriptive, exploratory and non-probabilistic, due to the random nature of its application, as well as convenience and judgment of the researcher (Moreira, Chaves, & Bignetti, 2019).

This work presents a quantitative method, by verifying the degree of factors that most impact bank customers in the adoption of m-banking and the CaixaTem application, with the use of statistics to quantify the collected data and analyze the understanding of the intentions and meanings of human actions when using technology (Denzin & Lincoln, 2011; Moreira, Chaves, & Bignetti, 2019).

With regard to the investigative method, a Survey-type research was applied in order to quantify the multiple-choice questions, carried out in person and addressed to the public at random. To ensure the validity of the questions and verify the assertiveness of the constructs selected in Figure 12, all items referring to the constructs were extracted from the study by Moreira, Chaves and Bignetti (2019), adapted after analyzing the works by Venkatesh *et al.* (2003) and Yu (2012).

The research instrument adopted was a questionnaire with 38 multiple-choice questions. The target population of the sample was 300 users of m-banking and CaixaTem, divided into two groups for the basis of evaluations and analyses, with the purpose of complying with the objectives of this work.

3.2 PRE-TEST

The sample tested by the questionnaire consisted of 33 respondents, eight of whom went with the author's relatives and the others at random, in front of the CAIXA branches and seven in a populous neighborhood of Cascavel/PR, where the largest target-public is located. The application of the questionnaire (Appendix A) took 2 days and was carried out on October 21st and 22nd, 2021.

After the survey, it was identified need to change the questionnaire, adjusting the order of the questions, ordinal and nominal, excluding some and including others, in order to obtain greater adherence to the specific objectives and adequacy to the applied method.

3.3 DATA COLLECTION AND TREATMENT

Data collection was carried out in person, through exploratory survey-type research, which is, according to Fontes and Poletto (2018), a type of research that captures data on a subject of collective interest, as it exists in the reality under study, for further analysis.

Three hundred respondents were interviewed, between December 15th 2021 and January 10th 2022, randomly approached in queues at bank branches, lottery shops, bus terminals and supermarkets downtown and in the Northern region of the city of Cascavel/PR. The questionnaire was applied with 38 multiple-choice questions, divided as follows: from 01 to 26 relating to the five-point Likert scale in the qualitative-ordinal format, which includes the option “totally disagree” at the lowest level and, at the highest level, , “totally agree” up to question 22, and the Likert frequency scale for questions 23 to 26 with the options “never/no” to “always”. The others deal with the banking, operational and financial preferences of the interviewees (27 to 32), with emphasis on question 31, which refers to the products offered.

Demographic and socioeconomic data are present in questions 33 to 38, in a nominal form, except for questions 34, 35 and 37, which deal with the variables of age, education and family income of respondents in ordinal format.

For reasons of space and formatting, the questionnaire is presented in Appendix A at the end of this work. This research instrument was designed and applied to a sample of 300 people. It should be mentioned that the term m-banking was changed into “banking application”, with the intention of adapting the questions in the questionnaire to the culture of the target audience, making it more understandable for them.

The field research had the help of a team from Instituto Sonda, a communication company from Cascavel/PR with experience in face-to-face research, composed of five people coordinated by the manager and under the supervision of the author (see item 3.3). Hiring was necessary to enable the work would be carried out in a timely manner and to ensure reliability and robustness in the collection and tabulation of data, in order to satisfactorily respond to the statistical criteria, tests and checklists, as recommended by Paschoarelli, Medola and Bonfim (2015).

Microsoft Excel 365, SPSS 22.0 statistical software and PLS 4 Regression (Partial Least Squares) – SEM (Structural Equation Modeling), or MEE – Structural Equation Modeling, were employed to process the data and prepare the analysis plan – also known as Partial Least Squares. The techniques used obeyed the following script: (i) Database tabulation and

codification; (ii) Statistical and descriptive analysis with determination of data set frequencies; (iii) Exploratory factor analysis; and (iv) Structural Equation Modeling.

3.4 DATA ANALYSIS PROCEDURES

Data analysis was structured in three steps after tabulating and coding the responses collected from SPSS into Excel, according to the nature of the variables, ordinal and nominal.

Initially, this was all submitted to descriptive statistics, with the extraction of frequencies and percentages, particularly for question 31, which deals with the offer of financial products provided by CaixaTem, which required coding, since it has multiple answers.

The ordinal questions, referring to questions 01 to 26, had their responses measured according to the five-point Likert scale, and then submitted to factor analysis and multiple regression by the PLS algorithm, with the purpose of adapting them to the UTAUT model and propositions of the goals. Questions 27 to 32 show the frequency of responses referring to the respondents' banking, operational and financial preferences, and questions 33 to 38 investigate the frequency of responses regarding the demographic and socioeconomic data from the 300 respondents.

To measure the reliability and validity of the two models, measurement and structural, Descriptive Statistics were applied, specifically the frequency distribution, the AFE – Exploratory Factor Analysis and the Structural Equation Modeling – MEE, whose theoretical basis was extracted from the studies in Hair *et al.* (2014) and Ringle, Da Silva and Bido (2014).

The following chapters discuss the analyzes and techniques used and the results found.

3.4.1 Descriptive Analysis

According to Nardino (2020, p. 2), “Descriptive Statistics aims to collect, organize, summarize, analyze, interpret and present a set of data in an appropriate way, allowing the researcher to carry out a quality analysis that allows the detection of trends associated with them and the standardization and comparisons with other results”.

For a better understanding of this work when it comes to following the proposed planning, only the frequency distribution was employed to support the validation of the model to be used in data processing: the absolute, number of occurrences of each element in the sample and the frequency relative, percentage referring to the absolute frequency. This technique was used in all questions, the results of which were fed into the software used in processing, both in the calculation of statistical and factorial indicators, in order to assert the research objectives.

It is important to be noted that other measures of position such as mode, median, etc. were not considered because they were not part of the planned scope. On the other hand, measures of dispersion such as variance, standard deviation, standard error, etc. are included in the software *Smart PLS-4*.

3.4.2 Exploratory Factor Analysis

Once the descriptive analysis is done, the next step is the AFE – Exploratory Factor Analysis, to analyze the correlations and causality of the set of data or variables, as it is necessary to know how many factors or constructs are needed to explain these intercorrelations and what these factors are measuring (Ringle, Da Silva, & Bido, 2014).

AFE is also used when there is the intention of working with variables that present, among themselves, relatively high correlation coefficients, in which an attempt is made to reduce a large number of variables to a smaller set. These variables are grouped by the correlation coefficient that captures the behavior of the original set and generates new variables called factors or constructs (Fávero & Belfiore, 2017).

The analysis was processed and measured by Smart PLS (version 4), an algorithm based on correlation, simple and multiple regression to estimate structural equation models (Ringle *et al.*, 2014). It is referenced by Hair, Risher, Sarstedt and Ringle (2019) as based on variance, since it accounts for the total variance and uses it to estimate the parameters.

The AFE was performed in groups to validate the measurement model and then individually, for questions regarding the CaixaTem application and mobile banking in general (Q23 to Q26), which followed a four-phase script: (i) verification of the convergent validity, represented by the average variance extracted (AVE), (ii) verification of the internal consistency, which encompasses the Reliability and Validity of the Constructs – CVC and Cronbach's Alpha, (iii) verification of the discriminant validity with the factorial and crossed loads and (iv) validation of the results according to the Fornell-Larcker criterion and the CVC.

3.4.3 Structural Equation Modeling

The growing use of MEE through SmartPLS has been an important differential point and its application has proven to be effective and robust in research models in the areas of social and behavioral sciences (Ringle *et al.*, 2014).

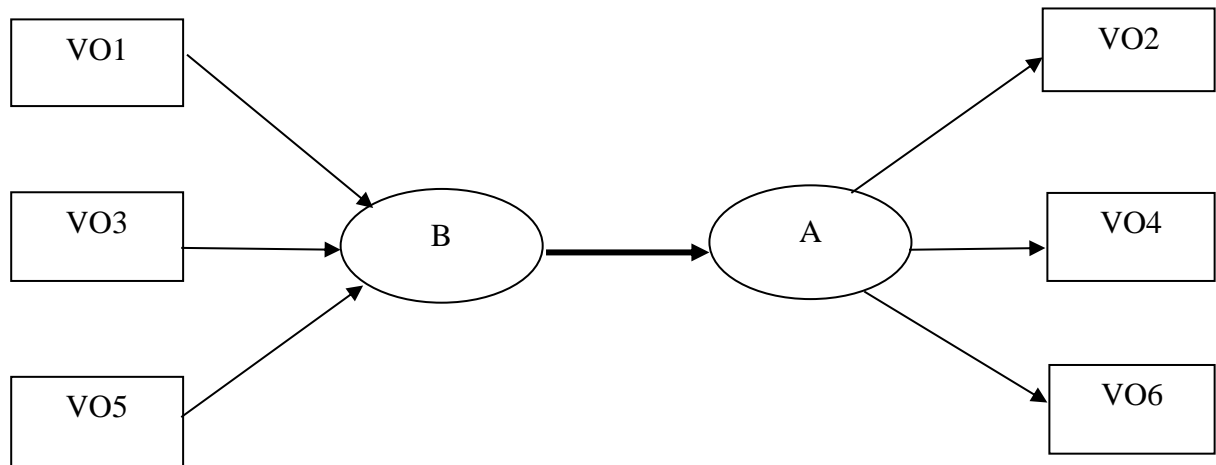
There are two types of models to be used in exploratory research, according to Ringle *et al.* (2014), such as the one performed in this work. The first, of structural equations based on

Covariance, called CB-SEM, is used in formative models that require little data or little explored data. The second, indicated for reflective models, has its structural equations based on Variance (VB-SEM) or, according to Hair *et al.* (2012), based on Partial Least Squares (PLS) fit estimation models, which is therefore the most recommended for this study.

The basic difference between them is in the form of data treatment. In the first case (CB-SEM) there are multiple linear regressions performed “at the same time” and, in the second one, the VB-SEM, the correlations among the constructs of their measured and/or observed variables are calculated, and then linear regressions are performed among the constructs of the structural model (Ringle *et al.*, 2014).

Thus, the most suitable application for this model is the PLS-SEM based on variance, executed by the SmartPLS 4 software, including for the development of the hypothesis test, discussed in chapter 2.7. Its execution involves the simultaneous evaluation of multiple variables, which are defined after the factorial analysis and their relationships, where the correlations among the constructs and their measured observed variables are calculated, and then the regressions among constructs can be performed (Hair Jr *et al.*, 2014; Ringle *et al.*, 2014).

Figure 16 exemplifies the structure of the two models in a different way, how they are integrated, and the symbology used in their development. The latent variables (LV) or Constructs are A and B, where A represents a reflective model and B, a formative one. VO are the observed variables. The arrow (highlighted) that connects the two constructs A and B determines the structural model, making it reflexive.

Figure 16*Hypothetical model of the two measurement models, interconnected*

Note. Source: Elaborated by the author (2022), adapted from Ringle *et al.* (2014).

Since PLS enables the structuring of the model – MEE, it is important that the reader becomes familiar with the symbology used and its meaning. Figure 17 shows the symbols used and their definition.

Figure 17*Symbols used in the model and their definitions*

SYMBOL	DEFINITION
	Construct or Latent Variable (VL)
	Observed or measured variable or indicator (VO)
	Correlation between LV and VO (measurement model)
	Causal Relationship - Path Coefficient between Independent LVs → Dependent (structural model)

Note. Source: Ringle *et al.* (2014).

The first step of implementing the PLS-SEM was the evaluation of the validity and reliability of the measurement model, through the analysis of the outputs generated from the Average Variance Extracted (AVE) and the internal consistency, represented by Cronbach's Alpha – AC and Reliability Composite – CC (Ringle *et al.*, 2014).

After validating the model, the general and structural fit of the model was evaluated using the Predictive Validity (Q^2) and Effect Size (f^2) indicators (Hair *et al.*, 2014; Ringle *et al.*, 2014), according to the defined criteria and parameters (see Chart 1) and the analysis of the Fornell-Larcker criterion and with the CVC – Reliability and Validity of Constructs, both in the grouped model and in the individual questions that relate CaixaTem to other applications, in the sense of confirming the assertion of the general adjustment and fulfilling objective three of this work.

The consistency of the structural model was attested by four indicators: (i) Strength and significance of the path coefficients using bootstrapping, (ii) Pearson's coefficients of determination (R^2), (iii) Cohen's indicator (f^2) or effect size; and (iv) Predictive relevance (validity) (Q^2).

Finally, in reference to the hypothesis test, to analyze the significance of the relationships among the constructs of the structural model and verify whether the hypotheses were supportable or not, the p-value and the structural coefficient were used, whose results are automatically generated by Smart PLS 4 through the bootstrapping tool, when conclusively running the model.

Chart 1 presents the indicators used in the analysis of the model, its purposes and the parameters/criteria expected in the two dimensions, measuring by AFE, and structural, by MEE, to be explained in the next chapter.

Chart 1

Indicators and parameters used for the AFE and general analysis/validation of the model

Indicator	Finality	Parameters/criteria	References
Average variances extracted (AVE)	Convergent Validities	Above 0.5	Hair <i>et al.</i> (2014)
Compound Reliability (CVC)	Model reliability/consistency	Above 0.7	Hair <i>et al.</i> (2014)
Cronbach's Alpha (AC)	Questionnaire and model reliability	Above 0.7	Hair <i>et al.</i> (2014)
Factor Loads	Correlations among the constructs; serves as a reference for determining the ideal AVE.	Between 0.6 and 0.7; desirable above 0.7	Hair <i>et al.</i> (2019); Ringle <i>et al.</i> (2014).
Cross Loads	Reference for discriminant validity and exclusion factor	Lower than the factorial loads	Hair <i>et al.</i> (2019); Ringle <i>et al.</i> (2014).

Fornell-Larcker Criterion	Discriminant Validity	The square roots of the AVE values of each construct are compared with the correlations (Pearson's) among the constructs (or latent variables). The square roots of the AVEs must be greater than the correlations of the constructs.	Fornell and Larcker (1981); Ringle <i>et al.</i> (2014).
Pearson's coefficients of determination (R^2)	Endogenous factor. Assesses how much of the variance of the main LV is explained by the other LV of the structural model.	$R^2 = 2\%$ explanation/small effect; $R^2 = 13\%$ medium effect; $R^2 = 26\%$ great effect	Cohen (1988)
Effect size (f^2) or Cohen's indicator.	Evaluates how much each construct is "useful" for model adjustment. Ratio between the explained and unexplained part of the model.	$(f^2) = 0.02$: small effect $(f^2) = 0.15$: medium effect $(f^2) = 0.35$: great effect	Hair <i>et al.</i> (2014)
Predictive relevance (Q^2) (Stone-Geisser indicator)	Evaluates the accuracy of the adjusted model, that is, it measures how much the adjusted paths correspond to the observed values.	$Q^2 > \text{zero}$	Hair <i>et al.</i> (2014)
Strength and significance of the structural path coefficients (Γ) and p-value of the model, by Bootstrapping	Assessment of causal relationships. Effect of one construct on the others (significance) and the sustainability of the hypotheses	Interpretation of values in the light of theory, with p-value of up to 0.05 of significance.	Hair <i>et al.</i> (2014) and Ringle <i>et al.</i> (2014).

Note. Ringle *et al.* (2014), adapted by the author (2022).

4 DESCRIPTION, ANALYSIS AND DISCUSSION OF THE RESULTS

This chapter presents the description and analysis of the results for later discussion. It was divided into five sections, each of which addresses the steps taken during the methodological research.

Initially, a descriptive analysis of the profile and characterization of the research participants is carried out, with the tables of the statistical results generated. Next, a descriptive analysis of the research assertions regarding the empirical evidence in relation to the theory is carried out. Subsequently, the exploratory factor analysis and the results of the two models, measurement and structural, are presented. Then, the results regarding the hypotheses proposed from the Structural Equation Modeling are shown.

Finally, the results are discussed.

4.1 PROFILE AND CHARACTERIZATION OF INTERVIEWEES

As described in section 3.3, the treatment of the sample was segmented by class of questions, to satisfy the objectives of this work and facilitate the analysis of the model proposed in the methodology. This section addresses the profile and characteristics of respondents with regard to socioeconomic and demographic data.

Thus, descriptive statistics, SPSS and Excel were used as instruments to enable the results.

Table 02 comprises the frequency of responses to the demographic and socioeconomic data of the 300 respondents (Q33 to 38), whose results will be analyzed for the purpose of calculating the CaixaTem user profile and business potential.

Table 2
Demographic and socioeconomic profile of respondents (N=300).

Q33		Masculine	Feminine	Others		
What is your gender?	Frequency	149	150	1		
	Proportion %	49.7%	50.0%	0.3%		
Q34		Under 18 years-old	19 - 30 years-old	31 - 50 years-old	51- 65 years-old	Above 65 years-old
What is your age?	Frequency	16	115	114	42	13
	Proportion %	5,3%	38,3%	38,0%	14,0%	4,30%

Q35		Up to complete or incomplete elementary school (1 st to 9 th grade)	High School – Complete or Incomplete	College degree – Complete or Incomplete	Graduate degree		
What's your education level?	Frequency	75	178	43	4		
	Proportion %	25,0%	59,3%	14,3%	1,30%		
Q36		I'm employed	Self-employed	Informal business	Public servant	I'm unemployed	Others
Do you perform any professional (economic) activity?	Frequency	144	54	12	10	21	59
	Proportion %	48,0%	18,0%	4,0%	3,30%	7,0%	19,7%
Q37		Up to 1 Minimum Wage (R\$ 1,100.00)	from 1 to 3 MW (between R\$1,100 and 3,300.00)	from 3 to 6 MW (between R\$ 3,300 and 6,600.00)	from 6 to 9 MW (between R\$ 6,600 and 9,900.00)	from 9 to 12 MW (between R\$ 9,900 and 13,200.00)	Above 12 MW (above R\$ 13,200.00)
What is the range of the SUM of MONTHLY FAMILY INCOME (Everyone who lives in your house?)	Frequency	59	162	57	16	5	1
	Proportion %	19.7%	54.0%	19.0%	5.3%	1.7%	0.3%
Q38		Single	Married	Widowed	Separated	Divorced	Other
What is your marital status?	Frequency	130	116	13	18	14	9
	Proportion %	43.3%	38.7%	4.3%	6.0%	4.7%	3.0%

Note. Data from SPSS adapted by the author (2022).

This Table shows predominance of the age group between 19 and 50 years-old, which together reached 76.30%, and the low level of education of the respondents, with 84.3% of the total in the range of complete or incomplete high school. This percentage coincides with data from PNAD – ongoing 2019 (IBGE, 2020), which recorded a level of education of 78.50% in the same ranges, including people with no formal education at all.

Regarding the work force and occupation, almost half of the respondents (48.0%) declared themselves to be employed, compared to 7.0% of the unemployed. On the other hand,

one point that draws attention is the contingent of autonomous workers, in informality and in the condition of others, which together represented 41.7% of the total, including the so-called “invisible” one and those who transit in the “day job economy” (Vaclavik, Oltramari, & Oliveira, 2022), not included in the regulated market.

Data from the report “Auxílio Emergencial e o Futuro dos Invisíveis”, published by researchers from the Getúlio Vargas Foundation – FGV, show that out of the 68 million people who received emergency aid, 38 million were outside the Single Register, that is, without receiving any type of social benefit.

In terms of income, there is a predominance of people earning 1 to 3 minimum wages, with more than half of the sample, 54%, followed by the range of up to 1 salary and between 3 and 6, according to the ongoing PNAD survey (IBGE) published in 2021, which found that the average real income from all sources changed from R\$ 2,292.00 in 2019 to R\$ 2,213.00 in 2020, with the Southeast, where it is located a fraction of the target population of this study, presenting the value of R\$ 2,575.00 (IBGE, 2020).

4.2 DESCRIPTIVE ANALYSIS

In this section, the statistical data generated by SPSS are analyzed, based on the frequency distribution, aiming at the fulfillment of specific objectives 1 and 3 of this work. This stage aims, according to Fávero and Belfiore (2017), to synthesize the characteristics observed in a set through tables allowing a better understanding of the behavior of the data.

Table 03 shows the number of frequencies of responses from the 300 respondents, referring to questions 01 to 22 related to UTAUT (5-point Likert format), measured by absolute frequency (Fabs) and its proportion (F%). The constructed scale ranges from DT = Strongly Disagree to CT = Strongly Agree. NN indicates neutrality, neither agree nor disagree, and DP and CP partially disagree and partially agree, respectively.

Table 3
Descriptive statistics of frequencies, referring to the UTAUT model (N=300).

Q	UTAUT Model	DT		DP		NN		CP		CT	
		Fabs	F%	Fabs	F%	Fabs	F%	Fabs	F%	Fabs	F%
Q1	Using the banking app improves/would improve my performance when dealing with banking business	37	12.3%	16	5.3%	19	6.3%	58	19.3%	170	56.7%
Q2	Using the banking app is timing saving for me	26	8.7%	8	0.7%	16	5.3%	57	19%	193	64.3%
Q3	I use/would use the banking app anywhere	26	8.7%	11	3.7%	20	6.7%	69	23%	174	58%

Q4	I consider the banking app useful	19	6.3%	11	3.7%	14	4.7%	42	14%	214	71.3%
Q5	People who are important to me think I should use a banking app.	13	4.3%	13	4.3%	28	9.3%	79	26.3%	167	55.7%
Q6	Most people around me use a banking app	14	4.7%	19	6.3%	19	6.3%	68	22.7%	180	60%
Q7	Using a banking app means I have a higher social status than those who don't	125	41.7%	22	7.3%	26	8.7%	31	10.3%	96	32%
Q8	I believe my information is/would be kept confidential	32	10.7%	31	10.3%	34	11.3%	82	27.3%	121	40.3%
Q9	I believe my transactions are/would be protected	29	9.7%	31	10.3%	29	9.7%	91	30.3%	120	40%
Q10	I believe my privacy will not/would not be disclosed	28	9.3%	31	10.3%	38	12.7%	86	28.7%	117	39%
Q11	I believe the virtual banking environment is safe	34	11.3%	31	10.3%	37	12.3%	86	28.7%	112	37.3%
Q12	The financial cost of using the <i>Banking App</i> is lower than the cost of other banking channels	20	6.7%	14	4.7%	38	12.7%	58	19.3%	170	56.7%
Q13	The financial cost of using the <i>Banking App</i> is higher than the cost of other banking channels	152	50.7%	34	11.3%	53	17.7%	40	13.3%	21	7%
Q14	Banking App expenses are high for me	172	57.3%	27	9%	38	12.7%	33	11%	30	10%
Q15	I have/would have the necessary resources to use the Banking App	21	7%	11	3.7%	7	2.3%	55	18.3%	206	68.7%
Q16	I have/would have the necessary knowledge to use the Banking Application	27	9%	20	6.7%	12	4%	56	18.7%	185	61.7%
Q17	All contents of the Banking App are easy to read and to understand	24	8%	20	6.7%	19	6.3%	72	24%	165	55%
Q18	A bank employee is/would be available when I have/would have a problem using the Banking App	41	13.7%	13	4.3%	27	9%	50	6.7%	169	56.3%
Q19	I prefer/would prefer to use the Banking App	34	11.3%	13	4.3%	24	8%	50	16.7%	179	59.7%
Q20	I intend to use the Banking App	27	9%	13	4.3%	21	7%	48	16%	191	63.7%
Q21	I'd rather go to a bank agency	103	34.3%	36	12%	39	13%	41	13.7%	81	27%
Q22	I'd rather go to a lottery	107	35.7%	34	1.3%	60	20%	29	9.7%	70	23.3%

Note. Data from SPSS adapted by the author (2022)

These results, as well as those in Table 04, are discussed in section 4.3, which deals with the model's AFE.

Table 04 presents the results of questions 23 to 26, on the Likert frequency scale, in which it compares the use of m-banking and CaixaTem and establishes a gradation in the answers of the interviewees that vary between "never or not", until always". Questions 25 and 26 had only four alternatives, which is why they are absent in the table.

Table 4

Descriptive statistics of frequency of use of m-banking and CaixaTem (N=300).

Frequency scale	Never/No		Rarely/Once		Occasionally/ more than once		Frequently		Always	
	Fabs	F%	Fabs	F%	Fabs	F%	Fabs	F%	Fabs	F%
Q23 How often do you use a banking app?	61	0.3%	54	18%	27	9%	74	4.7%	84	28%
Q24 How often do you use the CAIXATem applicative?	157	2.3%	75	25%	29	9.7%	23	7.7%	16	5.3%
Q25 Have you been making payments using CAIXATem regularly?	216	72%	37	12.3%	36	12%	11	3.7%	-	-
Q26 Have you been making transfers through CAIXATem regularly?	219	73%	31	10.3%	32	10.7%	18	6%	-	-

Note. Data from SPSS adapted by the author (2022).

Table 05 presents the frequencies of the respondents' banking preferences regarding question 27. Next, in Table 06, their operational and financial preferences (Q28 to Q32), except for Q31, whose questions were contextualized according to the lived reality by the author, as a professional of the institution and acting in the service to the target public.

Table 5
Respondents' banking preferences (N=300).

Q27	Banco do Brasil	Caixa	Bradesco	Itaú	Santander	Sicredi	Nubank	Other	None	
Which of the following operations do you perform MOST when using the Banking App?	Frequency	24	105	31	36	22	23	29	20	10
	Proportion %	8.0%	35.0%	10.3%	12.0%	7.3%	7.7%	9.7%	6.7%	3.3%

Note. Data from SPSS adapted by the author (2022).

Table 6
Respondents' operational and financial preferences (N=300).

Q28	Which of the following operations do you perform MOST when using the Banking App?	Payments (slips, bills, credit card)	Money transferences and PIX	Financial applications	Purchasing products, such as credit cards, insurance, capitalization title etc	I do not perform operations when using the app	
		Frequency	69	170	1	1	59
		Proportion %	23.0%	56.7%	0.3%	0.3%	19.7%
Q29	Did you know that in addition to Emergency Aid and FGTS, CAIXATem can be used as a bank account and receive other credits?	NÃO	SIM				
		Frequency	143	157			
		Proportion %	47.3%	52.3%			
Q30	Have you already registered with CAIXATem to receive credits?	Yes. and I am using it	I have downloaded. but haven't registered	I haven't downloaded CaixaTem	I don't know how to do it		
		Frequency	98	36	133	33	
		Proportion %	32.7%	12.0%	44.3%	11.0%	
Q32	Shopping	Paying bills. late or not	Personal use	I would use it for my business/commercial activity	Pay debts and clear my name		

If you were given a loan, where would you use the money as a priority?	Frequency	25	63	93	70	49
	Proportion %	8.3%	21.0%	31.0%	23.3%	16.30%

Note. Data from SPSS adapted by the author (2022).

The customer's preference for CAIXA as their bank with the greatest relationship appears clearly in question 27, with more than 1/3 of respondents confirming that it is the bank with the greatest turnover, followed by Itaú and Bradesco. With this, CAIXA's popularity as a commercial and social bank and its diversification in terms of service, at the different levels of customer needs, can be measured.

In question 28, the preference for PIX as a means of payment by respondents is evident, with 56.7% of operations, followed by various payments from concessionaires and slips. As this survey predates the consolidation of the PIX in the Brazilian banking system, it is likely that today this number has increased. It is worth noting the importance of the PIX as an instrument of technological innovation and financial inclusion for the low-income population, a fact verified by the study by Rimonato and Santos (2021), who concluded that the democratization of financial systems to promote social development and economical took its first steps with PIX, which is already a reality as a digital means of payment.

Question 29 addresses the use of CaixaTem not only to receive government benefits, but also to use it as a bank account with free movement, in view of the experience lived by the author in the consultations, in which this fact was verified. It was noticed that the proportion between YES and NO are equivalent, with a greater preference for the YES answer, but this number may have been increased due to the increase in the user base and the possibility of obtaining loans. This can be evidenced by the gap presented in question 30, in which 44.3% of users had not downloaded the application, despite having their bank accounts.

Question 32 reveals the respondent's preference for personal shopping (31%) to the detriment of using credit to pay bills, overdue or not (21.0%), and the payment of late debts (16.30%). This reflects an anomaly with regard to the rational use of money by the interviewees, in which the propensity for indebtedness is greater than the risk perception of defaulting and having a restricted name, especially in a scenario of high family indebtedness, today in 79.3%, especially those with low income (Agência Brasil, 2022).

Another result that draws attention is the vocation for entrepreneurship of this contingent, represented by 23.3% of the total, when answering they would use resources for investment in their business or in their commercial activity.

Question 31, presented in Table 07, addresses the frequency of a range of products to be offered by CaixaTem according to the preference of the public interviewed.

Because it was a multiple-response question, it had to be coded when transferred from SPSS to Excel, which followed an acceptance criteria of codes 0=NO and 1=YES. The results were 100% validated to the contingent of 300 respondents.

Table 7
Possibility of purchasing the products offered by CaixaTem.

		Frequency	Percentage (%)
Loans at low installments and low interest	NO	176	58.7
	YES	124	41.3
Life insurance	NO	251	83.7
	YES	49	16.3
House insurance	NO	279	93.0
	YES	21	16.3
Credit card	NO	124	41.3
	YES	176	58.7
Capitalization title	NO	293	97.7
	YES	7	2.3
Overdraft (Revolving Credit)	NO	293	97.7
	YES	7	2.3
Total		300	100

Note. Data from SPSS adapted by the author (2022).

It should be noted that the items Capitalization title and Overdraft (Revolving Credit) obtained the same frequencies and percentages, with a wide choice of NO. It should be noted that Vehicle Insurance was not included in the questionnaire because it is not currently part of CAIXA's portfolio, as a priority with regard to sales or expansion of the product.

It is noticed that all the products offered were significantly rejected, apart from the credit card, which indicates a tendency towards shopping by the interviewees. With good acceptance,

but insufficient, the loan with low interest and installments appears, which may represent the lack of purchasing power of this population for some personal or professional projects.

When it comes to Insurance, its low adherence is in line with what Lucena (2022, p. 8) found in her study, in which she says that “the insurance market in Brazil reflects the reality of the current scenario, especially in terms of respect to regulation, lack of publicity and low cultural habit of Brazilians related to life insurance, resulting in a market still unsatisfactory, when compared to other countries”.

4.3 EXPLORATORY FACTOR ANALYSIS

This stage is dedicated to the construction of the measurement and structural model of the set, that is, the execution of the AFE with the PLS-SEM, in which the correlations in all blocks of the model are processed and analyzed. For this, the data resulting from Tables 3 and 4 were used, in order to verify the validity of the UTAUT model and comply with the general and specific objectives of this work.

In this item, two phases are analyzed, the measurement model and the structural model in an assertive way, that is, one completes the other for the general validation of the model and the confirmation or not of the hypotheses listed in section 2.7.

4.3.1 Measurement Model Analysis

Hair *et al.* (2014) emphasizes the importance of this analysis, which is the test of reliability and validity of the model through its measurement, carried out from the indices of convergent validity, confidence in internal consistency and discriminant validity, which followed the script: (i) verification of the Reliability and Validity of the Constructs – CVC, which includes the AVE, Cronbach's Alpha and the Composite Reliability; (ii) verification of the discriminant validity with the factorial and crossed loads; (iii) confirmation of the results according to the Fornell-Larcker and the CVC and the validation of the model by the significance of the p-value.

The first step was to assemble the graphical structure of the correlations of the constructs from the UTAUT model, idealized in Figure 14, section 2.6, separating the latent variables – VL (or constructs) respectively into 3rd, 2nd and 1st orders. In turn, the questions connected to them are called Observed Variables – VO (Hair *et al.* 2019).

Each construct, formed by the observed variables, received an acronym for differentiation within the set, according to the sequence of the questionnaire applied (see Figure

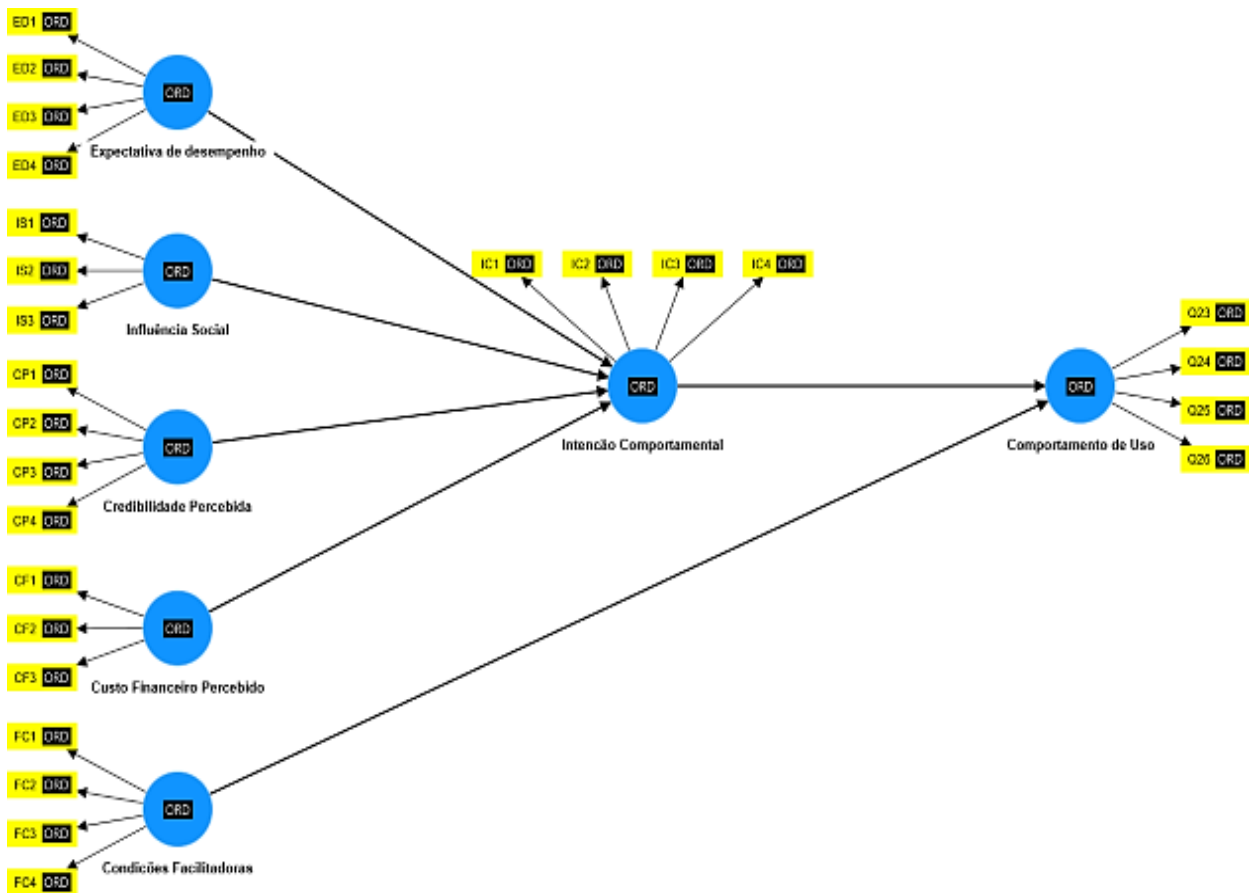
16) from “banking matters” question 01 to 04, that is, ED = Expectation of performance, IS = Social Influence (5 to 7), CP = Perceived Credibility (8 to 11), CF = Financial Cost (12 to 14), FC = Facilitating Conditions (15 to 18), these are 1st order; and IC = Intention Behavioral (19 to 22) of 2nd order that, at the end of the measurement, they determine the reliability and validity of the main construct of 1st order, the Behavior of Use.

In order to validate the whole set and establish the correlation between them, questions 23 to 26 were added to the behavior of use, which measures the intensity of the frequency of use in the two applications, m-banking and CaixaTem, in order to give meaning to the specific objectives of this study. Explaining in a mathematical way, the LVs behavioral intention and behavior of use are the dependent reflexive variables and the others, formative, are the independent variables (Bido, 2022).

Figure 18 graphically presents the initial structure of the model, as described previously.

Figure 18

Initial model structure, correlations among constructs.



Note. Source: Data from *SmartPLS 4* adapted by the author (2022).

After feeding the constructs with the frequencies of each question, the factorial construction of the model was started, individually and grouped, which obeyed the following

methodology, having as reference the variable behavior of use and the questions related to it: a) grouped measurement, in an assertive way (as shown in Figure 16), to confirm the results of the individual measurements; b) individual measurement of the structure with questions 23, 24, 25 and 26; c) adjustment of the parameters of the variables according to the criteria of discriminant validity, CVC and Fornell-Larcker, with the exclusion of questions that did not meet the model; and d) grouped measurement after the adjustments, with the final results to be discussed together with the hypothesis testing, in the modeling of structural equations.

First, it is important to explain the systematic adopted in the analysis, for a better understanding of the use of the criteria, listed in Chart 1. As it is a reflective model, that is, the latent variables manifest or are reflected in the observed ones and the set is encoded in the same direction, the relationship between them becomes positive (Hair, Sarstedt, Hopkins, & Kuppelwieser, 2014). Thus, it is possible to analyze the set in an integrated manner, considering the three indicators of the measurement model: the Average Variance Extracted – AVE, the internal consistency represented by the composite reliability (CC) and Cronbach's Alpha (AC) and, finally, the Discriminant Validity (VD) represented by the factorial and crossed loads and the Fornell-Larcker criterion.

Regarding AVE, the index result must be greater than 0.50. It may happen that, when running the model, variables with smaller values are found. To solve this and increase the AVE, the variables observed with a lower factorial load must be excluded one by one and the model run after each exclusion.

In measuring internal consistency, Cronbach's alpha is a traditional indicator responsible for intercorrelations between variables. It is a statistical tool that quantifies, on a scale from 0 to 1, the reliability of a questionnaire, with the minimum acceptable value to consider a reliable questionnaire is 0.7 (Hair *et al.*, 2014).

It happens that CA rivals with Composite Reliability because it is very sensitive to the number of variables observable in each construct, so much so that authors such as Hair *et al.* (2019) and Bido (2022) consider it ideal to use Composite Reliability (CC) and reject Cronbach's Alpha (AC) in exploratory research.

Thus, these authors consider that the appropriate values to validate the internal consistency of the model would be in a range between 0.60 and 0.70. However, to ensure consistency safely, they suggest a $CC > 0.7$.

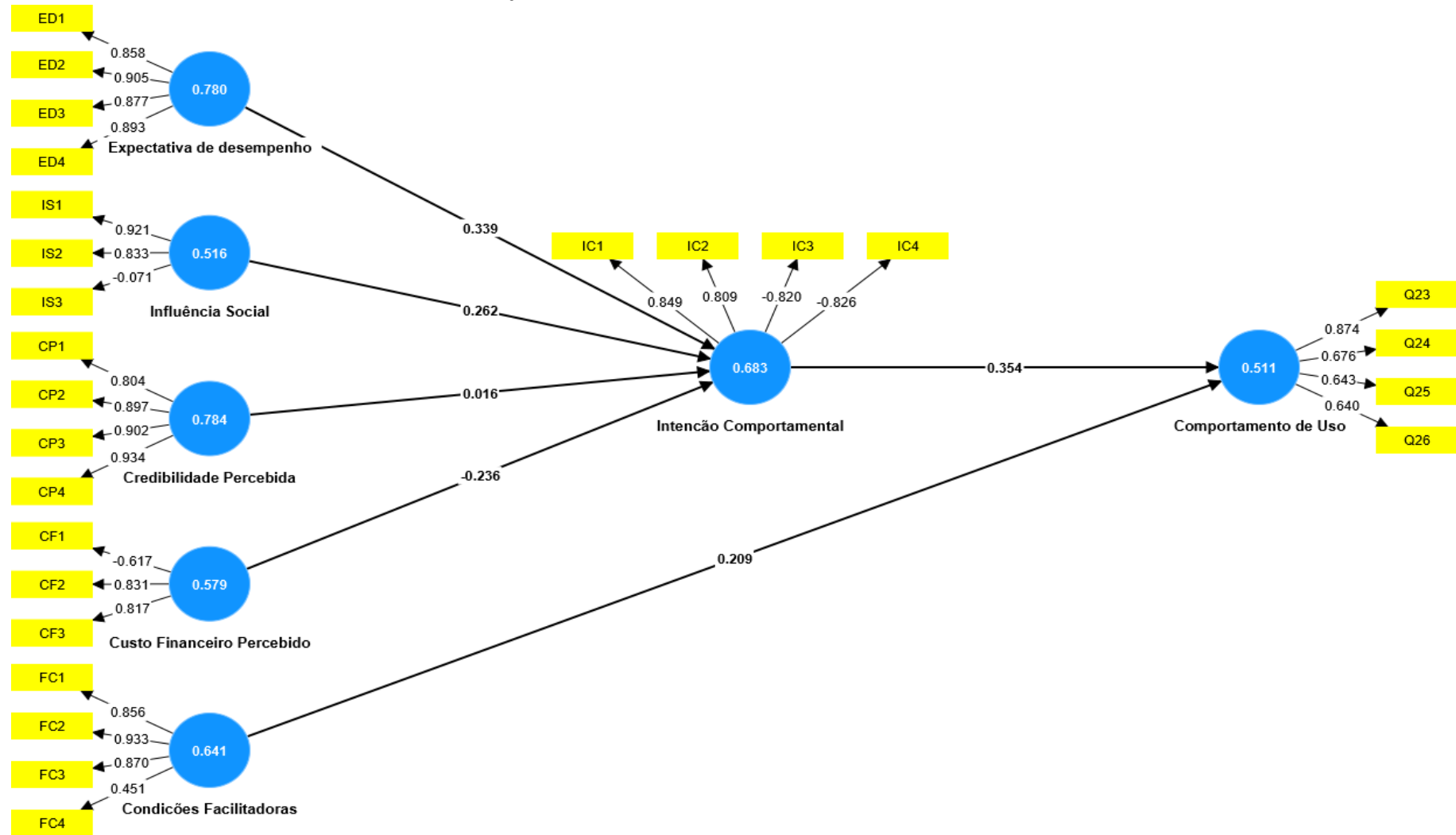
The Discriminant Validity, according to Hair *et al.* (2014), aims to empirically measure the construct to make it unique and true and to differentiate it from the others, due to its ability to capture phenomena not understood by others in the proposed model.

The Fornell-Larcker criterion compares the correlations among the constructs with the square root of the AVE, and *there will be* (author's emphasis) discriminant validity if the correlations between the latent variables are lower than the square root of the AVE. Cross loadings are used to ensure that the highest factor loadings (between 0.6 and 0.7) of the constructs are preserved and the lowest ones removed, both in the row and in the column, in order to guarantee the reliability of the model before and after adjustments.

Figure 19 graphically illustrates the results of the first output generated with the complete structural model and its factor loadings. The first analysis to be carried out in the measurement model is whether the loads and the AVE are within the parameters predicted for each construct, that is, whether there is optimization (maximization) of the observed variables in relation to the average variance extracted. It is represented by the correlations (loads) that are among the constructs and the variables observed in the external part of the model. This is what can be called, according to Hair *et al.* (2014), convergent validity. The values obtained from the AVEs are within the circles.

Figure 19

Measurement model with correlated indicators, factor loads and AVEs.



Note. Data from *SmartPLS 4* adapted by the author (2022).

In Table 08, the correlations between latent and observed variables resulting from the output of Figure 18 are quantified, according to the parameters presented in section 3.4.2, Chart 1, with regard to CVC and Cronbach's Alpha.

Table 8

Reliability and validity of constructs in measuring the model.

	Cronbach Alpha	Composed reliability	AVE – average variance extracted
Behavior of Use	0.779	0.804	0.511
Facilitating Conditions	0.797	0.871	0.641
Perceived Credibility	0.914	0.935	0.784
Perceived Financial Cost	0.145	0.457	0.579
Performance Expectation	0.906	0.934	0.780
Social Influence	0.468	0.661	0.516
Behavioral Intent	-0.226	0.000	0.683

Note. Data from *SmartPLS 4* adapted by the author (2022).

It is verified at first, by the AVE criterion (>0.50), which the extracted variances satisfy. However, there is a need to adjust the composite reliability and Cronbach's Alpha in the constructs Perceived Financial Cost, Social Influence and Behavioral Intention, whose indicators were lower than 0.7. This is done by proceeding with the discriminant validity, initially with the analysis of cross loads and then with the Fornell-Larcker criterion and the CVC, according to the parameters explained in Table 1, Chapter 3.4.2.

Table 09 shows the results of the cross-loads of all correlations, of the seven model constructs. The analysis is carried out by comparing the cross loads between them with those of all the others in vertical and horizontal ways, that is, analyzing their strength in relation to the defined parameters and in relation to the indicators of the other constructs.

It can be seen that most of them meet the criteria, except for facilitating conditions, perceived financial cost, social influence and behavioral intention, which showed loads below the parameters in addition to negative loads. This is solved by means of a technical adjustment in the loads CF1, IS3, IC3 and IC4, inverting the signals due to the negative processing by the PSL. The loads that were below the parameters, FC4 and IS3, must be excluded after being subjected to the crossing by laterality and verticality, as there are loads greater than them.

Table 9
Model cross loadings and adjustment/exclusion factors.

	Behavioral use	Facilitating Conditions	Perceived Credibility	Perceived Financial Cost	Performance Expectation	Social Influence	Behavioral Intent
CF1	0.256	0.411	0.244	-0.617	0.361	0.152	0.293
CF2	-0.128	-0.148	0.034	0.831	-0.233	-0.196	-0.362
CF3	-0.119	-0.163	0.046	0.817	-0.155	-0.219	-0.273
CP1	0.156	0.248	0.804	0.011	0.139	0.080	0.056
CP2	0.190	0.262	0.897	-0.090	0.252	0.151	0.107
CP3	0.092	0.232	0.902	-0.059	0.201	0.111	0.121
CP4	0.190	0.337	0.934	-0.064	0.275	0.129	0.195
ED1	0.467	0.414	0.187	-0.298	0.858	0.315	0.486
ED2	0.384	0.402	0.263	-0.321	0.905	0.302	0.412
ED3	0.415	0.406	0.220	-0.272	0.877	0.352	0.471
ED4	0.342	0.355	0.258	-0.275	0.893	0.277	0.437
FC1	0.331	0.856	0.260	-0.315	0.394	0.418	0.450
FC2	0.376	0.933	0.259	-0.256	0.381	0.368	0.508
FC3	0.358	0.870	0.278	-0.289	0.348	0.299	0.473
FC4	0.149	0.451	0.230	-0.068	0.370	0.083	0.180
IC1	0.393	0.521	0.211	-0.261	0.490	0.382	0.849
IC2	0.404	0.502	0.188	-0.292	0.460	0.382	0.809
IC3	-0.356	-0.347	-0.025	0.410	-0.357	-0.361	-0.820
IC4	-0.381	-0.369	-0.080	0.415	-0.384	-0.340	-0.826
IS1	0.277	0.391	0.187	-0.216	0.383	0.921	0.449
IS2	0.210	0.285	0.056	-0.182	0.236	0.833	0.288
IS3	-0.045	-0.004	0.103	0.168	0.066	-0.071	-0.090
Q23	0.874	0.448	0.104	-0.290	0.511	0.268	0.540
Q24	0.676	0.127	0.166	-0.001	0.148	0.203	0.135
Q25	0.643	0.162	0.204	-0.016	0.185	0.136	0.150
Q26	0.640	0.113	0.163	-0.051	0.161	0.164	0.138

Nota. Data from SmartPLS 4 adapted by the author (2022)

The next step is to determine the discriminant validity (DV) by applying the Fornell-Larcker criteria and the CVC, to validate the measurement model after analyzing the cross-loads. The function of discriminant validity is to analyze whether the latent variables (constructs) are independent of each other (Hair *et al.*, 2014; Ringle *et al.*, 2014), in which the Fornell-Larcker criterion is used to compare the roots squared values of the AVEs of each construct with the correlations (from Pearson) among the constructs, so that the square root values of the AVEs are greater than the correlations among the constructs (Fornell & Larcker, 1981; Ringle *et al.*, 2014). Table 10 presents this comparison, with the values highlighted diagonally, along with the CVC and its indicators.

Table 10
Discriminant validity by Fornell-Larcker and CVC criteria.

Fornell-larcker Criterion							
	Behavior of Use	Facilitating Conditions	Perceived Credibility	Perceived Financial Cost	Performance Expectation	Social Influence	Behavioral Intent
Behavior of Use	0.715						
Facilitating Conditions	0.396	0.800					
Perceived Credibility	0.179	0.314	0.885				
Perceived Financial Cost	-0.218	-0.310	-0.066	0.761			
Performance Expectation	0.458	0.448	0.261	-0.330	0.883		
Social Influence	0.286	0.391	0.137	-0.249	0.355	0.718	
Behavioral Intent	0.465	0.529	0.156	-0.414	0.514	0.443	0.826
Reliability and validity of constructs							
<i>Cronbach's alpha</i>	0.779	0.797	0.914	0.145	0.906	0.468	-0.226
<i>Composite reliability</i>	0.804	0.871	0.935	0.457	0.934	0.661	0.000
<i>Average variance extracted (AVE)</i>	0.511	0.641	0.784	0.579	0.780	0.516	0.683

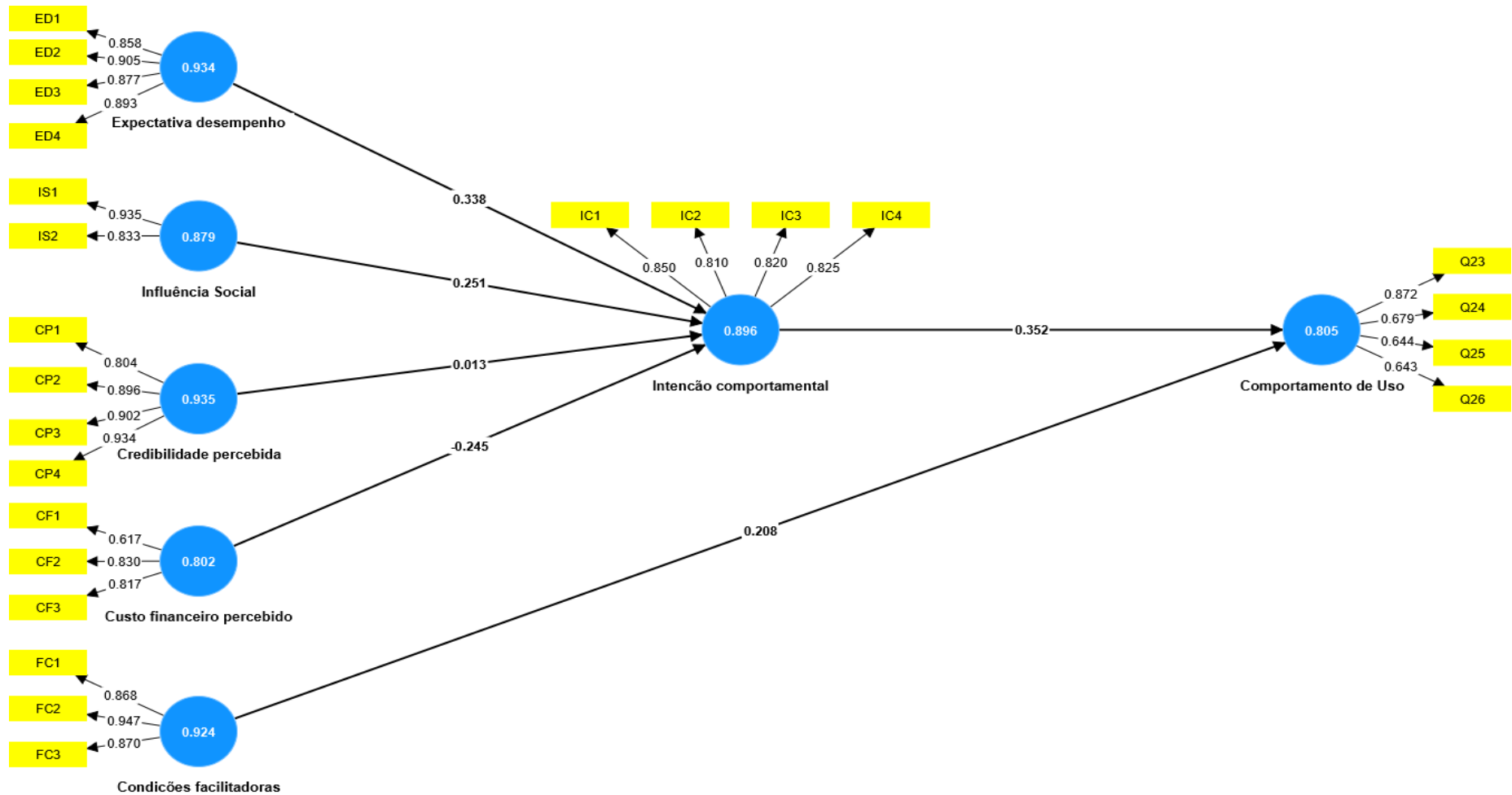
Note. Data from *SmartPLS 4* adapted by the author (2022).

When interpreting Table 10, it is demonstrated that the values (highlighted) of the Fornell-Larcker diagonals – square roots of the AVEs – are actually greater than all the values of the correlations of the constructs that are not within it, a fact that validates the measurement model. In evaluating the CVC, the low values obtained in the composite reliability (Composite reliability) of the constructs perceived financial cost, social influence and behavioral intention confirm the inversion of signs and the exclusions suggested in the analysis of Table 08, given that the indicators are below 0.7, as well as Cronbach's Alpha values for these constructs, although it is not relevant for structural model validation (Hair *et al.*, 2019).

Figure 20 shows the graphic model after the adjustments, this time with the composite reliability values within the constructs. It is observed that there has been significant improvement in the parameters, mainly in the perceived financial cost and in the behavioral intention.

It is also possible to observe that in the “key construct” of the model, which is the behavior of use (1st order latent variable), the highest load (0.872), that corresponds to question 23 (frequency of use of m-banking), is much higher than the others, from CaixaTem. This suggests an advantage in using applications (digital banks) from other institutions, implying that CaixaTem may be underutilized.

Figure 20
Measurement model after adjustments.



Note. Source: Data from SmartPLS 4 adapted by the author (2022).

Table 11 summarizes the discriminant validity after adjustments, considering the Fornell-Larcker criterion and the new CVC parameters, including a significant improvement in Cronbach's Alpha values in the constructs perceived financial cost, social influence, and behavioral intention.

Table 11

Discriminant validity of the measurement model after adjustments.

Fornell-larcker Criterion							
	Behavior of Use	Facilitating Conditions	Perceived Credibility	Perceived Financial Cost	Performance Expectation	Social Influence	Behavioral Intent
Behavior of Use	0.716						
Facilitating Conditions	0.396	0.896					
Perceived Credibility	0.179	0.297	0.885				
Perceived Financial Cost	-0.217	-0.319	-0.066	0.761			
Performance Expectation	0.457	0.417	0.261	-0.330	0.883		
Social Influence	0.280	0.398	0.151	-0.226	0.364	0.886	
Behavioral Intent	0.463	0.533	0.156	-0.414	0.514	0.431	0.826
Reliability and validity of constructs							
Cronbach's alpha X	0.779	0.876	0.914	0.626	0.906	0.736	0.845
Composite reliability	0.805	0.924	0.935	0.802	0.934	0.879	0.896
Average variance extracted (AVE)	0.512	0.802	0.784	0.579	0.780	0.784	0.683

Note. Data from *SmartPLS 4* adapted by the author (2022).

Another important indicator in the measurement stage is the p-value of the latent variables and their significance up to 0.05, as shown in Table 12. It is possible to generally verify the significance of the entire set ($p < 0.05$), confirming the validity of the model.

Table 12
P-value of the measurement model constructs.

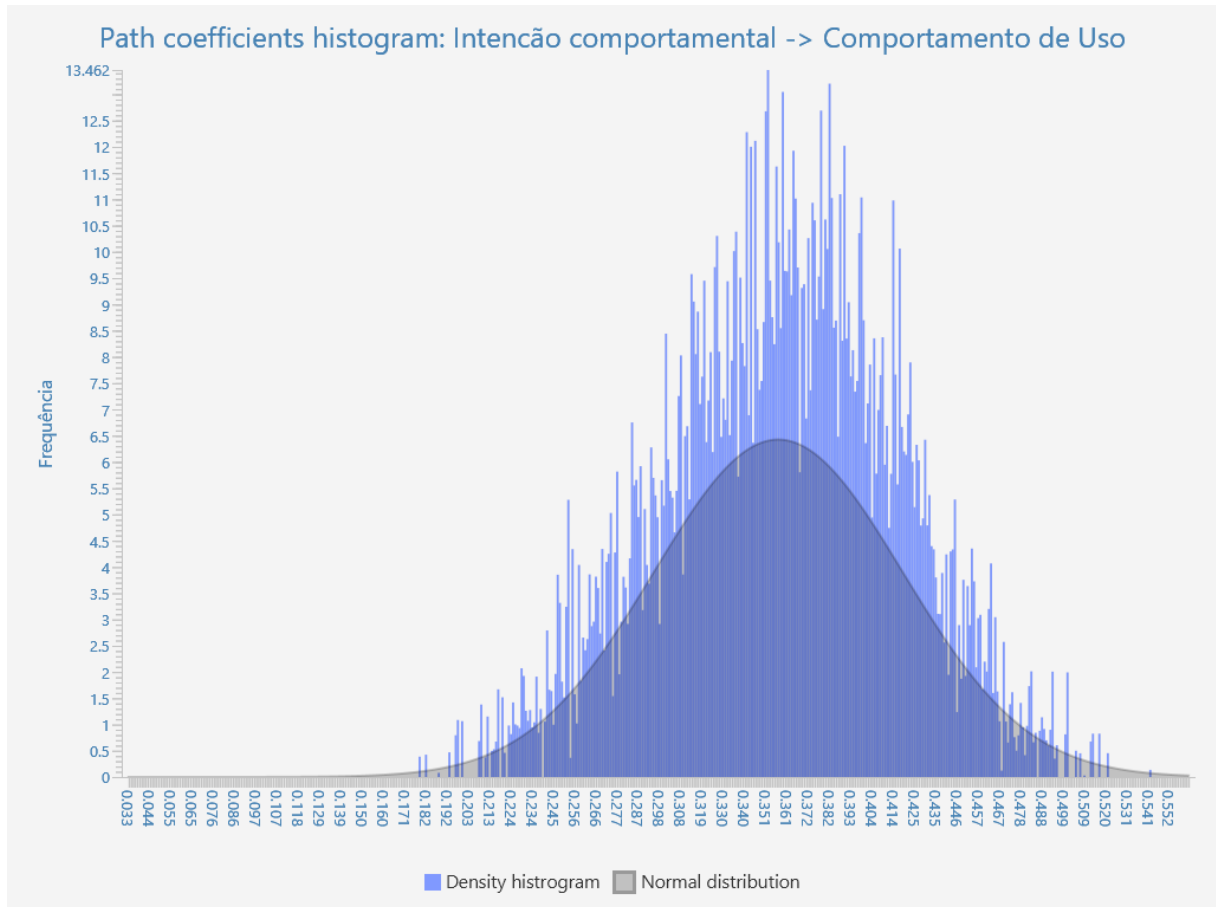
Variável Latente	P - Value
Behavior of Use	0.000
Facilitating Conditions	0.000
Perceived Credibility	0.000
Perceived Financial Cost	0.000
Performance Expectation	0.000
Social Influence	0.000
Performance Expectation	0.000

Note. Data from *SmartPLS 4* adapted by the author (2022).

Another factor that confirms the quality and validity of the measurement model can be obtained from the histogram of correlations, through bootstrapping, a tool for analyzing path coefficients and their effects on correlations (Hair *et al.*, 2014; Bido, 2022).

These histograms are considered prerequisites for the realization of the structural model, as it eliminates the possibility of having bi-modality in the graphs, due to measurement errors due to the introduction of binary variables or other statistical errors (Bido, 2022). Figure 21 exemplifies, on behalf of all those were validated, the histogram of the correlation of the variables behavioral intention and behavior of use.

Figure 21
Correlation histogram and path validation between two constructs.



Note. Source: Graph from *SmartPLS 4 – Bootstrapping* (2022).

Once the evaluation stage of the measurement model has been overcome, the next step is the analysis of the structural model, which is the verification of its internal validation based on the (endogenous) relationship of the constructs, with the analysis and interpretation of the effects, prediction and of the path coefficients and the significance of these relationships. This analysis works to carry out the hypothesis test (see section 2.7), in order to confirm whether the relationships of the constructs, in the structural dimension, are accepted or not.

4.4 STRUCTURAL MODEL ANALYSIS

The evaluation of the general fit of the model follows the pattern established by Hair *et al.* (2014), which uses the effect of one construct on the others, the size of this effect by the Cohen Indicator (f^2) and the accuracy of the model by means of Predictive Relevance (Q^2), which measures how much the paths of the constructs correspond to the observed variables (see Table 1, item 3.4.2) and, finally, the strength and significance indicators of the path coefficients

through the p-value using bootstrapping, in which process the path coefficients will be determined (structural) and the p-value to verify the sustainability of the hypotheses

The endogenous factor is supported by Cohen (1988) through the Coefficient of Determination R^2 (Pearson's Relation Coefficient) of each construct, which indicates how much each dependent variable (1st and 2nd order) is explained by the independent variables (3rd order), i.e., how much of the variance of a construct is explained by the others in the structural model.

The effect size was calculated using the Cohen Indicator (f^2), which assesses the usefulness of each construct for the endogenous fit of the structural model, considering the reflexive paths of the main constructs, behavioral intention and behavior of use in relation to the others, as described in Table 13.

Table 13
Size of individual effects (f^2) in the chain of constructs.

Latent variables (constructs)	Behavior of use	Behavioral intent
Behavior of Use	-	-
Facilitating Conditions	0.041	
Perceived Credibility		0.000
Perceived Financial Cost		0.086
Performance Expectation		0.142
Social Influence		0.087
Behavioral Intent	0.118	

Note. Data from *SmartPLS 4* adapted by the author (2022).

Considering the parameters predicted for the Cohen indicator in Table 1 (item 3.4.2), it appears that the effects are valid, from small to medium, with the exception of behavioral intention in relation to perceived credibility, which can be considered small.

The Predictive Relevance (Q^2) evaluates how close the model is to what was expected of it in relation to its observed variables, that is, the model's prediction quality or accuracy of the adjusted model in the main latent variables. The evaluation criteria assume values greater than zero (Hair *et al.*, 2014; Ringle *et al.*, 2014), which can be seen in Table 14, in the VOs of the two main constructs, behavioral intention and behavior of use.

Table 14
Adjusted model prediction

Constructs – VOs	Q ² predict
tIC1	0.257
IC2	0.253
IC3	0.223
IC4	0.230
Q23	0.241
Q24	0.020
Q25	0.030
Q26	0.019

Note. Data from *SmartPLS 4* adapted by the author (2022).

Thus, according to the results obtained in Tables 14 and 15, the indicators of predictive validity and effect size of the constructs can be evaluated in a positive way, regarding the general fit of the model.

For the Pearson ratio coefficient (R²) of the two main latent variables, Table 15 showed the following results, considering the R² of the adjusted model:

Table 15
Explanation of the endogenous effect of the adjusted model.

Main constructs	Adjusted R ²
Behavior of use	0.240
Behavioral intent	0.377

Note. Data from *SmartPLS4* adapted by the author (2022).

In interpreting these results, it can be stated that the variances in behavior of use and behavioral intention are explained from 24 to 37.7% by the other model variables, an effect that can be considered large.

Finally, the model's general fit indicators, using the Bootstrapping procedure (Ringle *et al.*, 2014) can be used to analyze the significance of the relationships (p-value), the interpretation of the path coefficients (Γ), also known as structural model, of the adjusted model and the confirmation of the hypotheses mentioned in section 2.7. In the Bootstrapping or resampling technique, presented in Table 16, the Pearson determination coefficients (R²), described in the previous table, are considered to evaluate the variance of the endogenous variables, explained by the structural model (Ringle *et al.*, 2014).

Table 16
Path coefficients and significance of relationships, with the proposed hypotheses.

Correlators	Hypothesis	Structural coefficient (Γ)	P- Values	Adjusted R ²
Facilitating Conditions → Behavior of Use	H5	0.208	0.001	0.240
Perceived Credibility → Behavioral Intent	H3	0.013	0.792	0.377
Perceived Financial Cost → Behavioral Intent	H4	-0.245	0.000	
Performance Expectation → Behavioral Intent	H1	0.338	0.000	
Social Influence → Behavioral Intent	H2	0.251	0.000	
Behavioral Intent → Behavior of Use	H6	0.352	0.000	0.240

Note. Data from *SmartPLS 4* adapted by the author (2022).

The path coefficients can be visualized in Figure 20 (previously presented), in the middle of the arrows that connect the constructs. They are interpreted as the betas (β) of simple or ordinary linear regressions (Ringle *et al.*, 2014). To exemplify, we take the coefficient among the constructs Behavioral Intention and Behavior of Use, which is 0.352. This means that by increasing the exogenous LV Behavioral intention to 1, the endogenous LV Behavior of Use increases by 0.352 (Ringle *et al.*, 2014).

It is verified, in Table 16, that positive and significant relations were confirmed in the whole set (p-value <0.05), except between perceived credibility and behavioral intention (highlighted), although all constructs presented significance in the measurement (v. Table 12), as well as the external loads (outer loadings) of the convergent validity of all observed variables, as determined by bootstrapping.

Thus, the p-value of 0.792 can be explained by the difference between the external loads (high) of the construct Perceived Credibility in relation to its endogenous load (low) in the correlation with the intention to use the banking application, which may have generated a problem of multicollinearity with the exogenous (observed) variables of the construct (Bido, 2022).

However, the fact that the set only presents an insignificant relationship does not invalidate the general quality of the structural model, since it presents content validity, due to the number of positive criteria in relation to this (Efron & Tibshirani, 1994; Bido, 2022).

Once this stage of general adjustment of the model has been carried out, it is necessary to carry out the same process for questions related to the frequency of use and transactions of CaixaTem users (Q23 to 26), in comparison to users of other banking applications, in order to

comply with the specific objective 3 of this study and compare it to the structural model already carried out, which proved to be viable from an operational point of view, based on the results of the hypotheses analyzed.

First, it is necessary to remember that question 23 is related to the frequency of use of m-banking, and questions 24, 25 and 26 are related to the frequency of use and transactions carried out by CaixaTem.

Following the same script and structural analysis of the previous process, after running each question individually, Table 17 shows the effect size of question 23, which refers to m-banking.

Table 17
Impact of individual effect (f^2), question 23.

Latent Variables (constructs)	Behavior of Use	Behavioral Intent
Behavior of Use	-	-
Facilitating Conditions	0.050	
Perceived Credibility		0.000
Perceived Financial Cost		0.086
Performance Expectation		0.142
Social Influence		0.087
Behavioral Intent	0.191	

Note. Data from *SmartPLS 4* adapted by the author (2022).

It can be observed that the results were similar to the adjustment of the structural model (Table 13) regarding the behavioral intention in relation to the other constructs, however with a slight advantage in their effects on the behavior of use with the facilitating conditions and behavioral intention, which demonstrates that its effects have been improved if the indicator parameters are considered.

Table 18 shows the result of the Q^2 indicator and its prediction.

Table 18
Prediction of the adjusted model (Q 23).

Constructs – VOs	Q ² predict
IC1	0.257
IC2	0.253
IC3	0.224
IC4	0.224
Q23	0.230

Note. Data from *SmartPLS4*, adapted by the author (2022).

It is noticed that there were little significant changes in relation to the general adjustment, with all satisfying the criterion of $Q^2 > 0$.

For the adjusted Pearson Coefficient (R^2), shown in Table 19, there was an improvement in the relationship with the behavior and intention of use in relation to the structural model, in which its effect, per se, can be explained 32% by the other variables and 37%, respectively, which suggests an advantage of m-banking over CaixaTem.

Table 19
Explanation of the endogenous effect of the adjusted model (Q23).

Main constructs	Adjusted R ²
Behavior of use	0.321
Behavioral intent	0.377

Note. Data from *SmartPLS4* adapted by the author (2022).

Table 20 presents the results of question 24, which deals with the frequency of use of CaixaTem, and its individual effects on the structural chain.

Table 20
Impact of individual effect (f^2), (Q24).

Latent Variables (constructs)	Behavior of Use	Behavioral Intent
Behavior of Use	-	-
Facilitating Conditions	0.007	
Perceived Credibility		0.000
Perceived Financial Cost		0.085
Performance Expectation		0.142
Social Influence		0.087
Behavioral Intent	0.005	

Note. Data from *SmartPLS 4* adapted by the author (2022).

A significant change can already be noted in the indicators of behavior of use without changing the behavioral intention, with an effect on the small limit (< 0.02) which denotes a deficiency of users in using the application.

The model prediction (Q^2) for question 24, shown in Table 21, was also impaired, but within the predicted parameters, not considered null.

Table 21
Adjusted model prediction (Q 24).

Constructs – VOs	Q^2 predict
IC1	0.257
IC2	0.253
IC3	0.223
IC4	0.230
Q24	0.020

Note. Data from *SmartPLS4* adapted by the author (2022).

The same happens with the R^2 coefficient, which had a small effect/explanation by the other variables, within the parameter limit of 2%, as follows:

Table 22
Explanation of the endogenous effect of the adjusted model (Q24).

Main constructs	Adjusted R^2
Behavior of use	0.018
Behavioral intent	0.377

Note. Data from *SmartPLS4* adapted by the author (2022).

Question 25, about payments made through CaixaTem, presented the following results, for its effects on the structural set.

Table 23
Impact of individual effect (f^2), question 25.

Latent Variables (constructs)	Behavior of Use	Behavioral Intent
Behavior of Use	-	-
Facilitating Conditions	0.011	
Perceived Credibility		0.000
Perceived Financial Cost		0.085
Performance expectation		0.142
Social Influence		0.087
Behavioral Intent	0.005	

Note. Data from *SmartPLS 4* adapted by the author (2022).

As in Q24, the effects of using the application as a means of payment were deficient, also within the limit of 0.02, but the intention to use it proved to be viable.

Predictive validity (Q^2), shown in Table 24, was satisfactory, within the expected rates, but with low perception of use.

Table 24
Adjusted model prediction (Q 25).

Constructs – VOs	Q^2 predict
IC1	0.257
IC2	0.253
IC3	0.223
IC4	0.230
Q25	0.029

Note. Data from *SmartPLS 4* adapted by the author (2022).

In explaining the effects by the other constructs, there was improvement in the behavior of use in relation to Q24, but with little strength.

Table 25
Explanation of the endogenous effect (Q25).

Main constructs	Adjusted R^2
Behavior of Use	0.027
Behavioral Intent	0.377

Note. Data from *SmartPLS 4* adapted by the author (2022).

Question 26 refers to the use of CaixaTem for regular transfers, both interbank and through PIX. Table 26 shows the effect sizes for the model.

Table 26
Impact of individual effect (f^2), (Q26).

Latent Variables (constructs)	Behavior of Use	Behavioral Intent
Behavior of Use	-	-
Facilitating Conditions	0.003	
Perceived Credibility		0.000
Perceived Financial Cost		0.085
Performance Expectation		0.142
Social Influence		0.087
Behavioral Intent	0.008	

Note. Data from *SmartPLS 4* adapted by the author (2022).

It appears that there is also a loss of strength in the effect on use, within the limit of 0.02, without changes in intention, which denotes the low use for this transaction, although the research period is well before the increase in transactions via PIX, currently widely used in the banking network.

Table 27 shows the Q^2 indicator, whose prediction is also low, but acceptable.

Table 27
Prediction of the adjusted model (Q 26).

Constructs – VO _s	Q^2 predict
IC1	0.257
IC2	0.253
IC3	0.223
IC4	0.230
Q25	0.018

Note. Data from *SmartPLS 4* adapted by the author (2022).

It is noticeable, however, that the prediction for the intention to use remained unchanged, which indicates a favorable predisposition to its use.

The series ends with the internal explanation for the model, in Table 28, by the Pearson coefficient (R^2), showing that this was the weakest effect of the set, for the behavior of use.

Table 28
Explanation of the endogenous effect (Q26).

Main Constructs	Adjusted R^2
Behavior of Use	0.016
Behavioral intent	0.377

Note. Data from *SmartPLS 4* adapted by the author (2022).

In addition to this series, it is necessary to run Bootstrapping to verify the general fit of each question, the indication of hypotheses (to be interpreted in the next chapter), the significance of the relationship (p-value) with the path coefficients and the adjusted R^2 , as in the main model. These are shown in Table 29.

Table 29
Coeficientes de caminho e significância das relações, com as hipóteses individuais.

Correlators	Hypotheses	Structural Coefficient (Γ)				P- Values				Adjusted R ²			
		Q23	Q24	Q25	Q26	Q23	Q24	Q25	Q26	Q23	Q24	Q25	Q26
Facilitating Conditions → Behavior of Use	H5	0.217	0.097	0.122	0.068	0.000	0.126	0.012	0.240	0.321	0.018	0.027	0.016
Perceived Credibility → Behavioral Intent	H3	0.013	0.013	0.013	0.013	0.794	0.792	0.795	0.796				
Perceived Financial Cost → Behavioral Intent	H4	-0.245	-0.245	-0.245	-0.245	0.000	0.000	0.000	0.000	0.377	0.377	0.377	0.377
Performance expectation → Behavioral Intent	H1	0.338	0.338	0.338	0.338	0.000	0.000	0.000	0.000				
Social Influence 1 → Behavioral Intent	H2	0.251	0.251	0.251	0.251	0.000	0.000	0.000	0.000				
Behavioral Intent → Behavior of Use	H6	0.425	0.084	0.086	0.103	0.000	0.251	0.187	0.158	0.321	0.018	0.027	0.016

Note. Data from *SmartPLS 4* adapted by the author (2022).

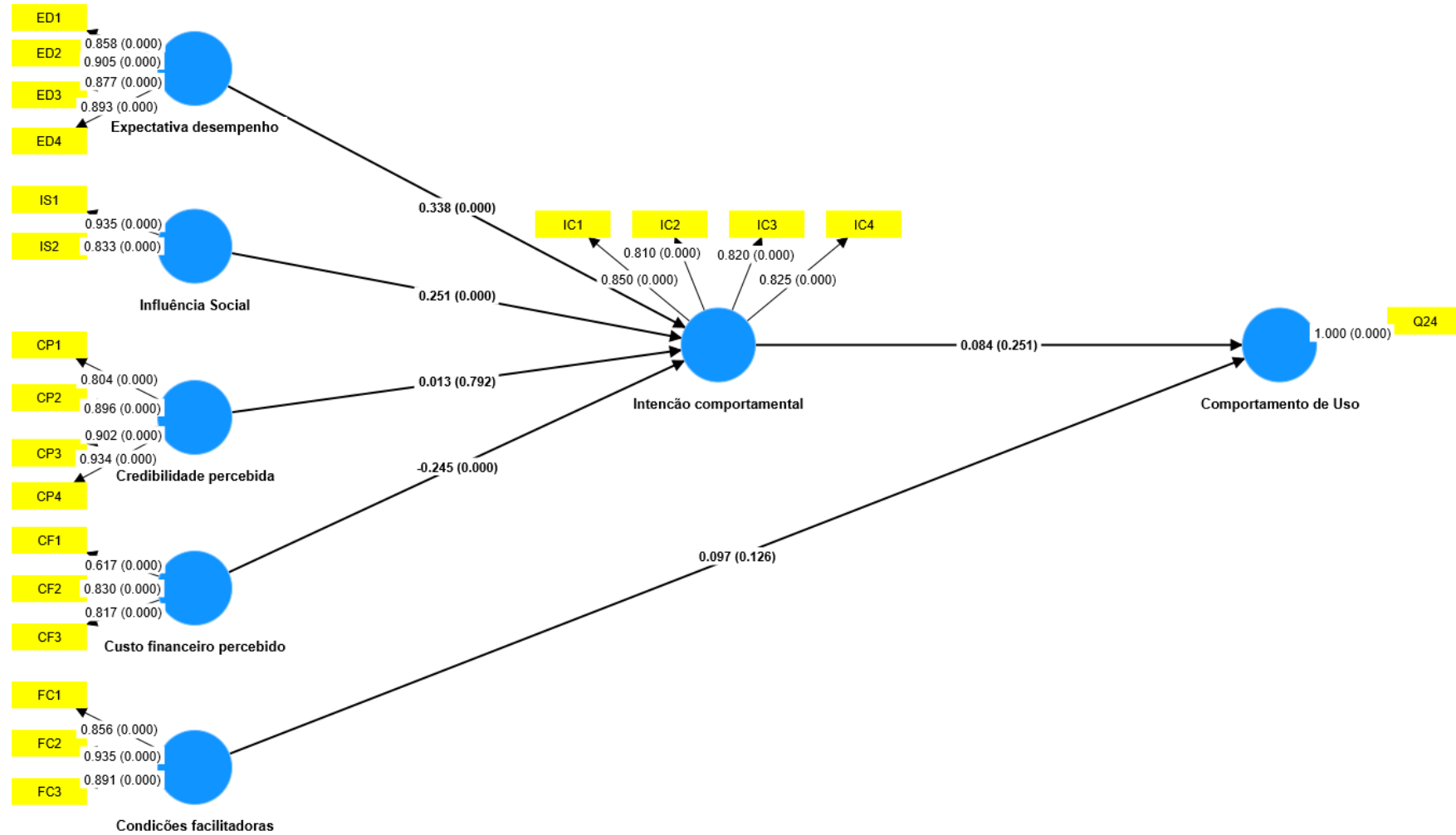
The data show that there was no change in the structural coefficient in relation to the main model, in any of the questions. However, the p-value of the relationships was altered, showing insignificance (> 0.05) in two constructs in relation to the behavior of use (facilitating conditions and behavioral intention) and one for perceived credibility, a relationship that remained similar to the structural model grouped (see Table 16). The adjusted R² was also modified, with an improvement in the indicator for Q23, but had a better result in relation to the main model. Nevertheless, for questions 24 to 26, they were lower in behavior of use, at the limit or below 2%, presenting a worsening in relation to the aggregated model.

It can be inferred from this that the (behavioral) use of m-banking in the relations is much more significant than that of CaixaTem, as also demonstrated in the model grouped by the effects of the indicators presented. For the intention of use, however, the indicators remained the same, that is, the grouped and individual models are explained 37% by the other variables of the model (latent or observed), with an effect considered “great” in the set.

To demonstrate the graphical model of the executed bootstrapping, Figure 22 shows, as an example, the output of question 24 generated in the configuration of the individual models, which for reasons of space and conciseness, are not presented in its entirety here. In it, one can check the coefficients of the paths of the latent variables and, next to it, in parentheses, the p-value of each relation of the related constructs.

Figure 22

Bootstrapping from question 24, with path coefficients (β) and p-values



Note. Data from SmartPLS 4 adapted by the author (2022).

Next, the results obtained in this work are discussed, with emphasis on those found in the hypotheses and their convergence with those of other studies on the same subject.

4.5 DISCUSSION OF THE RESULTS

This study used in its methodology the original matrix of the UTAUT model present in the work of Venkatesh *et al.* (2003) and Yu (2012), when using partial least squares regression (PLS) to elaborate the construction of the two key models for obtaining the results, the measurement and the structural.

As most of the results have already been presented in this chapter, this section has the purpose of discussing them from the perspective of the general and specific objectives presented at the beginning of this study. In this sense, the profile analysis of the 300 respondents used in the sample and the descriptive and factor analysis (regression) presented in the methodological, measurement and structural models will be considered.

Regarding the hypotheses and their relationship with the theoretical basis of the UTAUT model, presented in item 2.7 and concluded in Table 16, it was found that the performance expectation (H1) positively and significantly influences the intention to use the banking application. This result is confirmed in the works of Venkatesh *et al.* (2003), Radnan and Purba (2016), Ramos *et al.* (2018) and Moreira *et al.* (2019).

The practical evidence found in this work is consistent with the result of Yu (2012), in which the effect of this relationship is stronger for men and younger workers, given that in the survey carried out, 49% are men and 38% are young, up to the age range of 30 years-old.

The social influence (H2) on the intention to use was significant in this study, which is also positively supported in the works of Venkatesh *et al.* (2003), Ramos *et al.* (2018) and Yu (2012), who argue that social influence is the most powerful factor to affect people's intention to use mobile banking. However, there was divergence in the hypothesis of Moreira *et al.* (2019), which was not tested because its scale presented low reliability.

The H3 hypothesis of the perceived credibility relationship → intention (behavioral) of use was rejected for presenting p-value < 0.05. This result converges with that presented by Radnan and Purba (2016). However, it goes against what was found in the works of Yu (2012), Moreira *et al.* (2019) and Ramos *et al.* (2018), who accepted it.

The relationship of the perceived financial cost construct (H4) in the intention to use showed a positive and significant result, despite the negative coefficient of -0.245, a result of the external loads of negative majority, verified in Table 09, and the discriminant validity in relation to the other constructs, described in Table 10.

The perception of financial cost on the intention of use had its hypothesis positively validated by Yu (2012) and rejected in the studies by Moreira *et al.* (2019). This relationship was not addressed in the studies by Venkatesh *et al.* (2003), Radnan and Purba (2016) and Ramos *et al.* (2018).

Regarding the facilitating conditions (H5), this had a positive influence on the behavior of use of the banking application, in line with the studies by Ramos *et al.* (2018) and Moreira *et al.* (2019), who argue that the ease of use or its conditions directly affect the perceived usefulness and the positive attitude of the individual in adopting this technology in the future.

In the analysis by Venkatesh *et al.* (2003) there was also a significant result in this relationship, as well as in the works of Yu (2012) and Radnan and Purba (2016), considering the age and experience of the researched population.

The behavioral intention (H6) was the factor that showed the greatest strength and significance in relation to the behavior of use, obtaining unanimity in the significance not only in this study, but in all of the researched theoretical basis. This fact consolidates this construct as a key criterion in the acceptance and behavior of use by users in the adoption of this technology and contributes to the validation of the UTAUT model used in this research (see chap. 2.6), as argued by Venkatesh *et al.* (2003) and Yu (2012), including the validity of the direct and indirect effects it has on the other variables.

Figure 23 summarizes the set of hypotheses and the results found.

Figure 23

Hypothesis. Acceptance and rejection.

Construct	Hypothesis	Accepted/Rejected
Performance Expectation	H1: The performance expectation positively influences the intention to use the banking application.	Accepted
Social Influence	H2: Social Influence positively influences the intention to use the banking application	Accepted
Perceived Credibility	H3: Perceived credibility positively influences the intention to use the banking application.	Rejected
Perceived Financial Cost	H4: The Perceived Financial Cost positively influences the intention to use the banking application.	Accepted
Facilitating Conditions	H5: The Facilitating Conditions positively influence the behavior of using the banking application.	Accepted
Behavioral Intent	H6: The Behavioral Intention positively influences the behavior of using the banking application.	Accepted

Note. Source: Elaborated by the author (2022).

In the profile analysis, there was a combination of age group (19 to 50 years old) and low education in the surveyed population, with 84.3% of them presenting education level up to high school or incomplete, including semi-literate people and without any instruction. These data reveal the difficulty people have in adopting digital technology and using this medium for their businesses and their personal lives, and it is consistent with the situation of social vulnerability found after the pandemic, in which 38 million people were not receiving any type of benefit social (Gonzales, 2020). This fact alone would justify the broad digital and financial inclusion promoted by the federal government through the CaixaTem application during the Covid-19 Pandemic, despite its emergency nature, which can serve as a legacy in the event of a scenario with better living conditions of the population.

On the other hand, it was noticed that the variables low education and income (54% earn from 1 to 3 minimum wages) are convergent with regard to the difficulty in using (facilitating conditions) of banking applications, evidence that was reflected in the results obtained in the factorial analysis and in the hypotheses of this study, also confirmed by the author in his daily routine, which directly serves this public. This represents a great challenge for the institution as a digital bank, in the sense of promoting digital and financial education for these users, thereby improving their life quality.

Comparing the use of m-banking with CaixaTem, one of the purposes of this study, the results found suggest an advantage of m-banking in relation to the CAIXA application, considering that in the quantitative responses, the perception of use of CaixaTem was more because of receiving government benefits (government aid, FGTS, PIS etc.) than using the application as a bank account itself.

The results of the comparative structural analysis of the two instruments, with the questions run individually in the bootstrapping, related to the frequency of use and transactions of users of mobile banking (Q23) and CaixaTem (24 to 26), demonstrated the superiority of m-banking in general, in line with the general fit model. This was a necessary process to be carried out, in order to fulfill the specific objective 3 of this study and compare it to the structural model already carried out, which proved to be viable, as previously mentioned.

However, when analyzing each individual question, there were significant differences in strength and effect in the behavior of use for CaixaTem, compromising its performance, but not to the point of making it unfeasible, due to the positive intention of use.

In Figure 24, the hypotheses are listed after all the individual analyzes have been carried out, and the results obtained.

Figure 24

Hypothesis of questions 23 (m-banking) to 24 – 26 (CaixaTem). Acceptance and rejection.

Construct	Hypothesis	Q23	Q24	Q25	Q26
		Accepted/Rejected			
Performance Expectation	H1: The performance expectation positively influences the intention to use the banking application.	Accepted	Accepted	Accepted	Accepted
Social Influence	H2: Social Influence positively influences the intention to use the banking application	Accepted	Accepted	Accepted	Accepted
Perceived Credibility	H3: Perceived credibility positively influences the intention to use the banking application.	Rejected	Rejected	Rejected	Rejected
Perceived Financial Cost	H4: The Perceived Financial Cost positively influences the intention to use the banking application.	Accepted	Accepted	Accepted	Accepted
Facilitating Conditions	H5: The Facilitating Conditions positively influence the behavior of using the banking application.	Accepted	Rejected	Rejected	Rejected
Behavioral Intent	H6: The Behavioral Intention positively influences the behavior of using the banking application.	Accepted	Rejected	Rejected	Rejected

Note. Source: Elaborated by the author (2022).

As seen, it can be noted that the relations in question 23, representing the frequency of use of m-banking, are consistent with the general adjustment model, even showing better performance in the facilitating conditions variable. Questions 24, 25 and 26, which represent, respectively, the frequency of use, payments and transfers by CaixaTem have followed the general model of rejection in the relationship perceived credibility with the intention of use, but were rejected in two more relationships, conditions facilitators and (behavioral) intention to use, which denotes its fragility for the real use of the application without, however, affecting the intention to use, whose effect by the Pearson coefficient (R^2) was considered large.

This situation was empirically confirmed in the descriptive statistics, by the answers regarding the frequency of use and transactions in the two channels, in which 53% stated that they frequently and always use the competition's applications, while 77% stated that they never or rarely used them. CaixaTem, despite the majority (35%) of respondents claiming that CAIXA is their busiest bank, 48% do not know that the application can be used as a bank account and receive other credits and 44% have not downloaded the application. In transactions, this evidence was repeated with greater force: 84% said they did not make or made payments through CaixaTem only once and 83% did not use it or used it only once for transfers.

This result was confirmed by the analysis of the measurement model, in which the factor loadings of frequency of use of CaixaTem in the behavior of use (Q24 to Q26) were much lower than that of mobile banking as a whole (Q23).

The structural analysis also pointed out this divergence, since it contributed to the low index (0.041) of the Cohen Indicator (f^2) of the behavior of use in relation to the facilitating conditions in the internal adjustment of the model, and in the prediction (Q^2) of the adjusted model (Table 14), in which questions 24 to 26 had much lower rates than Q23. It also affected the result of the R^2 coefficient (Pearson) in the behavior of use construct (Table 15), although the effect on it did not compromise the model fit.

In general, the results and discussions presented here reveal the strengths and weaknesses of the research and are consistent with the purpose of this work. They also allow the objectives, in their empirical and methodological dimension, to be met. The next chapter is devoted to final considerations.

5 CONCLUSION

This study aimed to determine which factors influence the acceptance and use of mobile banking and the CaixaTem application in the surveyed population. At the same time, it analyzed the social, financial and operational conditions that these users would have in order to provide Caixa Econômica Federal with the opportunity to create an inclusive and sustainable digital bank.

As a Specific Objective 1, the aim was to identify, together with the users interviewed in Cascavel/PR, which factors were decisive for the acceptance and use of the CaixaTem application and its sustainability in the provision of financial services. This objective was achieved, as operations such as purchasing, e.g., credit cards and loans, were in high demand in the survey, with a total of 75% of customers prone to contracting, which, from a strategic point of view for the bank, is a promising business opportunity, if the possibility is considered of adding to this demand the balance of products that already belong to customers, such as FGTS, for example.

However, the acceptance and use of the application seemed to be more identified as a digital means for users to receive government benefits, and not as an instrument of credit and services. This can be proven in practice, by the consultations made by the author in this work, in his daily routine. This factor is important and can affect the sustainability of the product, due to the socioeconomic and educational conditions of the application's target population, especially those with low incomes.

Por outro lado, no que diz respeito ao potencial de entrega de serviços e produtos financeiros, mostrou-se adequado no ponto de vista estratégico, argumento que pode ser comprovado pelo crescimento robusto da utilização dos meios digitais em detrimento dos tradicionais, apesar do baixo grau de instrução, renda e conhecimento da população.

As Specific Objective 2, the intention was to measure the perception of customer-users regarding the factors: a) Performance expectation; b) Social influence; c) Perceived credibility, Perceived Financial Cost and Facilitating Conditions; and d) Behavioral and use intention, regarding the acceptance of CaixaTem.

In the set of hypotheses presented for the structural model, most of the relationships among the constructs can be confirmed positive and significant, namely: Performance expectation → Behavioral intention; Social Influence → Behavioral intention; Facilitating Conditions → Behavior of Use; Perceived financial cost → Behavioral intention; Behavioral Intention → Behavior of Use, exception made to item H3 – perceived credibility, whose

relationship with Behavior of Use was not accepted, although it has been considered significant in other studies of the theoretical basis.

In the specific analysis relating to item D of the objectives, which had as its object the acceptance and use of CaixaTem, the results were not good enough to attest to the full acceptance of real use, if we consider the comparison with m-banking and the results of the structural model.

Considering the analysis of the hypotheses discussed in the previous chapter, for questions related to their acceptance of use, questions 24 to 26, the rejection of the hypotheses was higher than those of the general model and m-banking (question 23) with three relationships rejected ($p > 0.05$) against one for the other two, which demonstrates that there are critical factors in its acceptance of use that need to be overcome. However, this fact does not make it unfeasible as a digital means of transactions, due to the fact that it presents a strong intention of use, with a 37% effect explained (R^2) by the other variables.

In this sense, the results found in measuring users' perception of use, in its theoretical and methodological dimensions, were consistent with the proposed constructs of the UTAUT model, whose importance is highlighted in the work by Venkatesh *et al.* (2003, p. 470), which says that “The UTAUT model explains up to 70% of the variation in the intention of use in the adoption of technology by the user”. Furthermore, the results of the hypotheses of the model presented here are superior to those of its theoretical basis, which strengthens its adherence to the UTAUT model.

In this way, the UTAUT method was a determining factor for the study to prosper satisfactorily and for the originality that it brought in its scope, in the sense of enabling a public bank to create a socially inclusive digital bank, thus satisfying the general objective of this work.

When comparing m-banking and CaixaTem, the underutilization of the CaixaTem application became evident, which needs to be improved and better publicized, in order to gain more space in this competitive market. However, when analyzing the feasibility of creating a digital bank in the light of the applied methodology, it becomes a great business opportunity for the public bank, as it already has an exceptional customer base, of approximately 126 million registered accounts, counting active and inactive (Volpp, 2022). Add to this the fact that the majority of respondents have Caixa Econômica Federal as their busiest bank (35%), but 48 and 44%, respectively, do not use CaixaTem as a bank account and have not downloaded the application to receive credits other than government benefits.

This demonstrates, therefore, the enormous potential that the institution has in its hands if it reconciled the popularity and reputation of its brand with the operationalization of this

digital asset, in the sense of expanding its business, increasing its profitability and yielding good results in case of sale of this subsidiary, if transformed into a digital bank.

Currently, despite the exponential growth promoted by emergency aid in 2020, in which 38 million people were immediately banked, the number of active (operational) users totals only 21 million; nevertheless, the highest total among banks (Volpp, 2022). This fact reveals that the institution may not be able to take advantage of this opportunity, either due to management or operational difficulties, evidence that was demonstrated in this work by the results discussed in the previous chapter and experienced in practice by the author, in his daily routine in the care of hundreds from clients.

This fact increases the institution's responsibility by digitally including this public, and obliges it to develop actions that reconcile the interests of the most vulnerable users, especially women, preponderant in this universe (Gonzales, 2020), with the institution's interests in preserving itself from the factors of risk and default, whose rates are extremely high in the country: 33.6% for those who receive up to 10 minimum wages and 39.7% of all families, totaling 67.9 million Brazilians with restricted credit (Serasa, 2022).

Add to this the fact that technology, especially digital, is evolving faster than human capacity to the point of overcoming it, which forces people to learn faster, and institutions, be they financial or governmental, to adopt a more intelligent governance in the relationship with its users (Friedman, 2018).

In this way, the purpose of this dissertation is in line with this premise and intends to make a contribution to the players in this market and especially to Caixa Econômica Federal, in the sense of providing it with data and information that may promote improvement in its actions of governance and management, aiming to increase its results and its competitiveness in this sector.

Obviously, this study has some limitations in its development, such as the expansion of its methodology, in the sense of adding moderating variables such as gender, age and income in its scope and analyzing them individually to verify the impacts they would have on the results of the applied models. However, this limitation implies suggestions for future studies, given its degree of importance.

Other limitations can be attributed, such as the territorial delimitation of the applied research and the characteristics of the respondent public profile, since the results may vary according to the state where the field research is carried out, as well as the fact that there are people who do not have relationship with the company.

Finally, as a suggestion for future work, in addition to what has been stated previously, a study to assist in the development of user skills would be feasible, so that they can interact with more quality and efficiency when using such applicatives. The realization of this project could come through data science – artificial intelligence –, turning it into artificial assistants.

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APPENDIX A – Data collection tool / questionnaire

ACADEMIC RESEARCH ON DIGITAL AND FINANCIAL INCLUSION USING BANKING APPS AND CAIXATEM

When answering questions 1 – 32, consider the following proposal for banking apps and CAIXATEM: smartphone apps to access and hire banking services, such as: check consulting balances/statements, making transfers, getting loans, purchasing products and paying bills and slips.

You should answer statements 1 - 30 on a scale of agreement, as follows, checking X on **ONLY ONE OPTION**.

➤ **When dealing with banking business:**

1. Using the banking app improves/would improve my performance when dealing with banking business.	Fully disagree 1	Partially disagree 2	Neither agree nor disagree 3	Partially agree 4	Fully agree 5
2. Using the banking app is timing saving for me.	Fully disagree 1	Partially disagree 2	Neither agree nor disagree 3	Partially agree 4	Fully agree 5
3. I use/would use the banking app anywhere.	Fully disagree 1	Partially disagree 2	Neither agree nor disagree 3	Partially agree 4	Fully agree 5
4. I consider the banking app useful.	Fully disagree 1	Partially disagree 2	Neither agree nor disagree 3	Partially agree 4	Fully agree 5

➤ **Regarding to your social environment:**

5. People who are important to me think I should use a banking app.	Fully disagree 1	Partially disagree 2	Neither agree nor disagree 3	Partially agree 4	Fully agree 5
6. Most people around me use a banking app.	Fully disagree	Partially disagree	Neither agree nor disagree	Partially agree	Fully agree
	1	2	3	4	5

	1	2	3		
7. Using a banking app means I have a higher social status than those who don't.	Fully disagree 1	Partially disagree 2	Neither agree nor disagree 3	Partially agree 4	Fully agree 5

➤ **When using a banking app:**

8. I believe my information is/would be kept confidential	Fully disagree 1	Partially disagree 2	Neither agree nor disagree 3	Partially agree 4	Fully agree 5
9. I believe my transactions are/would be protected.	Fully disagree 1	Partially disagree 2	Neither agree nor disagree 3	Partially agree 4	Fully agree 5
10. I believe my privacy will not/would not be disclosed.	Fully disagree 1	Partially disagree 2	Neither agree nor disagree 3	Partially agree 4	Fully agree 5
11. I believe the virtual banking environment is safe.	Fully disagree 1	Partially disagree 2	Neither agree nor disagree 3	Partially agree 4	Fully agree 5

➤ **Related to financial cost:**

12. The financial cost of using the <i>Banking App</i> is lower than the cost of other banking channels.	Fully disagree 1	Partially disagree 2	Neither agree nor disagree 3	Partially agree 4	Fully agree 5
13. The financial cost of using the <i>Banking App</i> is higher than	Fully disagree 1	Partially disagree 2	Neither agree nor disagree 3	Partially agree 4	Fully agree 5

the cost of other banking channels.					
14. Banking App expenses are high for me.	Fully disagree 1	Partially disagree 2	Neither agree nor disagree 3	Partially agree 4	Fully agree 5

➤ **Regarding the banking app:**

15. I have/would have the necessary resources to use the Banking App.	Fully disagree 1	Partially disagree 2	Neither agree nor disagree 3	Partially agree 4	Fully agree 5
16. I have/would have the necessary knowledge to use the Banking Application.	Fully disagree 1	Partially disagree 2	Neither agree nor disagree 3	Partially agree 4	Fully agree 5
17. All contents of the Banking App are easy to read and to understand.	Fully disagree 1	Partially disagree 2	Neither agree nor disagree 3	Partially agree 4	Fully agree 5
18. A bank employee is/would be available when I have/would have a problem using the Banking App.	Fully disagree 1	Partially disagree 2	Neither agree nor disagree 3	Partially agree 4	Fully agree 5

➤ **Regarding my business:**

19. I prefer/would prefer to use the Banking App.	Fully disagree 1	Partially disagree 2	Neither agree nor disagree 3	Partially agree 4	Fully agree 5

20. I intend to use the Banking App.	Fully disagree 1	Partially disagree 2	Neither agree nor disagree 3	Partially agree 4	Fully agree 5
21. I'd rather go to a bank agency.	Fully disagree 1	Partially disagree 2	Neither agree nor disagree 3	Partially agree 4	Fully agree 5
22. I'd rather go to a lottery.	Fully disagree 1	Partially disagree 2	Neither agree nor disagree 3	Partially agree 4	Fully agree 5

23. How often do you use the Banking App?

- 1 () Never
 2 () Rarely
 3 () Occasionally
 4 () Frequently
 5 () Always

24. How often do you use the CAIXATem applicative?

- 1 () I have never used
 2 () Rarely
 3 () Occasionally
 4 () Frequently
 5 () Always

25. Have you been making payments using CAIXATem regularly?

- 1 () No
 2 () Only once
 3 () More than once
 4 () I always do

26. Have you been making transfers through CAIXATem regularly?

- 1 () No

- 2 () Only once
- 3 () More than once
- 4 () I always do

27. Which of these banks do you have the account with the LARGEST movement? (Please tick only one)

- 1 () Banco do Brasil
- 2 () Caixa Econômica Federal
- 3 () Itaú
- 4 () Bradesco
- 5 () Santander
- 6 () Sicredi
- 7 () Nubank
- 8 () Other (Agibank, Inter, C6, Iti, Next etc.)
- 8 () None

28. Which of the following operations do you perform MOST when using the Banking App? (Please tick only one)

- 1 () Payments (slips, bills, credit card)
- 2 () Money transferences and **PIX**
- 3 () Financial applications
- 4 () Getting loans
- 5 () Purchasing products, such as credit cards, insurance, capitalization title etc.
- 6 () **I do not perform** operations when using the app

29. Did you know that in addition to Emergency Aid and FGTS, CAIXATem can be used as a bank account and receive other credits?

- 1 () NO
- 2 () YES

30. Have you already registered with CAIXATem to receive credits?

- 1 () YES, AND I AM USING IT
- 2 () I HAVE DOWNLOADED, BUT HAVEN'T REGISTERED
- 3 () I HAVEN'T DOWNLOADED CAIXATem
- 4 () I DON'T KNOW HOW TO DO IT

31. If CAIXATem makes the following products available on my cell phone, there is a possibility that I may purchase them (YOU CAN CHOOSE MORE THAN ONE ANSWER).

- 1 () Loans at low installments and low interest

- 2 () Life insurance
- 3 () House insurance
- 4 () Credit card
- 5 () Capitalization title
- 6 () Overdraft (Revolving Credit)

32. If you were given a loan, where would you use the money as a priority? (Please tick only one answer).

- 1 () Shopping
- 2 () Paying bills, late or not
- 3 () Personal use
- 4 () I would use it for my business/commercial activity
- 5 () Pay debts and clear my name.

33. What is your gender?

- 1 () Masculine
- 2 () Feminine
- 3 () Other

34. What is your age:

- 1 () Under 18 years-old
- 2 () 19 - 30 years-old
- 3 () 31 - 50 years-old
- 4 () 51- 65 years-old
- 5 () Above 65 years-old

35. What is your education level?

- 1 () Up to complete or incomplete elementary school (1st to 9th grade)
- 2 () High School – Complete or Incomplete
- 3 () College degree – Complete or Incomplete
- 4 () Graduate degree.

36. Do you perform any professional (economic) activity?

- 1 () I'm employed
- 2 () Self-employed
- 2 () Informal business
- 3 () Public servant

4 () I'm unemployed

5 () Others

37. What is the range of the SUM of MONTHLY FAMILY INCOME (Everyone who lives in your house)?

1 () Up to 1 Minimum Wage (R\$ 1,100.00)

2 () from 1 to 3 MW (between R\$1,100 and 3,300.00)

3 () from 3 to 6 MW (between R\$ 3,300 and 6,600.00)

4 () from 6 to 9 MW (between R\$ 6,600 and 9,900.00)

5 () from 9 to 12 MW (between R\$ 9,900 and 13,200.00)

6 () Above 12 MW (above R\$ 13,200.00)

38. What is your marital status?

1 () Single

2 () Married

3 () Widowed

4 () Separated

5 () Divorced

6 () Other