

**Mobile banking: a study on adoption stages using
Government Adoption Model (GAM) and the role of
demographic moderators**

Factors influencing Portuguese consumers' adoption

Inês Cristina Afonso Cabrita

Dissertation report presented as partial requirement for
obtaining the Master's degree in Information
Management, with a specialization in Knowledge
Management and Business Intelligence

NOVA Information Management School
Instituto Superior de Estatística e Gestão de Informação
Universidade Nova de Lisboa

**MOBILE BANKING: A STUDY ON ADOPTION STAGES USING
GOVERNEMENT ADOPTION MODEL (GAM) AND THE ROLE OF
DEMOGRAPHIC MODERATORS
FACTORS INFLUENCING PORTUGUESE CONSUMERS' ADOPTION**

by

Inês Cristina Afonso Cabrita

Dissertation report presented as partial requirement for obtaining the master's degree in Information Management, with a specialization in Knowledge Management and Business Intelligence

Advisor: Professor Doutor Rui Alexandre Henriques Gonçalves

August 2021

ACKNOWLEDGEMENTS

A presente dissertação não estaria concluída se não fosse pelo apoio e incentivo da minha família, do meu namorado e dos meus amigos. Obrigada por não me deixarem desistir. Agradeço também ao meu orientador pela ajuda e disponibilidade.

ABSTRACT

The present dissertation was developed with the objective of finding the most relevant factors for adoption of mobile banking, at each service stage – static, interaction, and transaction stages. After reviewing the literature addressing mobile banking and its adoption, it was implemented a revised version of GAM model, composed by eleven independent variables, grouped in four main constructs - attitude to use, ability to use, assurance to use, and adherence to use. Given the hypothesis drawn, a questionnaire was applied to Portuguese consumers and a sample of 208 respondents was achieved. Thus, the data gathered was analyzed under path analysis, with *SmartPLS 3*, by defining the three models separated. It was found that perceived functional benefit is the most relevant predictor at both static and transaction stages, and availability of resources is the most relevant predictor at the interaction stage. In addition, five demographic variables were considered as moderators for mobile banking adoption at each stage – age, gender, education level, income level, and occupation. After verifying the moderator variables in terms of measurement invariance, only gender presented good results, meaning that the other moderators had to be disregarded. By applying multigroup analysis, and given the findings of the most important factors for the adoption of mobile banking at the three presented stages, only the relation between PA and MBA-S was significantly moderated by gender.

KEYWORDS

Mobile banking adoption; Static stage; Interaction stage; Transaction stage; Portuguese consumers; Path analysis; GAM model; Moderation analysis

INDEX

1. Introduction.....	1
1.1. Background and problem identification.....	1
1.2. Study objectives.....	1
2. Study relevance and importance.....	3
3. Literature review	4
3.1. Mobile banking grounded in FinTech.....	4
3.2. Mobile banking – definition and outlook.....	7
3.3. Factors influencing adoption of mobile banking.....	9
3.4. Moderation effect	11
4. Theoretical framework	12
4.1. Conceptual model description	12
4.2. Conceptual hypotheses	14
5. Methodology	18
5.1. Data preparation and sample characterization	18
5.2. Measurement models	19
5.3. Structural model.....	24
5.4. Moderation analysis	27
5.4.1. Gender as the moderator variable	27
5.4.2. Age as the moderator variable.....	29
5.4.3. Income level as the moderator variable	30
6. Results analysis and discussion	31
7. Conclusions.....	34
8. Limitations and recommendations for future works	35
9. References.....	36
10. Appendix.....	48

LIST OF FIGURES

Figure 1. Fintech services by sector.	5
Figure 2. Proposed theoretical model.....	14
Figure 3. Sample characterization.....	19
Figure 4. Empirical model for mobile banking adoption at the static stage.....	31
Figure 5. Empirical model for mobile banking adoption at the interaction stage.....	32
Figure 6. Empirical model for mobile banking adoption at the transaction stage.	32

LIST OF TABLES

Table 1. Theoretical framework.....	17
Table 2. Item loadings.	21
Table 3. Internal consistency reliability.....	22
Table 4. Convergent validity.....	23
Table 5. Discriminant validity.	23
Table 6. Variance inflation factor.	26
Table 7. Significance of path coefficients, using p-value.	26
Table 8. R ² adjusted.....	26
Table 9. Model fit.	26
Table 10. Multigroup analysis for MBA-I, with p-value.	28
Table 11. Multigroup analysis for MBA-S, with p-value.....	29
Table 12. Multigroup analysis for MBA-T, with p-value.....	29

LIST OF ABBREVIATIONS AND ACRONYMS

EBA	European Banking Authority
FSB	Financial Stability Board
BCBS	Basel Committee on Banking Supervision
BIS	Bank for International Settlements
OECD	Organisation for Economic Co-operation and Development
SMEs	Small and medium-sized enterprises
AFS	Alternative financial services
ADB	Asian Development Bank
P2P	Peer-to-peer
ECB	European Central Bank
CBDC	Central bank digital currency
B2B	Business to business
FX	Foreign exchange
TAM	Technology acceptance model
UTAUT	Unified Theory of Acceptance and Use of Technology
GAM	E-government Adoption Model
MBA	Mobile Banking Adoption
PLS	Partial Least Squares
PA	Perceived Awareness
AOR	Availability of Resources
CSE	Computer-Self Efficacy
PATU	Perceived Ability to Use
MLO	Multilingual Option
PIQ	Perceived Information Quality
PT	Perceived Trust
PU	Perceived Uncertainty

PS	Perceived Security
PFB	Perceived Functional Benefit
PI	Perceived Image
MBA-S	Mobile Banking Adoption at the Static Stage
MBA-I	Mobile Banking Adoption at the Interaction Stage
MBA-T	Mobile Banking Adoption at the Transaction Stage
MGA	Multigroup Analysis
MICOM	Measurement Invariance of Composite Models

1. INTRODUCTION

1.1. BACKGROUND AND PROBLEM IDENTIFICATION

The technological paradigm has impacted all economic sectors, even the most traditional ones, as it is the case of banking. Digital banking is not a recent topic, but the rise of FinTech changed the paradigm, namely regarding the possibilities for mobile banking (*Campanella, Della Peruta, & Del Giudice, 2017; Omarini, 2018*). In this line, a widely discussed topic in literature regards the adoption of mobile banking, justified by the managerial and economic applications it can bring to companies.

By analyzing the literature on adoption, it is found that it was developed alongside with the new banking technologies, from the early inventions to nowadays FinTech innovations (*Daniel, 1999; Ibrahim, Joseph, & Ibeh, 2006; Singh, Sahni, & Kovid, 2020; Alkhowaiter, 2020*). The adoption of mobile banking has been studied under the light of various adoption models – UTAUT (*Dwivedi, Rana, Jeyaraj, Clement, & Williams, 2017; Alqahtani & Al-Badi, 2017; Alalwan, Dwivedi, Rana, & Algharabat, 2018; Merhi, Hone, & Tarhini, 2019*), TAM (*Sharma, 2019; Pikkarainen, Pikkarainen, Karjaluoto, & Pahnla, 2004; Fawzy & Esawai, 2017*), and, later on, GAM (*Shareef, Baabdullah, Dutta, Kumar, & Dwivedi, 2018*). Even though the same phenomenon is at study, different factors are found as the most relevant in different papers, such as trust, habit, perceived security, perceived usefulness, website characteristics, computer efficacy and electronic word of mouth (*Sharma, 2019; Alalwan, Dwivedi, Rana, & Algharabat, 2018; Merhi, Hone, & Tarhini, 2019; Pikkarainen, Pikkarainen, Karjaluoto, & Pahnla, 2004; Fawzy & Esawai, 2017; Al-Ajam & Nor, 2013; Giovanis, Binioris, & Polychronopoulos, 2012*).

However, there is a clear literature gap concerning factors influencing adoption per service stage – static stage, interaction stage, and transaction stage, which is of paramount importance since each service stage refers to services completely different from each other, from consultation services to transaction operations (*Shareef M. A., Kumar, Kumar, & Dwivedi, 2011; Rorissa, Demissie, & Pardo, 2011; Karokola & Kowalski, 2012; Jayashree & Marthandan, 2010; Lee J. , 2010*), meaning that the factors underlying adoption might be different. Only one paper (*Shareef, Baabdullah, Dutta, Kumar, & Dwivedi, 2018*) addressed this topic in 2018, but within the context of a developing country and without considering the impact of demographic moderators, as age, gender, or education level.

1.2. STUDY OBJECTIVES

The main objective of the present dissertation is to understand which factors are more relevant for the adoption of mobile banking, at the different stages (*Shareef, Baabdullah, Dutta, Kumar, & Dwivedi, 2018; Shareef M. A., Kumar, Kumar, & Dwivedi, 2011*), and whether demographic moderators affect such relations, considering Portuguese consumers. In particular, by applying a questionnaire, analyzing the relations between the variables in the light of partial least squares, and verifying the moderation effects of demographic variables, it is intended to answer the following research objectives:

- Did Portuguese consumers already used mobile banking?
- Which are the most important factors for adoption of mobile banking by Portuguese consumers, at the static stage? (*Shareef, Baabdullah, Dutta, Kumar, & Dwivedi, 2018; Shareef M. A., Kumar, Kumar, & Dwivedi, 2011*)

- Which are the most important factors for adoption of mobile banking by Portuguese consumers, at the interaction stage? (*Shareef, Baabdullah, Dutta, Kumar, & Dwivedi, 2018; Shareef M. A., Kumar, Kumar, & Dwivedi, 2011*)
- Which are the most important factors for adoption of mobile banking by Portuguese consumers, at the transaction stage? (*Shareef, Baabdullah, Dutta, Kumar, & Dwivedi, 2018; Shareef M. A., Kumar, Kumar, & Dwivedi, 2011*)
- Do age, gender, education level, income level, or occupation moderate the relation between such factors and adoption of mobile banking, at the different stages? (*Warsame & Ileri, 2018; Goularte & Zilber, 2018; Ryu, 2017; Alshurideh, Kurdi, Masa'deh, & Salloum, 2021; Chawla & Joshi, 2018; Kwateng, Atiemo, & Appiah, 2018*)

Accordingly, the goal of the present dissertation is to apply the GAM conceptual model to Portuguese consumers and understand the main factors affecting each stage of adoption, by analyzing with Partial Least Squares algorithm the data gathered through a questionnaire. The present dissertation will review the existing literature on the topic at hand and others viewed as relevant, as FinTech, digital banking, and mobile banking. Afterwards, the conceptual model, respective hypotheses, and methodology are drawn, and the data is gathered. By using *SmartPLS 3*, the Partial Least Squares algorithm and the Multigroup Analysis are applied to the data, and the results are analyzed and interpreted, so that conclusions can be drawn.

2. STUDY RELEVANCE AND IMPORTANCE

When analyzing the context surrounding mobile banking, it is found that the grounds for its development begun years ago, already with the promise of disrupting the sector (*Aladwani, 2001; Anagnostopoulos, 2018*). Nowadays, such vision is clearer than ever, especially given the rise of FinTech companies since 2008's financial crisis (*Lee & Shin, 2018*). Following the worldwide trend, the scenario is similar in Portugal.

Alongside with the development of new technologies in banking, academia studied comprehensively the respective adoption (*Daniel, 1999; Ibrahim, Joseph, & Ibeh, 2006; Singh, Sahni, & Kovid, 2020; Alkhowaiter, 2020*), recognizing the relevance of the technology for the sector but mostly for the consumers. By studying different angles of consumers' adoption in the digital banking context, researchers not only improve knowledge within academia, but also provide important benchmarks and consumer insights to banking companies.

In the present dissertation, it will be addressed the adoption of mobile banking, at the three service stages – static, interaction and transaction, a concept applied only once for mobile banking, by *Shareef, Baabdullah, Dutta, Kumar, & Dwivedi, 2018*. The referred study was based on the GAM model, developed by *Shareef, Kumar, Kumar, & Dwivedi, 2011*, and applied to the consumers of Bangladesh, in 2018. As such, one of the gaps addressed in the present dissertation is to study Portuguese consumers, applying the model to the context of a developed country, with a different economic and social structure. In addition, as this study is conducted three years later, with the Covid-19 Pandemic at the order of the day, its relevance is increased.

Besides the reasons presented, there is other significant aspect considered in the present study – the moderation effect. Such effect is widely studied in the literature for mobile banking (*Warsame & Ireri, 2018; Goularte & Zilber, 2018; Ryu, 2017; Alshurideh, Kurdi, Masa'deh, & Salloum, 2021; Chawla & Joshi, 2018; Kwateng, Atiemo, & Appiah, 2018*), but there is no study tackling moderation effect in each stage of mobile banking adoption, by considering as moderators gender, age, income level, education level, and occupation.

3. LITERATURE REVIEW

3.1. MOBILE BANKING GROUNDED IN FINTECH

The banking sector, as any other sector of the economy, is being challenged to distance itself from traditional practices, towards meeting the emergent needs of modern-day consumers (*Campanella, Della Peruta, & Del Giudice, 2017*). Accordingly, new companies are establishing themselves on the national and international stages, seizing the opportunity given by the digital paradigm and forcing recognized players to match their efforts (*Capgemini Research Institute, Efma, 2020*). When considering the Portuguese banking sector, even though adapting slower than other markets, FinTech applications are smoothing the path (*Autoridade da Concorrência, 2020*).

FinTech results from the contraction of the words “financial” and “technology”, for which numerous definitions were put forward, both at the academic and empirical level (*Schueffel, 2016*). For the purpose of the present dissertation, it will be used the scientific definition developed by Patrick Schueffel after reviewing more than two hundred academic articles, referent to forty years of research, resulting in the following “*FinTech is a new financial industry that applies technology to improve financial activities*” (*Schueffel, 2016*). On the empirical standpoint, the definition advanced by the Financial Stability Board (FSB), also adopted by the European Banking Authority (EBA) and the Basel Committee on Banking Supervision (BCBS), will be considered as well, justified by the topic in question and the recognized authority of such entities in the field. Hence, the definition for FinTech is as follows - “technologically enabled financial innovation that could result in new business models, applications, processes or products with an associated material effect on financial markets and institutions, and the provision of financial services” (*European Banking Authority, 2018; Thakor, 2019*).

In order to better understand FinTech, it will be easier to split it in distinct areas of impact. Similar to what was seen in its definition, there is no consensus within academia nor on practice of how many different areas can be defined. For the present dissertation, it will be considered the empirical division, presented by Bank for International Settlements (BIS) and BCBS, justified by the same reasoning as before (Figure 1). FinTech areas can be wrapped up in i) credit, deposit, and capital-raising services, ii) payments, clearing, and settlement services and iii) investment management services (*Bank for International Settlements, 2018; Thakor, 2019*). The areas to be further developed, on the light of the topic at hand, are i) credit, deposit, and capital-raising services, and ii) payments, clearing, and settlement services, which correspond to the second highest and highest number, respectively, of FinTech service providers, according to a survey carried out by BCBS on its members (*Bank for International Settlements, 2018*).

Credit, deposit, and capital-raising services include four sub-areas - crowdfunding, defined as “the financing of a task, idea, or project by making an open call for funding, mainly through Web 2.0 technologies” (*Hossain & Oparaocha, 2017*), marketplace lending or peer-to-peer (P2P) lending, referring to loans occurring in online platforms directly between borrowers and lenders, without banking intermediation (*Thakor, 2019*), mobile banks, defined by BIS as institutions taking deposits, which are covered by a deposit insurance scheme, providing banking services mainly through digital channels (*Bank for International Settlements, 2020*), and credit scoring, the rating of consumers that apply for credit (*Maldonado, Peters, & Weber, 2020*).

Figure 1. Fintech services by sector.

Sectoral innovations			
Credit, deposit, and capital-raising services	Payments, clearing and settlement services		Investment management services
Crowdfunding	Retail	Wholesale	High-frequency trading
Lending marketplaces	Mobile wallets	Value transfer networks	Copy trading
Mobile banks	Peer-to-peer transfers	FX wholesale	E-trading
Credit scoring	Digital currencies	Digital exchange platforms	Robo-advice

Source: Adapted from BCBS and Bank for International Settlements (2018).

Regarding payments, clearing, and settlement services, there is a division between retail and wholesale services. On the retail perspective, three sub-areas are considered – mobile wallets, or digital wallets, refers to a service that enables consumers to acquire electronic money through their smartphones and buy products and services with it (*Omarini, 2018*), peer-to-peer transfers, or peer-to-peer payment services, which are applications that grant consumers the possibility of associating their bank accounts and transferring money to other users directly, regardless of the bank of each one (*Caceres-Santamaria, 2020*), and digital currencies, or cryptocurrencies.

The latter is FinTech's most discussed area in literature (*Leong & Sung, 2018*). Digital currency is grounded on the concept of no intermediation on value exchange, that is, a decentralized system, leading to an absence of a traditional regulatory framework for such exchanges (*Dibrova, 2016*). From the empirical perspective, the definition provided by the European Central Bank (ECB) is as follows – “a digital representation of value, not issued by a central bank, credit institution or e-money institution, which, in some circumstances, can be used as an alternative to money” (*European Central Bank, 2015*). Notwithstanding, the growth of digital currency's disruptive potential has led central banks of different countries to study the possibility of issuing a central bank digital currency (CBDC), mainly to promote monetary and financial stability, suggesting a new landscape for digital currencies (*Bank for International Settlements, 2020; Bank of England, 2020*).

For the wholesale services, there are three sub-areas as well – business to business (B2B) point of sale, referring to payment services for transactions between companies, occurring mainly in the supply chain (*The Paypers, 2019*), foreign exchange (FX) wholesale, that is, the transaction of currencies between banks and other financial institutions (*Staszkiwicz & Staszkiwicz, 2015*), and digital exchange platform, which is understood as business to business decentralized transactions (*Mazur, 2020*).

By analyzing the inherent competition between FinTech companies and traditional banks, the competitive advantages of the former discussed in the literature regard the flexibility and rapidity to innovate, as physical capital is rare or nonexistent and, with the invention of cloud services, the needed resources can be rented at low cost (*Stulz, 2019*). Moreover, financial technologies benefit from intrinsic economies of scale (*Thakor, 2019*) – the average cost decreases as more clients are acquired (*Rosse, 1967*), hence contributing to the efficiency of financial systems (*Vučinić, 2020*). By simplifying multiple financial processes - as opening an account or applying for a loan - (*Gomber, Koch, & Siering, 2017*), FinTech companies operate on a transparency basis with their customers (*Vučinić, 2020*), leading to the third potential benefit, decrease in information asymmetry, a well-known intrinsic problem of the banking industry (*Amstad, 2020*). The latter can be illustrated by an academic paper,

published on the Asian Journal of Political Science, and following a model based on game theory, it was found that financial institutions manipulate their advisory services, to serve their self-interest, at the expense of consumers (*Han & Jang, 2013*).

The above-mentioned concern is inseparable from a worldwide challenge - low levels of financial literacy, which was “under 61% of the maximum financial literacy score”, according to the last survey conducted by the Organization for Economic Co-operation and Development (OECD) (*OECD, 2020*). Various effects were derived in the literature regarding this phenomenon, namely being negatively correlated with over-indebtedness (*Gathergood, 2011*), and positively correlated with engagement in financial markets (*Klapper, Lusardi, & Panos, 2013*), or individual welfare increase (*Grohmann, Kouwenberg, & Menkhoff, 2014*). Accordingly, the same problem escalates when considering other dimensions, such as small and medium-sized enterprises (SMEs), for which the literature suggests that superior financial literacy instigates appropriate access to external finance, being positively correlated with growth (*Hussain, Salia, & Karim, 2018*).

Lower levels of financial literacy were found to be a distinguishing feature of unbanked and underbanked households (*Breitbach & Walstad, 2014*). Unbanked individuals have no current or savings account (*Rhine & Greene, 2006*) and underbanked individuals own a bank account, but also make use of alternative financial services (AFS), not included in the traditional banking system (*Mylonidis, Chletsos, & Barbagianni, 2019*). AFS are a broad concept, encompassing numerous financial services, thus it will be used a five categories’ division, proposed by *Cliff A. Robb, Patryk Babiarz, Ann Woodyard, & Martin C. Seay, 2015* - payday loans (short-term loans based on the borrower’s current pay cycle), rent-to-own (loans based on product rental, for which are made low monthly payments, amounting to a total transaction cost higher than retail prices), auto-title loans (loans in which the borrower’s vehicle is used as collateral), tax refund anticipation loans (short-term loans based on the borrower’s tax refund), and pawn shops (short-term fixed-rate loans, in which the borrower’s personal property is used as collateral). All the presented financial services have in common the charging of high interest rates and, normally, no verification on the borrower’s ability to repay (*Robb, Babiarz, Woodyard, & Seay, 2015*).

In the light of the seclusion concerns raised above, there are controversial perspectives on the role FinTech companies will play. On the one hand, new FinTech entrepreneurs have the possibility to generate financial services seen as semi-formal, and able to be closer to consumers, by targeting specific points raised by unbanked individuals as reasons for not being a client of traditional banks (*Larios-Hernández, 2017*), or that financial technologies might be successful, in developing countries, if the consumer targeting is made based on local knowledge (*Buckley & Webster, 2016*). On the other hand, an individual may benefit from managing its account through digital channels, but consumers with no bank account will have no benefit at all. In addition, there is the “voluntary financial exclusion” obstacle, referring to consumers that are unwilling to use innovative forms of payment other than cash, justified by, in developing countries, not wanting to handle directly with financial services providers, having no awareness of digital financial services’ benefits, not being eligible for a loan through traditional banking channels, or lack of education on digital financial platforms (*Ozili, 2018*).

Even though there are academic studies in the literature predicting that FinTech’s competitive advantages will lead to an exponential growth, ruling out incumbent banks, other authors highlight the too-big-to-fail argument, in favor of traditional banks (*Li, Spigt, & Swinkels, 2017*). Notwithstanding,

competition within the banking sector is welcomed, due to the benefits it brings to society, namely increased efficiency, and new services, providing that such competition is duly regulated to ensure financial stability (Vives, 2019). On another perspective, Jooyong & Eunjung, 2016 call attention to one specific result achieved, that cooperation and partial integration between financial and non-financial companies, in the retail payments' market, can have more advantages for overall welfare than competition or replacement.

3.2. MOBILE BANKING – DEFINITION AND OUTLOOK

To understand how FinTech, banks, and mobile banking glue together, it is paramount to define a bank as well. Thus, “a bank is an institution whose current operations consist in granting loans and receiving deposits from the public”, corresponding to the definition that guides regulators and refers to the main activities of banks – deposits and loans (Freixas & Rochet, 2008). As observed previously in FinTech, banks also provide various financial services, grouped in four distinct areas - liquidity and payment services (referring to money changing and provision of payment services), transforming assets (which can be seen in three different perspectives - convenience of denomination, quality transformation, and maturity transformation), managing risks (arising from credit risk, interest rate risk, liquidity risk, and off-balance-sheet operations), and monitoring and information processing (as a solution for the problem of imperfect information on borrowing) (Freixas & Rochet, 2008).

Regarding the concept of digital banking, it is surrounded with misconceptions and confusion, namely because it has different names pointing to the same concept, both in academic and practical settings – “electronic banking”, “virtual banking”, “self-service banking”, “Banking 2.0” and “electronic fund transfer” (Shaikh & Karjaluto, 2016). Accordingly, the definition adopted is the following – “digital banking is an any day, anytime, and anywhere banking system consisting of a variety of alternative delivery channels, products, and services developed and deployed by a banking company or microfinance institute so that consumers can access banking information to conduct financial and non-financial transactions using an electronic device – commonly, but not exclusively, an ATM, the Internet, cell phone, smartphone, tablet, etc.” (Shaikh & Karjaluto, 2016). It is in this context that the concept of mobile banking arises, which is included in the delivery channels of digital banking - online, internet, and mobile banking (Shaikh & Karjaluto, 2016; Shaikh, Karjaluto, & Chinje, 2015). For the context of the present dissertation, the definition of mobile banking to be adopted is the one proposed by Tam & Oliveira, 2016 - “M-banking is a service or product offered by financial institutions that makes use of portable technologies”.

Even though nowadays' innovations in banking are unparalleled, digital banking is not a new topic. With the invention of the internet and consequently of electronic commerce, digital banking started its growth path, and it was not clear which banking areas or services would be the most impacted (Aladwani, 2001), but such early versions of digital banking were developed by traditional banks, subjects to a regulatory framework (Anagnostopoulos, 2018). The current digital paradigm in banking emerged mainly after the 2008's financial crisis, with the appearance of new FinTech players in the market (Lee & Shin, 2018). It has been argued that the current disruption in banking can be analyzed under the disruptive innovation model, which states that, as incumbent firms aim to satisfy the high end of the market (translated in higher profitability), the needs of low end and many mainstream consumers are neglected, providing an opening for new firms, that will eventually move upmarket to benefit from higher profitability and challenge incumbent companies (Anagnostopoulos, 2018). On the

one hand, it is demonstrated that FinTech companies can negatively and significantly impact banks' performance, especially state-owned and mature banks (*Phan, Narayan, Rahman, & Hutabarat, 2020*). On the other hand, evidence is found that FinTech innovations can increase banks' efficiency and improve the technology used (*Lee, Li, Yu, & Zhao, 2021*), reinforcing the advantages of cooperation mentioned before.

Since 2008, the number of bank branches in the European Union decreased from 237,7 thousand to 174 thousand, in 2018 (*statista, 2020*) and the low profitability of European banks has been a cause for concern of regulators (*Feng & Wang, 2018*). Recently, banks started to acknowledge the threat posed by FinTech, in a restrained manner though (*Bunea, Kogan, & Stolin, 2016*), being the different impacts comprehensively studied in the literature. Particularly, *Berg, Burg, Gombović, & Puri, 2019* demonstrate that information from the digital footprint is equivalent to the content of credit bureau scores, arguing that it brings a significant complementary advantage to traditional credit scores. Additionally, *Dobbie, Liberman, Paravisini, & Pathania, 2018* found considerable bias in consumer lending against immigrant and older applicants and show that machine learning can help reduce such bias.

When considering what might distinguish banks from FinTech competition, one factor pointed in the literature is relationship banking (*Thakor, 2019*). For the purpose of the present dissertation, the definition of relationship banking to be considered is “the provision of financial services by a financial intermediary that invests in obtaining customer-specific information, often proprietary in nature, and evaluates the profitability of these investments through multiple interactions with the same customer over time and/or across products”, as opposed to transaction banking, which is referred to be associated with the capital market, based on a single transaction occurring with the client, at a given point in time, and no relevant information on the client being collected (*Boot, 2000; Thakor, 2019*). FinTech companies are also considered to be closer to a transaction-oriented model (*Thakor, 2019; Jakšič & Marinč, 2019*), and relationship lending is likely to play an important role in market segmentation, since borrowers with less available information, or digital footprint, will remain dependent on relationship lending, but borrowers with a more extensive digital footprint will lean towards FinTech's transaction lending solutions (*Boot, Hoffmann, Laeven, & Ratnovski, 2021*).

On the one hand, it is argued that relationship banking is still a competitive advantage for banks, considering that geographic and cultural proximity with consumers is important, and hence human bankers cannot be completely replaced by artificial intelligence yet, as technology support is still just complementary (*Jakšič & Marinč, 2019*). On the other hand, applying algorithms based on hard data to make lending decisions, for instance, eliminates bankers' possible discretion, a factor documented as not leading to a better lending decision (*Liberti & Petersen, 2018*).

As a consequence, banks started to adapt to the new scenario, by adopting new technologies and investing in specialized human capital, so that an answer can be provided to the new expectations from customers, namely regarding transparency and user-friendliness of interfaces (*Vives, 2019*). Notwithstanding, it is important to acknowledge that there are different types of consumers, with various needs, behaviors, and perceptions. On the one hand, older clients, that have been clients of a specific bank for years, highlighting consumer loyalty importance, and on the other hand, a tech-savvy young generation, fueling the FinTech paradigm and demanding from traditional banks a quick response, to maintain its positioning in the market (*Anand & Mantrala, 2018*).

3.3. FACTORS INFLUENCING ADOPTION OF MOBILE BANKING

The adoption of mobile banking by consumers is widely studied by academia, regarding the entire time spectrum between electronic banking innovations of the 90's (Daniel, 1999; Ibrahim, Joseph, & Ibeh, 2006) and state-of-the-art's FinTech companies providing banking services (Singh, Sahni, & Kovid, 2020; Alkhowaiter, 2020). When analyzing the factors affecting mobile banking adoption, two models stand out in the literature – the technology acceptance model (TAM), which came to light in 1989 (Davis, 1989), build from the theory of reasoned action (TRA) (Fishbein & Ajzen, 1975) and heavily applied and improved ever since (Sharma, 2019), and the unified theory of acceptance and use of technology (UTAUT), the model that derived from the combination of different models of technology acceptance, including TAM, outperforming the previous models both on variance in behavioral intention and technology use (Dwivedi, Rana, Jeyaraj, Clement, & Williams, 2017; Alqahtani & Al-Badi, 2017; Alalwan, Dwivedi, Rana, & Algharabat, 2018; Merhi, Hone, & Tarhini, 2019).

Originally, TAM was based only on two measures - perceived ease of use and perceived usefulness -, leading to numerous extensions over the years to improve its explaining capability (Sharma, 2019). Different constructs were considered, alongside TAM, to explain adoption of mobile banking, namely perceived enjoyment, information on online banking, security and privacy, and quality of internet connection (Pikkarainen, Pikkarainen, Karjaluoto, & Pahnla, 2004), or the combination with computer efficacy, attitude, perceived risk, and intention (Fawzy & Esawai, 2017), or integrating with trust and attitude (Al-Ajam & Nor, 2013). Besides, it is also combined with various models, such as the self-determination theory, based on intrinsic and extrinsic motivations (Sharma, 2019), or with the innovation diffusion theory, which explains various types of usage and continual usage (Giovanis, Binioris, & Polychronopoulos, 2012), or even used as a benchmark to develop new models, namely the value-based adoption model (Kim, Chan, & Gupta, 2007).

UTAUT is grounded on four variables - performance expectancy, effort expectancy, social influence, and facilitating conditions – and four moderating variables – gender, age, experience, and voluntariness of use (Im, Hong, & Kang, 2011). The model has been applied to the study of mobile banking adoption, not only in its original form (Yu, 2012), but also its extended version, UTAUT2, adding three main variables - price value, habit, and hedonic motivation (Kwateng, Atiemo, & Appiah, 2018). As seen previously in TAM, UTAUT is also combined with different determinants, to better explain mobile banking adoption, specifically electronic service quality (Rahi, Mansour, Alghizzawi, & Alnaser, 2019), perceived risk (Oliveira & Popovič, 2014), website design and usage behavior (Qeisi & Al-Abdallah, 2014), or mass media and trust (Gharaibeh & Arshad, 2018). Accordingly, it is used alongside other models as well, such as the task technology fit model, which implies that adoption occurs if the technology in question executes efficiently (Zhou, Lu, & Wang, 2010), task technology fit model and initial trust model, stating that convenience, flexibility, and perceived benefits are important constructs for initial trust formation (Oliveira, Faria, Thomas, & Popovič, 2014), and diffusion of innovation model, based on four elements of diffusion - innovation, communication channel, time and social system (Rahi & Ghani, 2018). In the same logic, academic papers applied both TAM and UTAUT to better understand mobile banking adoption, for example Boonsiritomachai & Pitchayadejanant, 2017, with the main objective of determining the mediating effect of hedonic motivation on independent mobile banking adoption.

The application of such models has the objective of verifying which factors are the most influential on mobile banking adoption. Various results are found in the literature, regarding the main predictors, for instance, trust and autonomous motivation (*Sharma, 2019*), performance expectancy, effort expectancy, hedonic motivation, price value and perceived risk (*Alalwan, Dwivedi, Rana, & Algharabat, 2018*), habit, perceived security, perceived privacy and trust (*Merhi, Hone, & Tarhini, 2019*), perceived usefulness and information on online banking (*Pikkarainen, Pikkarainen, Karjaluoto, & Pahnla, 2004*), website characteristics, computer efficacy and perceived risk (*Fawzy & Esawai, 2017*), perceived relative advantages, perceived ease of use and trust (*Al-Ajam & Nor, 2013*), perceived compatibility, perceived usefulness, perceived ease of use and perceived security and privacy risk (*Giovanis, Binioris, & Polychronopoulos, 2012*), perceived value (*Kim, Chan, & Gupta, 2007*), social influence, perceived financial cost, performance expectancy and perceived credibility (*Yu, 2012*), habit, price value and trust (*Kwateng, Atiemo, & Appiah, 2018*), innovativeness and perceived technology security (*Rahi, Mansour, Alghizzawi, & Alnaser, 2019*), perceived risk, performance expectancy, effort expectancy and social influence (*Oliveira & Popovič, 2014*) or electronic word of mouth, mediated by initial trust (*Shankar, Jebarajakirthy, & Ashaduzzaman, 2020*).

For FinTech adoption, influential factors are also pointed out in the literature, specifically trust, perceived usefulness, innovativeness, government support, or brand image, according to a study based on an extended TAM (*Hu, Ding, Li, Chen, & Yang, 2019*). In addition, the legal risk was found to be an important predictor, with a negative effect, such as convenience, with a positive effect, but both moderated by being an early or late adopter (*Ryu, 2017*). Notwithstanding, a similar study in Brazil, did not find the legal risk factor as being significant, contrarily to economic benefits for early adopters and seamless transactions for late adopters (*Mascarenhas, Perpétuo, Barrote, & Perides, 2020*).

On an unique perspective, *Shareef, Baabdullah, Dutta, Kumar, & Dwivedi, 2018* propose that intention to adopt mobile banking differs according to service stages, namely static, which consists of verifying account or investment information, interaction, regarding any form of two-sided communication, and transactional stage, referring to sensitive financial operations, for instance, money transfer between accounts or payments of bills. Therefore, it is applied the E-Government Adoption Model (GAM), brought to light with the objective of studying the factors influencing e-Government, government services presented through communication and information technologies, at different stages of service maturity (*Shareef, Kumar, Kumar, & Dwivedi, 2011*), a scenario considered by *Shareef, Baabdullah, Dutta, Kumar, & Dwivedi, 2018* as having several similarities (such as technology or service delivery channel) with mobile banking adoption. The findings reveal that perceived functional benefit and perceived ability to use are the drivers of intention to adopt across the three stages, trust stands out in the static stage and security at the transaction one.

The division of adoption in service stages is mostly influenced by such division in e-government services, presented in different studies (*Shareef M. A., Kumar, Kumar, & Dwivedi, 2011; Rorissa, Demissie, & Pardo, 2011; Karokola & Kowalski, 2012; Jayashree & Marthandan, 2010; Lee J. , 2010*), and the application of such concepts in other fields is timidly explored in the literature. Even though the factors influencing mobile banking adoption as a whole are well studied in the literature, so as the differences in adoption for different banking channels (*Natarajan, Balasubramanian, & Manickavasagam, 2010; Mishra & Singh, 2015; Hoehle, Scornavacca, & Huff, 2012; Baabdullah, et al., 2019*), the adoption in different stages was approached only by *Shareef, Baabdullah, Dutta, Kumar, & Dwivedi, 2018*, within the mobile banking context, and was not tested yet in a developed country.

3.4. MODERATION EFFECT

Besides the direct effect of a given variable on mobile banking, the moderation effect is widely discussed in the literature (*Warsame & Ireri, 2018; Goularte & Zilber, 2018; Ryu, 2017; Alshurideh, Kurdi, Masa'deh, & Salloum, 2021; Chawla & Joshi, 2018; Kwateng, Atiemo, & Appiah, 2018*). A moderator variable refers to a variable that influences the relation between two others, altering the magnitude of the effect one causes in the other (*Aguinis, Edwards, & Bradley, 2017; Memon, et al., 2019*).

Within the mobile banking context, it is called attention for the role of gender and religious beliefs as a moderator variable, according to a study developed in Kenya (*Warsame & Ireri, 2018*), and other one in United Arab Emirates, highlighting the importance of gender as a moderator on electronic payment technology acceptance (*Alshurideh, Kurdi, Masa'deh, & Salloum, 2021*). Moreover, it was found in Korea that the user type, early or late adopter, moderates the adoption of FinTech (*Ryu, 2017*). A more comprehensive study, developed in India, found that gender, age, qualification, experience, occupation, income, and marital status were significant moderating variables, whereas educational background was not (*Chawla & Joshi, 2018*). In the same logic, a study on Ghana consumers found that gender, age, educational level, and user experience are relevant moderators (*Kwateng, Atiemo, & Appiah, 2018*). On the other hand, a study applied in Brazil revealed that cultural factors, represented by Hofstede cultural dimensions, are not relevant moderators for mobile banking (*Goularte & Zilber, 2018*).

4. THEORETICAL FRAMEWORK

Shareef, Baabdullah, Dutta, Kumar, & Dwivedi, 2018 addressed a clear gap in the literature for mobile banking adoption, by proposing that the factors influencing adoption differ between adoption stages. Such result was achieved by applying the GAM model, developed by *Shareef, Kumar, Kumar, & Dwivedi, 2011*, who comprehensively explore different factors affecting e-Government services adoption at different stages. The model was applied to mobile banking because regarding “technology, operation, self-service technology, virtual medium, security requirements, and service delivery channel”, the adoption behavior is similar to e-Government adoption. Accordingly, the general model is based on five main constructs – attitude to use, ability to use, assurance to use, adherence to use and adaptability to use. Each construct considers one or more factors, in a total of fourteen factors affecting, directly or indirectly, e-Government adoption. Considering the different stages of adoption, two models were derived – GAM (S), for the static stage, and GAM (I), for the interaction stage. In a later study, the model for the transaction stage, GAM (T), was developed, grounded on ability to use and assurance to use (*Shareef, Kumar, & Dwivedi, 2014*).

From the final GAM, *Shareef, Baabdullah, Dutta, Kumar, & Dwivedi, 2018*, a revised version of the general model was applied to the context of mobile banking, with four main constructs – attitude to use, ability to use, assurance to use, and adherence to use, each one composed by different independent variables that influence mobile banking adoption. In the study developed, *Shareef M. A., Kumar, Kumar, & Dwivedi, 2011* considered the adoption of e-Gov a continuous process, which begins with “awareness of the system, beliefs of the system benefits, attitude toward using it, intention to use, actual use, satisfaction, and recurring use”, justifying the division in five constructs (however, *Shareef, Baabdullah, Dutta, Kumar, & Dwivedi, 2018* found that four constructs would fit better within the mobile banking context).

4.1. CONCEPTUAL MODEL DESCRIPTION

The first construct is composed by three variables – perceived awareness (PA), availability of resources (AOR), and computer-self efficacy (CSE). Perceived awareness is described in the literature as the degree consumers deem to be sufficient to learn and understand the characteristics, benefits and challenges of mobile banking, and being able to operate with it (*Shareef, Baabdullah, Dutta, Kumar, & Dwivedi, 2018; Fonchamnyo, 2012; Santini, Ladeira, Sampaio, Perin, & Dolci, 2019*). Availability of resources is referred as the technological resources and infrastructure necessary to use mobile banking, in terms of freedom to access, speed, and cost (*Shareef, Baabdullah, Dutta, Kumar, & Dwivedi, 2018; Jaruwachirathanakul & Fink, 2005*). The last variable, computer-self efficacy, is described as the perceived capacity to use, interact, and perform transactions on a mobile banking service, with no or minimal assistance, defining the usefulness of the latest technologies (*Shareef, Baabdullah, Dutta, Kumar, & Dwivedi, 2018; Nasri & Zarai, 2014; Zainab, Bhatti, & Alshagawi, 2017; Sharma & Govindaluri, 2014*). These predicted variables are categorized as the “attitude to use”, because *Shareef M. A., Kumar, Kumar, & Dwivedi, 2011* considered that perceived awareness is the first stimulus in inducing attitude, availability of resources develops a belief to use, leading to an attitude to use, and computer self-efficacy regards the perception of skills one has, regardless of the actual skills.

For the second construct, ability to use, two predicted variables are laid out – perceived ability to use (PATU) and multilingual option (MLO). The first variable implies the technological, organizational, and

psychological perspectives, referring to the judgement of one's competence in using mobile banking systems (Shareef M. A., Kumar, Kumar, & Dwivedi, 2011; Shareef, Baabdullah, Dutta, Kumar, & Dwivedi, 2018). In addition, multilingual option regards the availability of different primary languages in digital banking systems, enhancing the ability to use with better service quality (Shareef M. A., Kumar, Kumar, & Dwivedi, 2011; Shareef, Baabdullah, Dutta, Kumar, & Dwivedi, 2018).

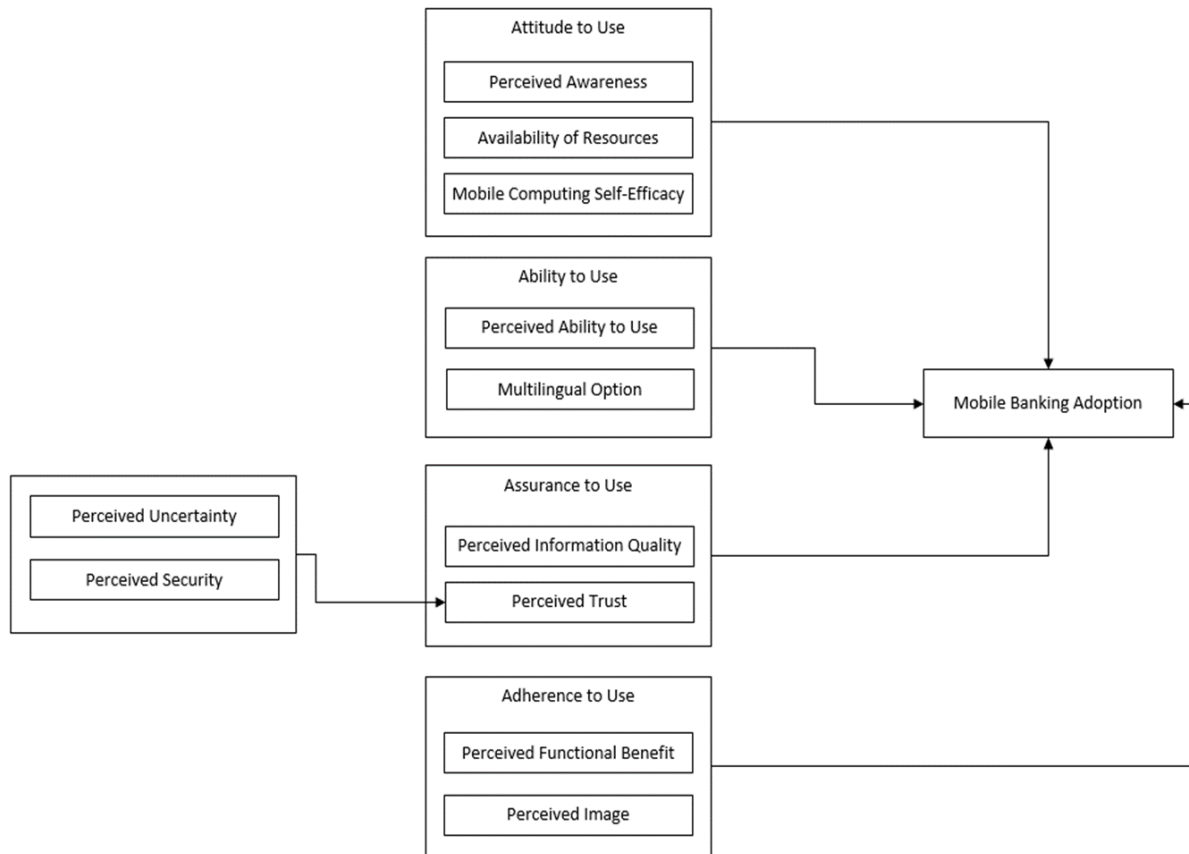
The third construct, assurance to use, is grounded on perceived information quality (PIQ) and perceived trust (PT), being proposed that the latter is influenced by perceived uncertainty (PU) and perceived security (PS). Perceived information quality regards the completeness, accuracy, format, and currency provided by the mobile banking system, as it is understood by the customer (Shareef, Baabdullah, Dutta, Kumar, & Dwivedi, 2018; Jayasiri, Gunawardana, & Dharmadasa, 2016; Milan, Suélen, Toni, & Eberle, 2015). Concerning the variable perceived trust, it is defined as the consumer judgement of confidence "for reliability, credibility, safety, and integrity of mobile banking system from the technical, organizational, social, and political standpoints and also from the effective, efficient, prompt, and sympathetic customer service response", regardless of the possibility to control the banks' actions (Shareef, Baabdullah, Dutta, Kumar, & Dwivedi, 2018; Yousafzai, Pallister, & Foxall, 2003; Mokhtar, Katan, & Hidayat-ur-Rehman, 2017). Both constructs reflect the confidence in using mobile banking, being characterized as the assurance to use (Shareef M. A., Kumar, Kumar, & Dwivedi, 2011).

Given the complexity and the numerous studies on perceived trust, Shareef M. A., Kumar, Kumar, & Dwivedi, 2011 proposed perceived uncertainty and perceived security would influence perceived trust. The first variable is defined as the level of risk understood by consumers in each transaction, justified by unknown situations impacting the mobile banking system and referring to different dimensions, namely financial or operational (Shareef, Baabdullah, Dutta, Kumar, & Dwivedi, 2018; Bazgosha, Eizi, Nawaser, & Parhizgar, 2012). Regarding perceived security, it is described as the consumers' judgement on whether it is safe to share personal information, within the mobile banking context, both on the interaction and transaction stages, with the belief that the provider will take the appropriate actions to protect such information from security breaches (Shareef, Baabdullah, Dutta, Kumar, & Dwivedi, 2018; Balapour, Nikkhah, & Sabherwal, 2020).

Adherence to use, the last construct, includes two variables – perceived functional benefit (PFB) and perceived image (PI). Perceived functional benefit is found to have economic, organizational, marketing, behavioral, and social dimensions, being the level to which consumers acknowledge both the absolute and relative practical advantages of using mobile banking, at the expense of using traditional physical branches (Shareef, Baabdullah, Dutta, Kumar, & Dwivedi, 2018; Shareef M. A., Kumar, Kumar, & Dwivedi, 2011). The second predicted variable is described as the extent to which the use of mobile banking is believed, in terms of behavior and culture, to enhance social status (Shareef, Baabdullah, Dutta, Kumar, & Dwivedi, 2018; Abdulkadir, Galoji, & Razak, 2013; Mohammadi, 2015). Both variables are classified as adherence to use because Shareef M. A., Kumar, Kumar, & Dwivedi, 2011 considered those as conveying reasons to adopt.

The general model defined is depicted below:

Figure 2. Proposed theoretical model.



Source: Adapted from Shareef, Baabdullah, Dutta, Kumar, & Dwivedi, 2018.

In order to model the adoption in three stages, three dependent variables were defined – MBA, standing for mobile banking adoption, (S), for the static stage, MBA (I), regarding the interaction stage, and MBA (T), for the transaction stage. Each variable is characterized by the activities it accounts for, reflecting a decision to accept and use mobile banking systems for such activities, as one requires, with the positive perception of benefiting from a competitive advantage. MBA (S) regards checking account balance, account status, and account transaction, searching account and investment information and interest rates, or downloading forms for account related functions. In MBA (I), it is considered interacting and seeking customer services to pose questions, for different financial reasons. For MBA (T), the activities considered are transactions to transfer money from one account to another and/or pay bills.

In addition to the conceptual model explained above, it will be analyzed the impact of five demographic moderator variables – gender, age, education level, occupation, and income level – in all the constructs defined, in order to verify if there are different patterns of adoption behavior within distinct groups.

4.2. CONCEPTUAL HYPOTHESES

For perceived awareness, Shareef, Baabdullah, Dutta, Kumar, & Dwivedi, 2018 hypothesized that the variable had a positive relation with adoption of mobile banking, finding that it was only relevant at the static stage. Other authors (Daud, Kassim, Said, & Noor, 2011; Fonchamnyo, 2012) also found a

significant, positive relation with adoption of mobile banking. In this line, the following hypothesis is drawn:

H1. Perceived awareness (PA) has a positive relation with mobile banking adoption.

Availability of resources and computer-self efficacy were proposed as having a positive relation with mobile banking as well, but the data gathered revealed that neither one was relevant in any stage. Regarding computer-self efficacy, studies (Ndubisi, 2006; Guriting, Chunwen, & Ndu, 2007) show, however, that it can be an important factor for adoption of mobile banking. For availability of resources, no studies were found revealing its importance, but for the sake of applying to new data the model put forward by Shareef, Baabdullah, Dutta, Kumar, & Dwivedi, 2018. Accordingly, two hypotheses are laid out:

H2. Availability of resources (AOR) has a positive relation with mobile banking adoption.

H3. Computer-self efficacy (CSE) has a positive relation with mobile banking adoption.

In the second construct, for perceived ability to use, a positive relation with adoption of mobile banking was proposed, and the data revealed it to be relevant at the three phases. Different studies (Shareef M. A., Kumar, Kumar, & Dwivedi, 2011; Akram & Malik, 2012; Kenny & Connolly, 2017) also find it to be a relevant variable for the adoption of new technologies. Thus, it is presented the following hypothesis:

H4. Perceived ability to use (PATU) has a positive relation with mobile banking adoption.

On the other hand, multilingual option, hypothesized as having a positive relation with mobile banking adoption, was found as not relevant in any stage. Even though the authors did not obtain a relevant result, and no other studies were found attesting its importance in mobile banking adoption, for the sake of the model presented, it is proposed the following hypothesis:

H5. Multilingual option (MLO) has a positive relation with mobile banking adoption.

Considering the third construct, in what concerns perceived information quality, also hypothesized as having a positive relation with mobile banking adoption, it was found to be relevant in both static and interaction stages. Moreover, Ezeh & Nkamnebe, 2018 corroborated this finding and Mathew, Jose, G, & Chacko, 2020 discovered that, in the light of e-service recovery satisfaction in banking, this variable was the most significant predictor. Accordingly, the following hypotheses is proposed:

H6. Perceived information quality (PIQ) has a positive relation with mobile banking adoption.

For perceived trust, hypothesized as having a positive relation with mobile banking adoption, it was only found to be relevant in the static phase. Barkhordari, Nourollah, Mashayekhi, Mashayekhi, & Ahangar, 2016 studied perceived trust impact on e-payment services adoption, and realized that it was an important predictor as well. So did Mokhtar, Katan, & Hidayat-ur-Rehman, 2017, when

discovering that perceived trust impacted positively mobile banking adoption. Hence, the following hypotheses is proposed:

H7. Perceived trust (PT) has a positive relation with mobile banking adoption.

Regarding the two variables influencing perceived trust, perceived uncertainty and perceived security, hypothesized as having a negative and positive relation with trust of mobile banking, respectively, both were found to be relevant at all stages. For perceived uncertainty, *Liu, Huang, & Zhu, 2008* validated that it presents a negative relation with trust as well, and *Yousafzai, Pallister, & Foxall, 2009* corroborated the positive relation of perceived security with trust. Accordingly, the next hypothesis are drawn:

H8. Perceived uncertainty (PU) has a negative relation with trust of mobile banking.

H9. Perceived security (PS) has a positive relation with trust of mobile banking.

Lastly, in the fourth construct, perceived functional benefit and perceived image were both hypothesized as having a positive relation with mobile banking adoption, but only perceived functional benefit was found to be relevant in the three stages, contrarily to perceived image, that was not relevant at all. *Shareef M. A., Kumar, Kumar, & Dwivedi, 2011* found perceived functional benefit to be relevant at the static stage of e-Gov adoption and perceived image at the interaction stage. For perceived image, only one study (*Bashir & Madhavaiah, 2015*) found it to be relevant for adoption, but for the sake of the model presented, it will be considered, and the following hypotheses are proposed:

H10. Perceived functional benefit (PFB) has a positive relation with mobile banking adoption.

H11. Perceived image (PI) has a positive relation with mobile banking adoption.

To close the topic of conceptual hypothesis, *Shareef, Baabdullah, Dutta, Kumar, & Dwivedi, 2018* found that perceived security was a strong predictor in the transaction phase, even though no relation was hypothesized between perceived security and mobile banking adoption. The referred finding is corroborated by *Baabdullah, Alalwan, Rana, Patil, & Dwivedi, 2019; Ong & Lin, 2015* and *Salimon, Yusoff, & Mokhtar, 2016*. Accordingly, the last hypotheses is defined as follows:

H12. Perceived security (PS) has a positive relation with mobile banking adoption.

The following table summarizes the hypotheses defined above and the respective literature:

Table 1. Theoretical framework.

Topics Definition	Literature Review	Hypotheses
Adoption of mobile banking at the static stage	<i>Shareef, Baabdullah, Dutta, Kumar, & Dwivedi, 2018; Shareef, Kumar, Kumar, & Dwivedi, 2011; Shareef M. A., Kumar, Kumar, & Dwivedi, 2011; Rorissa, Demissie, & Pardo, 2011; Karokola & Kowalski, 2012; Jayashree & Marthandan, 2010; Lee J., 2010</i>	-
Adoption of mobile banking at the interaction stage	<i>Shareef, Baabdullah, Dutta, Kumar, & Dwivedi, 2018; Shareef, Kumar, Kumar, & Dwivedi, 2011; Shareef M. A., Kumar, Kumar, & Dwivedi, 2011; Rorissa, Demissie, & Pardo, 2011; Karokola & Kowalski, 2012; Jayashree & Marthandan, 2010; Lee J., 2010</i>	-
Adoption of mobile banking at the transaction stage	<i>Shareef, Baabdullah, Dutta, Kumar, & Dwivedi, 2018; Shareef, Kumar, Kumar, & Dwivedi, 2011; Shareef M. A., Kumar, Kumar, & Dwivedi, 2011; Rorissa, Demissie, & Pardo, 2011; Karokola & Kowalski, 2012; Jayashree & Marthandan, 2010; Lee J., 2010</i>	-
Perceived awareness	<i>Shareef, Baabdullah, Dutta, Kumar, & Dwivedi, 2018; Daud, Kassim, Said, & Noor, 2011; Fonchamnyo, 2012</i>	PA has a positive relation with mobile banking adoption.
Availability of resources	<i>Shareef, Baabdullah, Dutta, Kumar, & Dwivedi, 2018</i>	AOR has a positive relation with mobile banking adoption.
Computer-self efficacy	<i>Shareef, Baabdullah, Dutta, Kumar, & Dwivedi, 2018; Ndubisi, 2006; Guriting, Chunwen, & Ndu, 2007</i>	CSE has a positive relation with mobile banking adoption.
Perceived ability to use	<i>Shareef, Baabdullah, Dutta, Kumar, & Dwivedi, 2018; Shareef M. A., Kumar, Kumar, & Dwivedi, 2011; Akram & Malik, 2012; Kenny & Connolly, 2017</i>	PATU has a positive relation with mobile banking adoption.
Multilingual option	<i>Shareef, Baabdullah, Dutta, Kumar, & Dwivedi, 2018</i>	MLO has a positive relation with mobile banking adoption.
Perceived information quality	<i>Shareef, Baabdullah, Dutta, Kumar, & Dwivedi, 2018; Ezeh & Nkamnebe, 2018; Mathew, Jose, G, & Chacko, 2020</i>	PIQ has a positive relation with mobile banking adoption.
Perceived trust	<i>Shareef, Baabdullah, Dutta, Kumar, & Dwivedi, 2018; Barkhordari, Nourollah, Mashayekhi, Mashayekhi, & Ahangar, 2016; Mokhtar, Katan, & Hidayat-ur-Rehman, 2017</i>	PT has a positive relation with mobile banking adoption.
Perceived uncertainty	<i>Shareef, Baabdullah, Dutta, Kumar, & Dwivedi, 2018; Liu, Huang, & Zhu, 2008</i>	PU has a negative relation with trust of mobile banking.
Perceived security	<i>(1) Shareef, Baabdullah, Dutta, Kumar, & Dwivedi, 2018; Yousafzai, Pallister, & Foxall, 2009; (2) Shareef, Baabdullah, Dutta, Kumar, & Dwivedi, 2018; Baabdullah, Alalwan, Rana, Patil, & Dwivedi, 2019; Ong & Lin, 2015; Salimon, Yusoff, & Mokhtar, 2016</i>	(1) PS has a positive relation with trust of mobile banking; (2) PS has a positive relation with mobile banking adoption.
Perceived functional benefit	<i>Shareef, Baabdullah, Dutta, Kumar, & Dwivedi, 2018; Shareef M. A., Kumar, Kumar, & Dwivedi, 2011</i>	PFB has a positive relation with mobile banking adoption.
Perceived image	<i>Shareef, Baabdullah, Dutta, Kumar, & Dwivedi, 2011; Bashir & Madhavaiah, 2015</i>	PI has a positive relation with mobile banking adoption.

Source: By author.

5. METHODOLOGY

Considering the hypothesis laid out in the previous chapter and the main objectives of the present dissertation, that has the general goal of studying the adoption of mobile banking, in the Portuguese market, by applying the constructs defined in the GAM model, by *Shareef M. A., Kumar, Kumar, & Dwivedi, 2011*, and revised by *Shareef, Baabdullah, Dutta, Kumar, & Dwivedi, 2018* for the context of mobile banking. Accordingly, the methodology to be applied is based on both studies.

The first step was defining the objectives to be achieved with the research study and the research questions to be answered, establishing the path for the literature review that followed. After defining the main concepts, discussing the main models and variables found to affect mobile banking adoption, the model used, the GAM model, was presented and each of its constructs explained. In line with the model, conceptual hypotheses are laid out and justified by the existing literature. To test the model, a questionnaire will be delivered online and in paper, so that data on Portuguese consumers can be gathered, within the scope of mobile banking adoption. Such data will be cleaned and analyzed, under the light of partial least squares (PLS), a regression model defined as “a general method which supported modeling causal paths among any number of “blocks” of variables (latent variables), somewhat akin to covariance-based structural equation modeling” (*Garson, 2016*). The application of PLS in the field at hand is corroborated by *Khasawneh, 2015; Mahfuz, Khanam, & Mutharasu, 2016; Thaker, Pitchay, Thaker, & Amin, 2019; Zhou, Lu, & Wang, 2010; Yu, 2012* and *Oliveira, Faria, Thomas, & Popovič, 2014*.

Following the reasoning explained above, the present research design has a quantitative character, defined by *Creswell & Creswell, 2018* as “an approach for testing objective theories by examining the relationship among variables”, which fits within the current dissertation context. In this line, the method chosen is a survey, conceptualized as “a research strategy in which quantitative information is systematically collected from a relatively large sample taken from a population” (*Leeuw, Hox, & Dillman, 2008*). As mentioned before, the questionnaire will be directed to the audience electable to open a bank account (over eighteen years old), residing in Portugal, with the goal of gathering as much data as possible, so that the sample is significant, and the model can produce relevant results.

To briefly characterize the Portuguese banking market, banks are included in the category “credit institutions”, defined by Bank of Portugal, the supervisory authority of the Portuguese banking market (*Banco de Portugal, 2021*). The market is composed by 28 banks, authorized by Bank of Portugal (*Banco de Portugal, 2021*).

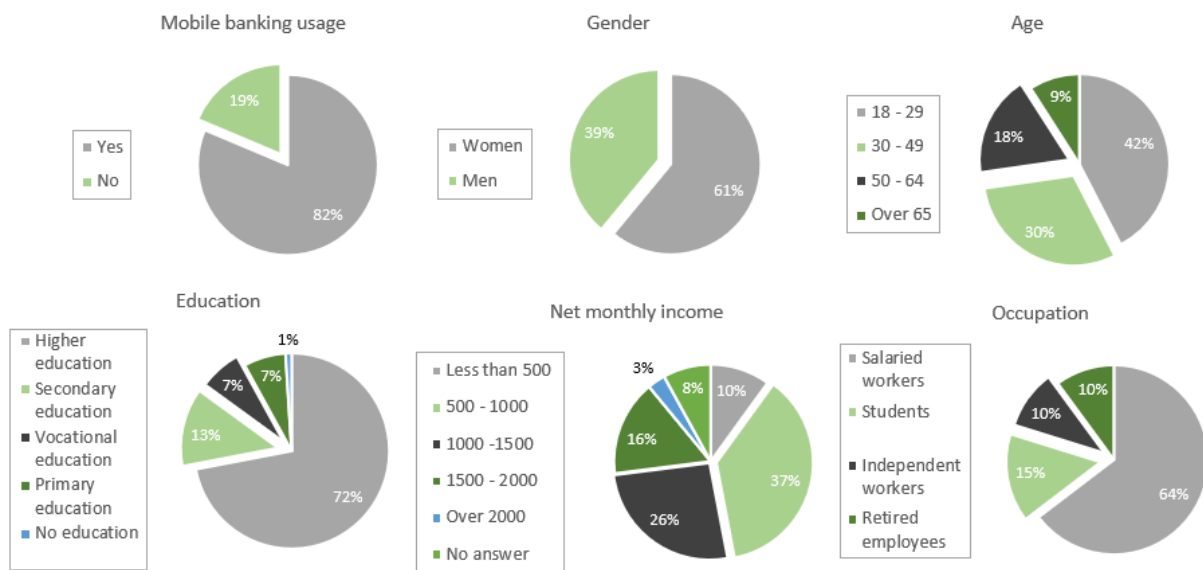
5.1. DATA PREPARATION AND SAMPLE CHARACTERIZATION

Before performing path analysis, the data must be treated, namely in what refers to missing data, suspicious response patterns, outliers, and data distributions (*Hair, Black, Babin, & Anderson, 2014; Hair, Hult, Ringle, & Sarstedt, 2017*). For the present context, missing data and outliers are not an issue, as all the questions were pre-defined as mandatory in the online questionnaire (and verified on the ones in paper) and the possible answers were provided in categories, with multiple-choice logic. Regarding suspicious response patterns, one was found as straight lining response and accordingly removed from the dataset, considering that such data points reduce variability (*Cheah, Thurasamy, Memon, Chuah, & Ting, 2020*). For data distribution, even though the algorithm does not require the

data to be normally distributed, one should be cautious with extreme nonnormal data (Hair, Hult, Ringle, & Sarstedt, 2017; Hair, Ringle, & Sarstedt, 2011). To assess data normality, *SmartPLS 3* provides the values of each indicator's excess kurtosis and skewness. For the present data sample, none of the indicator variables present values too far from the defined thresholds – values between -1 and 1, for both excess kurtosis and skewness (Hair, Hult, Ringle, & Sarstedt, 2017). The last step was to perform data transformation, regarding changing non-numerical categories to numerical values.

The questionnaire gathered answers from 208 Portuguese consumers, with the majority claiming to have used mobile banking (82% to 19%). Respondents are roughly distributed between women and men (61% to 39%), with a significant edge for women. In addition, the most frequent age group is 18 to 29 years old (42%), followed by 30 to 49 (30%), 50 to 64 (18%), and more than 65 years (9%). Most respondents have higher education (72%), followed by secondary education (13%), vocational and primary education (both with 7%), and no education (1%). Regarding income distribution, 37% respondents present a net monthly income between 500 and 1000 euros, 26% between 1000 and 1500 euros, 16% between 1500 and 2000 euros, 10% with less than 500 euros, 8% prefer not to answer, and 3% with over 2000 euros, with the majority being salaried workers (64%), contrasting with students (15%), independent workers (10%), and retired employees (10%) (Figure 3).

Figure 3. Sample characterization.



Source: By author.

5.2. MEASUREMENT MODELS

The path analysis using partial least squares algorithm is performed with *SmartPLS 3*. Accordingly, it is divided in two main stages - the measurement (or outer) model and the structural (or inner) model (Hair, Black, Babin, & Anderson, 2014). In the measurement model, it is observed the relation between indicators (scale items) and latent variables (Khan, Dewan, & Chowdhury, 2016). Indicators are the variables that are in fact being measured, through the questionnaire applied, and latent variables, on the other hand, are the constructs, measured by the indicators (Hair, Hult, Ringle, & Sarstedt, 2017). Considering the questionnaire applied, the measurement model is reflective, as the latent construct

causes the indicator variables, being the latter manifestations of the former (*Hair, Hult, Ringle, & Sarstedt, 2017*). In a reflective measurement model, the indicators are interchangeable and highly correlated (*Khan, Dewan, & Chowdhury, 2016*).

In order to evaluate the reflective measurement models, and considering that both the construct and the indicator variables were assessed for exploratory and confirmatory factor analysis previously, on *Shareef M. A., Kumar, Kumar, & Dwivedi, 2011*, it will be regarded indicator reliability, internal consistency reliability, convergent validity, and discriminant validity were considered (*Hair, Ringle, & Sarstedt, 2011*). Indicator reliability regards how much of the indicator's variance is explained by the latent variable (*Hamid, Sami, & Sidek, 2017*), being observable in the item loadings, that should be higher than 0.70 (*Hair, Ringle, & Sarstedt, 2011*). The item loadings lower than the given benchmark refer to AOR1 (only in MBA-T), MLO1, MLO2, PA3, PFB3, PFB6, PI1 (only in MBA-T), PI2 (only in MBA-I and MBA-T), PI3 (only in MBA-T), PT3 and PT4 (Table 2).

Table 2. Item loadings.

Construct	Indicators	MBA_S	MBA_I	MBA_T
AOR	AOR1	0.7278	0.7722	0.6948
	AOR2	0.8835	0.8612	0.9004
	AOR3	0.8462	0.8253	0.8537
CSE	CSE1	0.9092	0.9047	0.9066
	CSE2	0.9282	0.9272	0.9255
	CSE3	0.9076	0.9096	0.9103
	CSE4	0.9162	0.9191	0.9182
MBA_S	MBA_S1	0.8919	N/A	N/A
	MBA_S2	0.7755	N/A	N/A
	MBA_S3	0.9256	N/A	N/A
	MBA_S4	0.8839	N/A	N/A
MBA_I	MBA_I1	N/A	0.7992	N/A
	MBA_I2	N/A	0.9144	N/A
	MBA_I3	N/A	0.8063	N/A
	MBA_I4	N/A	0.8837	N/A
MBA_T	MBA_T1	N/A	N/A	0.9399
	MBA_T2	N/A	N/A	0.9534
	MBA_T3	N/A	N/A	0.8603
	MBA_T4	N/A	N/A	0.9502
MLO	MLO1	0.3963	0.4810	0.1233
	MLO2	0.4100	0.4945	0.1389
	MLO3	0.9363	0.9110	0.9582
	MLO4	0.9221	0.8919	0.9634
PA	PA1	0.8235	0.8104	0.8554
	PA2	0.9188	0.9031	0.9216
	PA3	0.6469	0.6844	0.5943
PATU	PATU1	0.9200	0.9210	0.9198
	PATU2	0.9520	0.9546	0.9522
	PATU3	0.9637	0.9644	0.9638
	PATU4	0.9407	0.9364	0.9405
PFB	PFB1	0.8726	0.8636	0.8725
	PFB2	0.8940	0.8843	0.8930
	PFB3	-0.6520	-0.6477	-0.6574
	PFB4	0.7867	0.8007	0.7872
	PFB5	0.8944	0.8894	0.8937
	PFB6	0.6554	0.6722	0.6520
PI	PI1	0.9758	0.7679	-0.4182
	PI2	0.8948	0.6988	-0.4079
	PI3	0.8301	0.9795	0.1917
PIQ	PIQ1	0.8817	0.8750	0.8777
	PIQ2	0.8744	0.8760	0.8814
	PIQ3	0.8696	0.8772	0.8781
	PIQ4	0.8645	0.8634	0.8587
	PIQ5	0.8542	0.8523	0.8466

PS	PS1	0.9212	0.9155	0.9233
	PS2	0.9321	0.9326	0.9326
	PS3	0.8165	0.8243	0.8124
PT	PT1	0.9078	0.9039	0.9027
	PT2	0.8659	0.8674	0.8599
	PT3	0.4023	0.4035	0.4221
	PT4	0.6093	0.6147	0.6217
PU	PU1	0.9245	0.9247	0.9246
	PU2	0.8921	0.8920	0.8918
	PU3	0.8904	0.8902	0.8905

Source: SmartPLS 3.

Internal consistency reliability regards checking if the block of indicators is homogeneous and unidimensional, considering that each indicator in a block is understood as measuring the same unique underlying concept (Vinzi, Trinchera, & Amato, 2010). To do so, it is applied composite reliability and Cronbach's alfa, and both measurements should be between 0.70 and 0.95 (Hamid, Sami, & Sidek, 2017). Moreover, Dillon-Goldstein's rho alfa is considered as well, assuming that it should be higher than 0.70 (Ravand & Baghaei, 2016). Accordingly, the constructs that fall under these thresholds are PFB for Cronbach's alfa, PI (only in MBA-I and MBA-T) for rho_A, and PI (only in MBA-T) and MLO (only in MBA-T) for composite reliability (Table 3).

Table 3. Internal consistency reliability.

	MBA_S			MBA_I			MBA_T		
	Cronbach's Alpha	rho_A	Composite Reliability	Cronbach's Alpha	rho_A	Composite Reliability	Cronbach's Alpha	rho_A	Composite Reliability
AOR	0.7571	0.7789	0.8611	0.7571	0.7617	0.8604	0.7571	0.8144	0.8598
CSE	0.9355	0.9362	0.9538	0.9355	0.9391	0.9538	0.9355	0.9379	0.9538
MBA_S	0.8939	0.9153	0.9261	N/A	N/A	N/A	N/A	N/A	N/A
MBA_I	N/A	N/A	N/A	0.8777	0.9122	0.9137	N/A	N/A	N/A
MBA_T	N/A	N/A	N/A	N/A	N/A	N/A	0.9448	0.9533	0.9605
MLO	0.7296	0.8907	0.7847	0.7296	0.8419	0.8026	0.7296	0.9077	0.6923
PA	0.7192	0.7818	0.8435	0.7192	0.7421	0.8445	0.7192	0.8082	0.8406
PATU	0.9594	0.9629	0.9705	0.9594	0.9634	0.9705	0.9594	0.9629	0.9705
PFB	0.6767	0.9036	0.8461	0.6767	0.8950	0.8468	0.6767	0.9021	0.8454
PI	0.9082	1.7497	0.9289	0.9082	-1.0527	0.8614	0.9082	-5.1300	0.1331
PIQ	0.9190	0.9218	0.9391	0.9190	0.9222	0.9390	0.9190	0.9256	0.9389
PS	0.8723	0.9124	0.9205	0.8723	0.9012	0.9210	0.8723	0.9189	0.9201
PT	0.7228	0.8650	0.8039	0.7228	0.8497	0.8046	0.7228	0.8598	0.8072
PU	0.8864	0.8967	0.9294	0.8864	0.8970	0.9294	0.8864	0.8968	0.9294

Source: SmartPLS 3.

For convergent validity, that is to which degree the construct converges to explain the variance of its indicators (Hair, Risher, Sarstedt, & Ringle, 2018), it is used average variance extracted (AVE), stating that the indicators of a given construct must explain at least 50% of its variance (Hair, Ringle, & Sarstedt, 2011). The constructs presenting an AVE lower than 0,5 is MLO (only in MBA-T) and PI (only in MBA-T) (Table 4).

Table 4. Convergent validity.

	MBA_S	MBA_I	MBA_T
AOR	0.6754	0.6730	0.6741
CSE	0.8378	0.8376	0.8376
MBA_S	0.7587	N/A	N/A
MBA_I	N/A	0.7265	N/A
MBA_T	N/A	N/A	0.8588
MLO	0.5130	0.5253	0.4702
PA	0.6469	0.6469	0.6447
PATU	0.8916	0.8916	0.8916
PFB	0.6390	0.6386	0.6391
PI	0.8140	0.6791	0.1260
PIQ	0.7550	0.7549	0.7545
PS	0.7947	0.7957	0.7940
PT	0.5267	0.5275	0.5297
PU	0.8144	0.8144	0.8144

Source: SmartPLS 3.

Lastly, discriminant validity regards the degree to which a given construct is empirically different from other constructs in the inner model (Hair, Risher, Sarstedt, & Ringle, 2018), and it is assessed through the Fornell-Larcker criterion, stating that the square root of AVE should be higher than the correlation with other constructs (Hamid, Sami, & Sidek, 2017), and the heterotrait-monotrait (HTMT) ratio of correlations, appointed as having superior performance than the Fornell-Larcker criterion, defining a threshold of less than 0.90 (Henseler, Ringle, & Sarstedt, 2014). After conducting this analysis, PA and CSE, PATU and CSE, PATU and PA, PFB and PA, PFB and PATU, PFB and MBA-T (only in MBA-T) fall under the heterotrait-monotrait ratio (Table 5).

Table 5. Discriminant validity.

	MBA_S										
	AOR	CSE	MBA_S	MLO	PA	PATU	PFB	PI	PIQ	PS	PT
CSE	0.6124										
MBA_S	0.6031	0.7659									
MLO	0.3697	0.4143	0.4473								
PA	0.6826	0.9321	0.8433	0.5066							
PATU	0.6982	0.9385	0.7607	0.4111	0.9236						
PFB	0.6247	0.8486	0.8595	0.4818	0.9100	0.9150					
PI	0.1964	0.0973	0.0953	0.3291	0.1089	0.1383	0.0939				
PIQ	0.6278	0.7618	0.7083	0.2698	0.7618	0.8443	0.7703	0.0603			
PS	0.6185	0.5510	0.5523	0.3203	0.6845	0.5877	0.6108	0.1363	0.6388		
PT	0.6128	0.5803	0.6268	0.2797	0.7084	0.6622	0.6912	0.0710	0.7753	0.8235	
PU	0.5827	0.7831	0.7038	0.4291	0.7848	0.8179	0.8665	0.1436	0.6469	0.4819	0.4833

MBA_I											
	AOR	CSE	MBA_I	MLO	PA	PATU	PFB	PI	PIQ	PS	PT
CSE	0.6124										
MBA_I	0.6044	0.6705									
MLO	0.3697	0.4143	0.3704								
PA	0.6826	0.9321	0.6980	0.5066							
PATU	0.6982	0.9385	0.7137	0.4111	0.9236						
PFB	0.6247	0.8486	0.6624	0.4818	0.9100	0.9150					
PI	0.1964	0.0973	0.1041	0.3291	0.1089	0.1383	0.0939				
PIQ	0.6278	0.7618	0.6758	0.2698	0.7618	0.8443	0.7703	0.0603			
PS	0.6185	0.5510	0.4227	0.3203	0.6845	0.5877	0.6108	0.1363	0.6388		
PT	0.6128	0.5803	0.5285	0.2797	0.7084	0.6622	0.6912	0.0710	0.7753	0.8235	
PU	0.5827	0.7831	0.5255	0.4291	0.7848	0.8179	0.8665	0.1436	0.6469	0.4819	0.4833

MBA_T											
	AOR	CSE	MBA_T	MLO	PA	PATU	PFB	PI	PIQ	PS	PT
CSE	0.6124										
MBA_T	0.5948	0.7552									
MLO	0.3697	0.4143	0.3860								
PA	0.6826	0.9321	0.7935	0.5066							
PATU	0.6982	0.9385	0.7919	0.4111	0.9236						
PFB	0.6247	0.8486	0.9125	0.4818	0.9100	0.9150					
PI	0.1964	0.0973	0.0694	0.3291	0.1089	0.1383	0.0939				
PIQ	0.6278	0.7618	0.6493	0.2698	0.7618	0.8443	0.7703	0.0603			
PS	0.6185	0.5510	0.5751	0.3203	0.6845	0.5877	0.6108	0.1363	0.6388		
PT	0.6128	0.5803	0.6252	0.2797	0.7084	0.6622	0.6912	0.0710	0.7753	0.8235	
PU	0.5827	0.7831	0.7585	0.4291	0.7848	0.8179	0.8665	0.1436	0.6469	0.4819	0.4833

Source: SmartPLS 3.

Considering the problems found with the measurement models, and considering all measurements seen so far, its performance is significantly improved when dropping the items with the lowest loadings - PFB3, MLO1 (only in MBA-S and MBA-T), and MLO2 (only in MBA-S and MBA-T) – and the PI construct from the MBA-T, as all the loadings were below the threshold. By doing so, internal consistency reliability is improved, as only PI (in MBA-I) perform under the Cronbach's alfa threshold, so is AVE, that has no variable below the threshold, and discriminant validity. Since the model is improved with these minor alterations, no other changes are made in the measurement model, to avoid losing information (Bido & Silva, 2019; Little, Lindenberger, & Nesselroade, 1999).

5.3. STRUCTURAL MODEL

Concluded the assessment of the measurement model, the structural model, based on the path relationships between the independent latent variables and the dependent latent variables, is evaluated. Well-established assessment criteria encompass the coefficient of determination (R^2), and the statistical significance of the path coefficients (Hair, Risher, Sarstedt, & Ringle, 2018). However, it is relevant to first verify the collinearity between independent and dependent variables, so that the regression outcome is not biased, by using the variance inflation factor (VIF), which should be lower

than 5 (*Hair, Hult, Ringle, & Sarstedt, 2017*). It is important to note that, in order to verify the significance of path coefficients, it was applied the bootstrapping algorithm, since a distribution must be derived from the data, so that the significance can be tested. This is because PLS-SEM makes no assumptions for the distribution of the data (*Hair, Hult, Ringle, & Sarstedt, 2017*).

In what concerns R^2 and taking into consideration the context of the present dissertation, the reference values are 0.75, for substantial, 0.50 for moderate, and 0.25 for weak (*Henseler, Ringle, & Sinkovics, 2009*). To avoid avoid bias against complex models, R^2 adjusted is used (*Hair, Hult, Ringle, & Sarstedt, 2017*).

Model fit is also considered to assess the model, even though it is a new assessment method, in the context of partial least squares path modeling, and accordingly, must be used with caution (*Benitez, Henseler, Castillo, & Schuberth, 2020; Hair, Hult, Ringle, & Sarstedt, 2017; Hair, Sarstedt, & Ringle, 2019*). In this line, it is used the standardized root mean square residual (SRMR), providing an insight on the difference between the empirical data and the actual model, and should present values lower than 0.1 (*Weston, 2006*). Normed Fit Index (NFI) is also evaluated, referring to an incremental fit measure based on comparing the Chi-square value of the present model with a significant benchmark, and it represents acceptable model fit if above 0.9 (*Bentler & Bonett, 1980*).

In the static phase (MBA-S), PATU and CSE are the only constructs with a VIF value above the threshold. Moreover, the constructs significant for the dependent variable are CSE, PA, PFB, PS and PU (both for PT). Regarding R^2 adjusted, the values for MBA-S and PT are 0,686 and 0,536, respectively, being moderate in both cases, even though the former is closer to a substantial level. In topic of model fit, the value obtained for SRMR is 0,084, being within the threshold considered, and for NFI the value is 0,715.

For the interaction stage (MBA-I), regarding collinearity between the constructs and the dependent variable, PATU and CSE present values above the threshold. In significance analysis, AOR and PS revealed to be significant for mobile banking adoption in the interaction stage, and PS and PU are significant for PT, in the same stage. Analyzing the R^2 adjusted, the values for MBA-I and PT are 0,524 and 0,529, respectively, which leads to a classification of moderate in both cases. For model fit, and taking into consideration that it is still in early stages, as explained before, the SRMR presents a value of 0,086, being within the threshold defined, and NFI performs below the threshold, with 0,711.

Lastly, in the transaction stage (MBA-T), PATU and CSE are the only constructs with a VIF value above the threshold. Considering the significance of path coefficients, PFB is significant in MBA-T, and PS and PU are significant for PT. R^2 adjusted presents values of 0,727 and 0,530 for MBA-T and PT, respectively, with the former closer to an evaluation of substantial and the latter closer to moderate. In what regards model fit, the SRMR presents a value of 0,086, being within the threshold defined, and the NFI has a value of 0,719, falling below the threshold.

Table 6. Variance inflation factor.

	MBA_S	PT MBA_S	MBA_I	PT MBA_I	MBA_T	PT MBA_T
AOR	1.7301		1.7243		1.7209	
CSE	5.3617		5.3860		5.3853	
MLO	1.5834		1.4897		1.4970	
PA	3.1841		3.0849		3.2138	
PATU	9.1688		9.0201		8.8721	
PFB	3.7211		3.6683		3.4723	
PI	1.2122		1.1230		N/A	N/A
PIQ	3.6550		3.6472		3.6530	
PS	2.2062	1.2510	2.1154	1.2461	2.1907	1.2536
PT	3.0162		3.0570		2.9394	
PU		1.2510		1.2461		1.2536

Source: SmartPLS 3.

Table 7. Significance of path coefficients, using p-value.

MBA_S		MBA_I		MBA_T	
AOR -> MBA_S	0.1601	AOR -> MBA_I	0.0057	AOR -> MBA_T	0.3595
CSE -> MBA_S	0.0424	CSE -> MBA_I	0.5255	CSE -> MBA_T	0.2920
MLO -> MBA_S	0.1434	MLO -> MBA_I	0.1978	MLO -> MBA_T	0.2678
PA -> MBA_S	0.0196	PA -> MBA_I	0.5274	PA -> MBA_T	0.6725
PATU -> MBA_S	0.1894	PATU -> MBA_I	0.2854	PATU -> MBA_T	0.5476
PFB -> MBA_S	0.0000	PFB -> MBA_I	0.4826	PFB -> MBA_T	0.0000
PI -> MBA_S	0.1449	PI -> MBA_I	0.2239	PIQ -> MBA_T	0.2479
PIQ -> MBA_S	0.1823	PIQ -> MBA_I	0.0510	PS -> MBA_T	0.2311
PS -> MBA_S	0.8098	PS -> MBA_I	0.0481	PS -> PT	0.0000
PS -> PT	0.0000	PS -> PT	0.0000	PT -> MBA_T	0.4649
PT -> MBA_S	0.2428	PT -> MBA_I	0.2253	PU -> PT	0.0056
PU -> PT	0.0049	PU -> PT	0.0016		

Source: SmartPLS 3.

Table 8. R² adjusted.

MBA_S	0.6690
PT MBA_S	0.5205
MBA_I	0.4940
PT MBA_I	0.5228
MBA_T	0.7119
PT MBA_T	0.5186

Source: SmartPLS 3.

Table 9. Model fit.

	MBA_S	MBA_I	MBA_T
SRMR	0.0838	0.0858	0.0861
NFI	0.7153	0.7112	0.7194

Source: SmartPLS 3.

5.4. MODERATION ANALYSIS

As explained before, a crucial part of the present dissertation is moderation analysis, as it is hypothesized that five moderating variables – gender, age, education level, occupation, and income level – might influence the adoption of mobile banking at the different stages. Taking into consideration that it is intended to verify the moderation effect of the referred variables on all the constructs defined, the most efficient method is to apply multigroup analysis (MGA) (Hair, Hult, Ringle, & Sarstedt, 2017; Sarstedt, Henseler, & Ringle, 2011). In MGA, different groups are defined, based on one moderator variable, and new models are estimated for each group, so that it can be verified if the differences between groups are significant (Vinzi, Chin, Henseler, & Wang, 2010; Cheah, Thurasamy, Memon, Chuah, & Ting, 2020; Hair, Hult, Ringle, & Sarstedt, 2017).

By analyzing the data gathered on the moderator variables, only gender, age, and income level present enough samples and equal sample sizes on different groups, so that statistical power is achieved (Cheah, Thurasamy, Memon, Chuah, & Ting, 2020). Due to this limitation in the data gathered, it is not possible to verify the hypotheses drawn for education level and occupation, as the statistical power cannot be guaranteed (Hair, Hult, Ringle, & Sarstedt, 2017; Aguinis, Edwards, & Bradley, 2017).

5.4.1. Gender as the moderator variable

When analyzing gender as the moderator variable, two groups are clearly established – male respondents, with 80 samples, and female respondents, with 127 respondents. Using G*Power (Faul, Erdfelder, Lang, & Buchner, 2007; Faul, Erdfelder, Buchner, & Lang, 2009), it is found that a statistical power of 80% is reported, as per recommendation in Cheah, Thurasamy, Memon, Chuah, & Ting, 2020.

Before applying the algorithm, measurement invariance must be verified (Cheah, Thurasamy, Memon, Chuah, & Ting, 2020), most specifically the measurement invariance of composite models (MICOM), which refers to a three-step approach – first, configural invariance must be verified, followed by compositional invariance, and lastly the equality of composite mean values and variances (Henseler, Ringle, & Sarstedt, 2016). By doing so, it is assured that the differences between two groups are found in the structural model and not caused by differences in the measurement model (Henseler, Ringle, & Sarstedt, 2016). If step one is achieved but step two is not, measurement invariance is not assured. On the other hand, if steps one and two are achieved but step three is not, partial measurement invariance is guaranteed and the MGA can be performed, to verify if there are significant differences in the structural models of both groups (Henseler, Ringle, & Sarstedt, 2016; Cheah, Thurasamy, Memon, Chuah, & Ting, 2020). Step one is not directly obtained in *SmartPLS 3*, as running MICOM in the program already establishes configural invariance. Steps two and three are verified by using the permutation algorithm in *SmartPLS 3*.

Starting with the MBA-I model, considering the age groups defined, it was found a singular matrix problem when running MICOM, solved by deleting MLO1 and PT3 (both presenting the worst values for item loadings) from the MBA-I model. When observing the values for MICOM, in step two, all variables performed well, except for PIQ, leading to the deletion of PIQ5 indicator from the model. In step three, all constructs fall within the defined constructs, except for H9 variance, meaning that partial measurement invariance is achieved. For MBA-S model, both step two and three presented good values for all constructs, implying full measurement invariance. Considering finally MBA-T, when observing the values for MICOM, in step two, all variables performed well. In step three, all constructs

fall within the defined constructs, except for H9 variance, meaning that partial measurement invariance is assured. With such outcomes, it is possible to proceed with MGA in all models.

There are several approaches available for MGA, that can be grouped in parametric and nonparametric approaches (Hair, Hult, Ringle, & Sarstedt, 2017; Sarstedt, Henseler, & Ringle, 2011). Parametric approach, proposed by (Keil, et al., 2000), is appointed as the most liberal, subject to type I errors, and it is inconsistent with PLS nonparametric nature, as it assumes a normal distribution of the sample data (Sarstedt Henseler, & Ringle, 2011). The Welch-Satterthwaite test is identical to the parametric approach, though it does not assume equal variances when comparing the mean of the two groups (Cheah, Thurasamy, Memon, Chuah, & Ting, 2020). On the other hand, nonparametric approaches were proposed in academia as well, such as the permutation test (Chin & Dibbern, 2010), pointed as being similar to the parametric approach but less liberal, and requires samples of identical size (Hair, Hult, Ringle, & Sarstedt, 2017). PLS-MGA approach was proposed by Henseler, Ringle, & Sinkovics, 2009, and it is based in bootstrapping results. Lastly, for comparing more than two groups, it was developed the omnibus test of group differences (Sarstedt Henseler, & Ringle, 2011).

The first step is to apply the PLS algorithm to the models of both groups, individually, to verify whether there are differences between the values for both, and there is. Next, it is verified whether such difference is significant. In MBA-I, the only relationship significantly different is the one proposed in H9, between PS and PT, and it is established in all approaches of MGA except in the permutation algorithm (Table 10). Women show a higher path coefficient (0.729 to 0.436), meaning that perceived trust in mobile banking at the interaction stage, for women, is mostly affected by perceived security. When considering MBA-S, the relation between PA and MBA-S appears as significantly different between groups in the permutation algorithm (Table 11), with men presenting a significantly higher path coefficient (0.428 to 0.102). Lastly, in MBA-T, the relation between PA and MBA-T appears as significantly different in all approaches (Table 12), with men presenting a higher path coefficient (0.360 to -0.112). Moreover, the relation between PIQ and MBA-T is also depicted as significantly different in the permutation algorithm only (Table 12), having men a higher path coefficient (0.099 to -0.195).

Table 10. Multigroup analysis for MBA-I, with p-value.

	PLS-MGA	Parametric test	Welch-Satterthwait test	Permutation test
AOR -> MBA_I	0.9743	0.9697	0.9698	0.9638
CSE -> MBA_I	0.4355	0.4301	0.4396	0.4354
MLO -> MBA_I	0.3019	0.2708	0.3152	0.2608
PA -> MBA_I	0.3438	0.3494	0.3464	0.3654
PATU -> MBA_I	0.8001	0.7991	0.8094	0.7980
PFB -> MBA_I	0.2334	0.2558	0.2360	0.2460
PI -> MBA_I	0.8777	0.8895	0.8902	0.9182
PIQ -> MBA_I	0.8354	0.8431	0.8451	0.8486
PS -> MBA_I	0.9855	0.9897	0.9895	0.9882
PS -> PT	0.0341	0.0278	0.0447	0.0618
PT -> MBA_I	0.2884	0.3075	0.2895	0.3060
PU -> PT	0.1862	0.1458	0.1814	0.2390

Source: SmartPLS 3.

Table 11. Multigroup analysis for MBA-S, with p-value.

	PLS-MGA	Parametric test	Welch-Satterthwait test	Permutation test
AOR -> MBA_S	0.8050	0.8196	0.8155	0.8130
CSE -> MBA_S	0.2368	0.2145	0.2460	0.1870
MLO -> MBA_S	0.7875	0.8103	0.8169	0.7980
PA -> MBA_S	0.0582	0.0519	0.0581	0.0350
PATU -> MBA_S	0.9607	0.9502	0.9554	0.9520
PFB -> MBA_S	0.6358	0.6482	0.6542	0.6760
PI -> MBA_S	0.3318	0.3259	0.3494	0.3940
PIQ -> MBA_S	0.8217	0.8525	0.8602	0.8470
PS -> MBA_S	0.2727	0.3215	0.2912	0.3170
PS -> PT	0.0938	0.0857	0.1334	0.0890
PT -> MBA_S	0.2381	0.2673	0.2466	0.2080
PU -> PT	0.3397	0.2786	0.3427	0.3180

Source: SmartPLS 3.

Table 12. Multigroup analysis for MBA-T, with p-value.

	PLS-MGA	Parametric test	Welch-Satterthwait test	Permutation test
AOR -> MBA_T	0.5070	0.5070	0.5141	0.5400
CSE -> MBA_T	0.7906	0.7906	0.7774	0.7730
MLO -> MBA_T	0.0813	0.0813	0.0824	0.0820
PA -> MBA_T	0.0014	0.0014	0.0033	0.0030
PATU -> MBA_T	0.1670	0.1670	0.1630	0.1360
PFB -> MBA_T	0.0844	0.0844	0.0678	0.0890
PIQ -> MBA_T	0.0556	0.0556	0.0731	0.0330
PS -> MBA_T	0.1947	0.1947	0.2046	0.2550
PS -> PT	0.0968	0.0968	0.1270	0.1280
PT -> MBA_T	0.0700	0.0700	0.0833	0.1400
PU -> PT	0.4147	0.4147	0.4040	0.4230

Source: SmartPLS 3.

5.4.2. Age as the moderator variable

For the moderator variable age, a different approach is followed, as three different groups were identified – the youngest, between 18 and 29 years old, with 88 respondents, the adults, between 30 and 49 years old, with 63 respondents, and the oldest, regarding more than 50 years' individuals, with 56 respondents. A statistical power of 80% is achieved in the three groups.

When starting the analysis with MBA-I, it is found that it is not possible to compare the two youngest age groups, as the samples gathered are too similar, and it is not meaningful to the analysis at hand. With this scenario at hand, and the fact that the sample size for the oldest age group is much smaller than the sum of the two younger groups, it will be compared the youngest age group with the oldest.

There was a singular matrix problem when running the referred algorithm, which was solved by deleting MLO1 and PT3 from the MBA-I model (with the worst values for item loadings). However,

when observing the values for MICOM, in step two, most variables do not perform well, meaning that partial invariance is not achieved. Accordingly, it is not possible to perform a multigroup analysis with age groups in MBA-I.

In the context of MBA-S, there is also a collinearity problem between the two younger age groups. In this line, the oldest and the youngest age groups will be the ones chosen. However, when observing the values for MICOM, in step two, most variables do not perform well, meaning that partial invariance is not achieved. Accordingly, it is not possible to perform a multigroup analysis with age groups in MBA-S. Regarding MBA-T, it is found a collinearity problem between all age groups. Accordingly, by performing a MICOM analysis, it is concluded that there are no significant differences between age groups, at any model.

5.4.3. Income level as the moderator variable

The last observed moderator variable is income level, in which two groups were found – low income, for a net monthly income level below 1000 euros, with 97 respondents, and high income, for a net monthly income level above 1000 euros, with 94 respondents, and a statistical power of 80% is achieved.

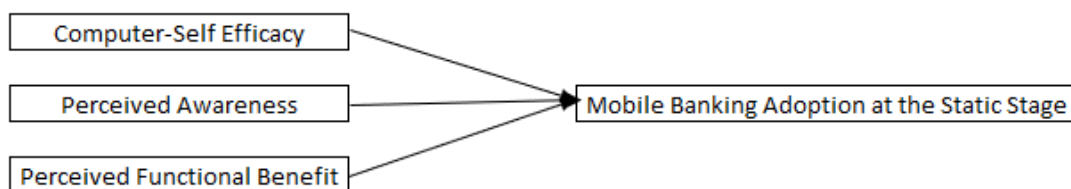
However, when performing MICOM, it is found that there are several issues with several variables in step two, for all the three models, which means that measurement invariance is not achieved in neither one.

6. RESULTS ANALYSIS AND DISCUSSION

The first part of the analysis in the present dissertation regards verifying whether factors influencing adoption differ across service stages. In MBA-S, the data gathered revealed that the most significant factors are CSE, PA, PFB, PS, and PU, which means that H3, H1, H10, H9, and H8 stand for MBA-S. When considering MBA-I, AOR, PS, and PU revealed to be the only significant constructs. In MBA-T, PFB, PS, and PU revealed to be the significant constructs. Facing this scenario, the variables that are not relevant at any stage are PATU, MLO, PIQ, PT, and PI, meaning that the hypotheses H4, H5, H6, H7, and H11, do not stand.

For mobile banking adoption at the static stage, the strongest predictor is PFB, the exact same finding as *Shareef, Baabdullah, Dutta, Kumar, & Dwivedi, 2018*, but with a stonger effect – a unit positive change on PFB leads to a 0.456 unit positive change on the adoption of mobile banking at the static stage, explaining almost half of the variation, given that the remain predictors are constant. Accordingly, it is key to consumers to achieve functional benefit when using mobile banking to check account or investment information, and value being able to do so at any given time in any place. Moreover, computer self-efficacy and perceived awareness appear as relevant predictors - the consumer comprehends that the self-knowledge of his computing skills is key to check its account or investment information, in the context of mobile banking application, and understands the concept and the benefits of using it. Even though CSE was not a significant predictor in *Shareef, Baabdullah, Dutta, Kumar, & Dwivedi, 2018* at the static stage, PA was also found as significant. The importance of the last two variables might indicate that the inquired consumers are still in an early stage of mobile banking adoption. It is also important to mention that, even though PS and PU are significant predictors for PT, the latter is not a significant predictor for the adoption of mobile banking at the static stage, so the two indicators will not be considered for the present model (Figure 4).

Figure 4. Empirical model for mobile banking adoption at the static stage.

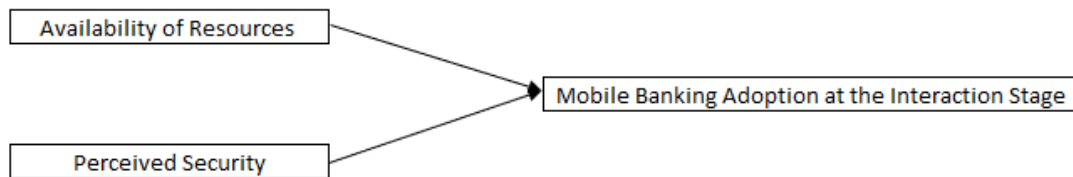


Source: By author.

Considering mobile banking adoption at the interaction stage, in which there is a two-way communication between consumers and the service provider, availability of resources revealed to be an important predictor for the inquired consumers, contrarily to what was found in *Shareef, Baabdullah, Dutta, Kumar, & Dwivedi, 2018* or even in *Shareef M. A., Kumar, Kumar, & Dwivedi, 2011*, for the context of e-government services, which gives strength to the conclusion retrieved in the previous model – consumers might still be in an early stage of adoption and find issues on the resources available to access mobile banking, as internet availability and its cost, for instance. For this model, PS is found to be a significant predictor for mobile banking adoption at the interaction stage, affecting directly the dependent variable, but with a negative effect, that is, one unit positive change in PS, leads to a 0.132 negative change on the adoption of mobile banking at the interaction stage, which is the contrary of what is found in the literature

and consequently in the proposed positive relation in H12. Such finding might indicate problems in indicator variables considered for PS (Figure 5).

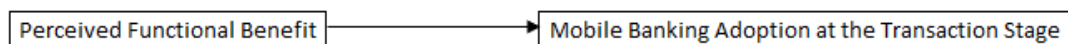
Figure 5. Empirical model for mobile banking adoption at the interaction stage.



Source: By author.

In the transaction stage, even though PU and PS are significant for PT, PT is not significant for MBA-T, hence such effect is disregarded. Accordingly, the only relevant factor for mobile banking adoption at the transaction stage is PFB – one unit change in PFB leads to a 0.586 positive change in mobile banking adoption at the referred stage. Consumers value the possibility to make a payment or a transfer anywhere and anytime, considering that the utilization of the mobile banking service provides more benefits than going to a physical teller to perform the same operations (Figure 6).

Figure 6. Empirical model for mobile banking adoption at the transaction stage.



Source: By author.

Regarding the factors that were not found to be significant at any stage, it is not surprising that a multi-lingual option is not relevant for the inquired consumers, as most mobile banking services are available in Portuguese. Even though there was no question regarding the respondent's nationality, the questionnaire was handed out in Portuguese, meaning that only Portuguese speakers were able to answer. Accordingly, it is expected that MLO is not a relevant factor at any stage. PATU, according to *Shareef M. A., Kumar, Kumar, & Dwivedi, 2011*, is a similar concept to CSE, meaning that a lack of significance for this variable is expected (since CSE is significant at the static stage). Moreover, perceived image is not significant as well, in line with the findings of *Shareef, Baabdullah, Dutta, Kumar, & Dwivedi, 2018*, considering that the utilization of digital services is the norm nowadays. On the other hand, the lack of significance for PT and PIQ is unexpected, considering the finding in *Shareef, Baabdullah, Dutta, Kumar, & Dwivedi, 2018*, or even in *Barkhordari, Nourollah, Mashayekhi, Mashayekhi, & Ahangar, 2016; Mokhtar, Katan, & Hidayat-ur-Rehman, 2017; Ezeh & Nkamnebe, 2018; Mathew, Jose, G, & Chacko, 2020*.

In the second part of the analysis, it was analysed the influence of five demographic moderator variables. Due to statistical problems in four of those, gender was the only variable considered in the analysis as a moderator. Accordingly, it was found that the relation between PA and MBA-S, and PA and MBA-I, appears as significantly different for men and women. In MBA-I, there is a significant difference in the relation between PS and PT, for men and women, with a stronger effect of PS in PT for the latter.

Given the findings of the most important factors for the adoption of mobile banking at the three presented stages, only the differences (between men and women) in the relation of PA and MBA-S are relevant for the analysis. Accordingly, it is found that men present a higher path coefficient (0.428 to 0.102), leading to the conclusion that men tend to be more aware of the possibility to check account information through

mobile banking, and the benefits associated with it, or even claiming to have gone through training regarding mobile banking's features.

7. CONCLUSIONS

As stated in *Shareef, Baabdullah, Dutta, Kumar, & Dwivedi, 2018*, static, interaction, and transaction stages of mobile banking adoption present several differences in “operations, functional activities, service patterns, association of technologies, sensitivity of operations, and vulnerability of risks”. In this line, it is only relevant to deepen the study of mobile banking adoption at the three stages.

Considering the objectives defined initially, this study found that there are different factors affecting mobile banking adoption at the three defined stages – in the static stage, perceived functional benefit has been revealed as the strongest predictor, followed by computer self-efficacy and perceived awareness. For the interaction stage, availability of resources is the most important predictor and, for the transaction stage, it is perceived functional benefit. Accordingly, it builds on the scarce literature of mobile banking adoption at different stages, by applying the GAM model to data gathered in Portugal, a developed country. Moreover, it contributes to demonstrate that there are different factors affecting each stage of adoption, contrarily to what is found on most literature about the topic, in which adoption is treated as a whole.

When performing moderation analysis, contrarily to what was hypothesized, it was found that age, education level, income level, and occupation are not relevant moderators, as those variables did not pass the MICOM test. Only gender was found as a significant moderator, namely between the relation of perceived awareness and mobile banking adoption at the static stage. Accordingly, men are more aware of mobile banking, the respective benefits, and the training required, when comparing to women. This outcome strengthens the literature on gender as an important moderator for mobile banking and, specifically, in what regards checking account or investment information.

Considering the results achieved, it is found that each adoption stage of mobile banking is affected by different factors, as proposed in the conceptual hypotheses defined. Moreover, comparing with the existing work on the topic, the factors found to affect each stage are different, as it portrays the Portuguese consumers. Even though ambitious goals were defined regarding demographic moderators, it was only possible to verify the role of gender, given the limitations of the data. As such, it was found that gender plays a relevant role moderating the relation between perceived awareness and mobile banking adoption at the static stage. For the remaining relations and stages, gender was not found to be a relevant moderator.

8. LIMITATIONS AND RECOMMENDATIONS FOR FUTURE WORKS

As explained throughout the study, the present dissertation is the second study on factors affecting mobile banking adoption at the different stages, and the third applying the GAM model to the study of adoption at the different stages, meaning that it is still at an exploratory level (*Shareef, Baabdullah, Dutta, Kumar, & Dwivedi, 2018; Shareef M. A., Kumar, Kumar, & Dwivedi, 2011*). Accordingly, it must be applied in both developed and developing countries, at a larger scale, to allow for generalization.

Regarding data collection and considering that the study was developed in a pandemic context, it was handed out through online means only, possibly limiting the sample respondents in terms of age, digital abilities, or financial resources. Additionally, it should be analyzed the factors behind the non-adoption of mobile banking, at the different stages, as it would reveal specific obstacles for the service providers to work on (*Laukkanen, Sinkkonen, & Laukkanen, 2008*).

For the moderation analysis, it is found on the literature that factors as religious beliefs (*Warsame & Ireri, 2018*), experience, or marital status (*Chawla & Joshi, 2018; Kwateng, Atiemo, & Appiah, 2018*) are relevant moderators for mobile banking adoption and thus its effect should be evaluated for each adoption stage of mobile banking as well. Moreover, the problems found with measurement invariance for age, education level, income level, and occupation can be solved with a larger sample, as these moderator variables might have interesting effects on the variable at study.

9. REFERENCES

- Abdulkadir, N., Galoji, S. I., & Razak, R. B. (2013). An Investigation into the Adoption of Mobile Banking in Malaysia. *American Journal of Economics*.
- Aguinis, H., Edwards, J. R., & Bradley, K. J. (2017). Improving Our Understanding of Moderation and Mediation in Strategic Management Research. *Organizational Research Methods*.
- Akram, M. S., & Malik, A. (2012). Evaluating citizens' readiness to embrace e-government services. *Proceedings of the 13th Annual International Conference on Digital Government Research*.
- Aladwani, A. M. (2001). Online banking: a field study of drivers, development challenges, and expectations. *International Journal of Information Management*.
- Al-Ajam, A. S., & Nor, K. M. (2013). Internet Banking Adoption: Integrating Technology Acceptance Model and Trust. *European Journal of Business and Management*.
- Alalwan, A. A., Dwivedi, Y. K., Rana, N. P., & Algharabat, R. (2018). Examining factors influencing Jordanian customers' intentions and adoption of internet banking: Extending UTAUT2 with risk. *Journal of Retailing and Consumer Services*.
- Alkhowaiter, W. A. (2020). Digital payment and banking adoption research in Gulf countries: A systematic literature review. *International Journal of Information Management*.
- Alqahtani, M. A., & Al-Badi, A. H. (2017). Exploratory Study of M-Transaction: User's Perspectives. *The Electronic Journal on Information Systems in Developing Countries*.
- Alshurideh, M. T., Kurdi, B. A., Masa'deh, R., & Salloum, S. A. (2021). The moderation effect of gender on accepting electronic payment technology: a study on United Arab Emirates consumers. *Review of International Business and Strategy*.
- Amstad, M. (2020). Regulating Fintech: Objectives, Principles, and Practices. *Asian Development Bank Institute Working Paper Series*.
- Anagnostopoulos, I. (2018). Fintech and regtech: Impact on regulators and banks. *Journal of Economics and Business*.
- Anand, D., & Mantrala, M. (2018). Responding to Disruptive Business Model Innovations: The Case of Traditional Banks Facing Fintech Entrants. *Journal of Banking and Financial Technology*.
- Autoridade da Concorrência, 2020. *Inovação Tecnológica e Concorrência no Setor Financeiro em Portugal*
- Baabdullah, A. M., Alalwan, A. A., Rana, N. P., Patil, P., & Dwivedi, Y. K. (2019). An integrated model for m-banking adoption in Saudi Arabia. *International Journal of Bank Marketing*.
- Baabdullah, A. M., Rana, N. P., Alalwan, A. A., Islam, R., Patil, P., & Dwivedi, Y. K. (2019). Consumer Adoption of Self-Service Technologies in the Context of the Jordanian Banking Industry: Examining the Moderating Role of Channel Types. *Information Systems Management*.

- Balapour, A., Nikkhah, H. R., & Sabherwal, R. (2020). International Journal of Information Management. *Mobile application security: Role of perceived privacy as the predictor of security perceptions*.
- Banco de Portugal. (2021). *Instituições*. Retrieved from Portal do Cliente Bancário: <https://clientebancario.bportugal.pt/instituicoes>
- Banco de Portugal. (2021). *Instituições autorizadas*. Retrieved from Banco de Portugal: <https://www.bportugal.pt/entidades-autorizadas/67/all>
- Bank for International Settlements . (2020). *Central bank digital currencies: foundational principles and core features*.
- Bank for International Settlements. (2018). *Sound Practices - Implications of fintech developments for banks and bank supervisors*. Bank for International Settlements.
- Bank for International Settlements. (2020). *Policy responses to fintech: a cross-country overview*.
- Bank of England. (2020). *Central Bank Digital Currency - Opportunities, challenges and design*.
- Barkhordari, M., Nourollah, Z., Mashayekhi, H., Mashayekhi, Y., & Ahangar, M. S. (2016). Factors influencing adoption of e-payment systems: an empirical study on Iranian customers. *Information Systems and e-Business Management*.
- Bashir, I., & Madhavaiah, C. (2015). Trust, Social Influence, Self-Efficacy, Perceived Risk and Internet Banking Acceptance: An Extension of Technology Acceptance Model in Indian Context. *Metamorphosis*.
- Bazgosha, G., Eizi, N., Nawaser, K., & Parhizgar, M. M. (2012). Technology of e-banking: perspective of costumers' perceived risk and uncertainty. *Indian Journal of Science and Technology*.
- Benitez, J., Henseler, J., Castillo, A., & Schuberth, F. (2020). How to perform and report an impactful analysis using partial least squares: Guidelines for confirmatory and explanatory IS research. *Information & Management*.
- Bentler, P. M., & Bonett, D. G. (1980). Significance Tests and Goodness-of-Fit in the Analysis of Covariance Structures. *Psychological Bulletin*.
- Berg, T., Burg, V., Gombović, A., & Puri, M. (2019). On the Rise of FinTechs – Credit Scoring Using Digital Footprints. *The Review of Financial Studies*.
- Bido, D. d., & Silva, B. d. (2019). SMARTPLS 3: Specification, Estimation, Evaluation and Reporting. *Resources and techniques of teaching and research*.
- Boonsiritomachai, W., & Pitchayadejanant, K. (2017). Determinants affecting mobile banking adoption by generation Y based on the Unified Theory of Acceptance and Use of Technology Model modified by the Technology Acceptance Model concept. *Kasetsart Journal of Social Sciences*.
- Boot, A. W. (2000). Relationship Banking: What Do We Know? *Journal of Financial Intermediation*.

- Boot, A., Hoffmann, P., Laeven, L., & Ratnovski, L. (2021). Fintech: what's old, what's new? *Journal of Financial Stability*.
- Breitbach, E., & Walstad, W. B. (2014). Financial Literacy and Banking Affiliation: Results for the Unbanked, Underbanked, and Fully Banked. *Perspectives on Economic Education Research*.
- Buckley, R. P., & Webster, S. (2016). FinTech in Developing Countries: Charting New Customer Journeys. *Journal of Financial Transformation*.
- Bunea, S., Kogan, B., & Stolin, D. (2016). Banks vs. fintech: At last, it's official. *Journal of Financial Transformation*.
- Caceres-Santamaria, A. J. (2020, April). Peer-to-Peer (P2P) Payment Services. *Page One Economics*®.
- Campanella, F., Della Peruta, M. R., & Del Giudice, M. (2017). The Effects of Technological Innovation on the Banking Sector. *Journal of the Knowledge Economy*.
- Capgemini Research Institute, Efma. (2020). *World Retail Banking Report*. Capgemini Research Institute, Efma.
- Chawla, D., & Joshi, H. (2016). Consumer perspectives about mobile banking adoption in India – a cluster analysis. *International Journal of Bank Marketing*.
- Chawla, D., & Joshi, H. (2018). The Moderating Effect of Demographic Variables on Mobile Banking Adoption: An Empirical Investigation. *Global Business Review*.
- Cheah, J.-H., Thurasamy, R., Memon, M. A., Chuah, F., & Ting, H. (2020). Multigroup Analysis using SmartPLS: Step-by-Step Guidelines for Business Research. *Asian Journal of Business Research*.
- Chin, W. W., & Dibbern, J. (2010). An Introduction to a Permutation Based Procedure for Multi-Group PLS Analysis: Results of Tests of Differences on Simulated Data and a Cross Cultural Analysis of the Sourcing of Information System Services Between Germany and the USA. In V. V. Esposito, J. H. W. W. Chin, & H. W. (Eds.), *Handbook of Partial Least Squares* (pp. 171-193). Springer Handbooks of Computational Statistics Series.
- Creswell, J. W., & Creswell, J. D. (2018). *Research Design - Qualitative, Quantitative, and Mixed Methods*. SAGE.
- Daniel, E. (1999). Provision of electronic banking in the UK and the Republic of Ireland. *International Journal of Bank Marketing*.
- Daud, N. M., Kassim, N. E., Said, W. S., & Noor, M. M. (2011). Determining Critical Success Factors of Mobile Banking Adoption in Malaysia. *Australian Journal of Basic and Applied Sciences*.
- Davis, F. D. (1989). Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. *MIS Quarterly*.
- Dibrova, A. (2016). Virtual Currency: New Step in Monetary Development. *Procedia - Social and Behavioral Sciences*.

- Dijkstra, T. K. (2010). Latent Variables and Indices: Herman Wold's Basic Design and Partial Least Squares. In V. E. Vinzi, W. W. Chin, J. Henseler, & H. Wang, *Handbook of Partial Least Squares* (pp. 23-46).
- Dobbie, W., Liberman, A., Paravisini, D., & Pathania, V. (2018). Measuring Bias in Consumer Lending. *Working Paper, No 24953*. National Bureau of Economic Research.
- Dwivedi, Y. K., Rana, N. P., Jeyaraj, A., Clement, M., & Williams, M. D. (2017). Re-examining the Unified Theory of Acceptance and Use of Technology (UTAUT): Towards a Revised Theoretical Model. *Information Systems Frontiers*.
- European Banking Authority. (2018). *The EBA's FinTech Roadmap*. The EBA's FinTech Roadmap.
- European Central Bank. (2015). *Virtual currency schemes – a further analysis*.
- Ezeh, P. C., & Nkamnebe, A. D. (2018). A conceptual framework for the adoption of Islamic banking in a pluralistic-secular nation - Nigerian perspective. *Journal of Islamic Marketing*.
- Faul, F., Erdfelder, E., Buchner, A., & Lang, A.-G. (2009). Statistical power analyses using G*Power 3.1: Tests for correlation and regression analyses. *Behavior Research Methods*.
- Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods*.
- Fawzy, S. F., & Esawai, N. (2017). Internet banking adoption in Egypt: Extending technology acceptance model. *Journal of Business and Retail Management Research*.
- Feng, G., & Wang, C. (2018). Why European banks are less profitable than U.S. banks: A decomposition approach. *Journal of Banking and Finance*.
- Fishbein, M., & Ajzen, I. (1975). *Belief, Attitude, Intention, and Behavior: An Introduction to Theory and Research*. Addison Wesley, Reading.
- Fonchamnyo, D. C. (2012). Customers' Perception of E-banking Adoption in Cameroon: An Empirical Assessment of an Extended TAM. *International Journal of Economics and Finance*.
- Freixas, X., & Rochet, J. C. (2008). *Microeconomics of Banking*. MIT press.
- Garson, G. D. (2016). *Partial Least Squares: Regression & Structural Equation Models*. Statistical Associates Publishing.
- Gathergood, J. (2011). Self-control, financial literacy and consumer over-indebtedness. *Journal of Economic Psychology*.
- Gharaibeh, M., & Arshad, M. R. (2018). Determinants of Intention to Use Mobile Banking Services in the North of Jordan: Extending UTAUT2 with Mass Media and Trust. *Journal of Engineering and Applied Sciences*.

- Giovanis, A. N., Binioris, S., & Polychronopoulos, G. (2012). An extension of TAM model with IDT and security/privacy risk in the adoption of internet banking services in Greece. *EuroMed Journal of Business*.
- Gomber, P., Koch, J.-A., & Siering, M. (2017). Digital Finance and FinTech: current research and future research directions. *Journal of Business Economics*.
- Goularte, A. d., & Zilber, S. N. (2018). The moderating role of cultural factors in the adoption of mobile banking in Brazil. *International Journal of Innovation Science*.
- Grohmann, A., Kouwenberg, R., & Menkhoff, L. (2014). Financial Literacy and Its Consequences in the Emerging Middle Class. *Kiel Institute for the World Economy*.
- Guriting, P., Chunwen, G., & Ndu, N. (2007). Computer self-efficacy levels, perceptions and adoption of online banking. *International Journal of Services Technology and Management*.
- Hair, J. F., Black, J. W., Babin, B. J., & Anderson, R. E. (2014). *Multivariate Data Analysis*. Pearson Education Limited.
- Hair, J. F., Hult, G. T., Ringle, C. M., & Sarstedt, M. (2017). *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)*. SAGE Publications, Inc.
- Hair, J. F., Ringle, C. M., & Sarstedt, M. (2011). PLS-SEM: Indeed a Silver Bullet. *Journal of Marketing Theory and Practice*.
- Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2018). When to use and how to report the results of PLS-SEM. *European Business Review*.
- Hair, J. F., Sarstedt, M., & Ringle, C. M. (2019). Rethinking some of the rethinking of partial least squares. *European Journal of Marketing*.
- Hamid, M. R., Sami, W., & Sidek, M. H. (2017). Discriminant Validity Assessment: Use of Fornell & Larcker criterion versus HTMT Criterion. *Journal of Physics*.
- Han, J.-J., & Jang, W. (2013). Information Asymmetry and the Financial Consumer Protection Policy. *Asian Journal of Political Science*.
- Henseler, J., Ringle, C. M., & Sarstedt, M. (2014). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the Academy of Marketing Science*.
- Henseler, J., Ringle, C. M., & Sarstedt, M. (2016). Testing measurement invariance of composites using partial least squares. *International Marketing Review*.
- Henseler, J., Ringle, C. M., & Sinkovics, R. R. (2009). The Use of Partial Least Squares Path Modeling in International Marketing. In S. Zou, *Advances in International Marketing*. Emerald Publishing.
- Hoehle, H., Scornavacca, E., & Huff, S. (2012). Three decades of research on consumer adoption and utilization of electronic banking channels: A literature analysis. *Decision Support Systems*.
- Hossain, M., & Oparaocha, G. O. (2017). Crowdfunding: Motives, Definitions, Typology and Ethical Challenges. *Entrepreneurship Research Journal*.

- Hu, Z., Ding, S., Li, S., Chen, L., & Yang, S. (2019). Adoption Intention of Fintech Services for Bank Users: An Empirical Examination with an Extended Technology Acceptance Model. *Symmetry*.
- Hussain, J., Salia, S., & Karim, A. (2018). Is knowledge that powerful? Financial literacy and access to finance: An analysis of enterprises in the UK. *Journal of Small Business and Enterprise Development*.
- Ibrahim, E. E., Joseph, M., & Ibeh, K. I. (2006). Customers' perception of electronic service delivery in the UK retail banking sector. *International Journal of Bank Marketing*.
- Im, I., Hong, S., & Kang, M. S. (2011). An international comparison of technology adoption: Testing the UTAUT model. *Information & Management*.
- Jakšič, M., & Marinč, M. (2019). Relationship banking and information technology: the role of artificial intelligence and FinTech. *Risk Management*.
- Jaruwachirathanakul, B., & Fink, D. (2005). Internet banking adoption strategies for a developing country: the case of Thailand. *Internet Research*.
- Jayashree, S., & Marthandan, G. (2010). Government to E-government to E-society. *Journal of Applied Sciences*.
- Jayasiri, N., Gunawardana, K., & Dharmadasa, P. (2016). Adoption of Internet Banking in Sri Lanka: An Extension to Technology Acceptance Model. *Asia Pacific Journal of Contemporary Education and Communication Technology*.
- Jooyong, J., & Eunjung, Y. (2016). Entry of FinTech firms and competition in the retail payments market. *Asia-Pacific Journal of Financial Studies*.
- Karokola, G., & Kowalski, S. (2012). Secure e-Government Services: A Comparative Analysis of e-Government Maturity Models for the Developing Regions—The Need for Security Services. *International Journal of Electronic Government Research*.
- Keil, M., Tan, B. C., Wei, K. K., Saarinen, T., Tuunainen, V. K., & Wassenaar, A. (2000). A Cross-Cultural Study on Escalation of Commitment Behavior in Software Projects. *MIS Quarterly*.
- Kenny, G., & Connolly, R. (2017). Towards an Inclusive World: Exploring M-Health Adoption across Generations. *25th European Conference on Information Systems*.
- Khan, E. A., Dewan, M. N., & Chowdhury, M. M. (2016). Reflective or formative measurement model of sustainability factor? A three industry comparison. *Corporate Ownership and Control Journal*.
- Khasawneh, M. H. (2015). An Empirical Examination of Consumer Adoption of Mobile Banking (M-Banking) in Jordan. *Journal of Internet Commerce*.
- Kim, H.-W., Chan, H. C., & Gupta, S. (2007). Value-based Adoption of Mobile Internet: An empirical investigation. *Decision Support Systems*.

- Klapper, L., Lusardi, A., & Panos, G. A. (2013). Financial literacy and its consequences: Evidence from Russia during the financial crisis. *Journal of Banking & Finance*.
- Kumar, R., Sachan, A., Mukherjee, A., & Kumar, R. (2018). Factors influencing e-government adoption in India: a qualitative approach. *Digital Policy, Regulation and Governance*.
- Kwateng, K. O., Atiemo, K. A., & Appiah, C. (2018). Acceptance and use of mobile banking: an application of UTAUT2. *Journal of Enterprise Information Management*.
- Larios-Hernández, G. J. (2017). Blockchain entrepreneurship opportunity in the practices of the unbanked. *Business Horizons*.
- Laukkanen, P., Sinkkonen, S., & Laukkanen, T. (2008). Consumer resistance to Internet banking: Postponers, opponents and rejectors. *International Journal of Bank Marketing*
- Lee, C.-C., Li, X., Yu, C.-H., & Zhao, J. (2021). Does fintech innovation improve bank efficiency? Evidence from China's banking industry. *International Review of Economics & Finance*.
- Lee, I., & Shin, Y. J. (2018). Fintech: Ecosystem, business models, investment decisions, and challenges. *Business Horizons*.
- Lee, J. (2010). 10 year retrospect on stage models of e-Government: A qualitative meta-synthesis. *Government Information Quarterly*.
- Leeuw, E. D., Hox, J. J., & Dillman, D. A. (2008). *International Handbook of Survey Methodology*. Routledge.
- Leong, K., & Sung, A. (2018). FinTech (Financial Technology): What is It and How to Use Technologies to Create Business Value in Fintech Way? *International Journal of Innovation, Management and Technology*.
- Li, Y., Spigt, R., & Swinkels, L. (2017). The impact of FinTech start-ups on incumbent retail banks' share prices. *Financial Innovation*.
- Liberti, J. M., & Petersen, M. A. (2018). Information: Hard and Soft. *The Review of Corporate Finance Studies*.
- Little, T. D., Lindenberger, U., & Nesselroade, J. R. (1999). On selecting indicators for multivariate measurement and modeling with latent variables: When "good" indicators are bad and "bad" indicators are good. *Psychological Methods*.
- Liu, G., Huang, S.-P., & Zhu, X.-K. (2008). User acceptance of Internet banking in an uncertain and risky environment. *The 2008 International Conference on Risk Management & Engineering Management*.
- Mahfuz, M. A., Khanam, L., & Mutharasu, S. A. (2016). The influence of website quality on m-banking services adoption in Bangladesh: Applying the UTAUT2 model using PLS. *International Conference on Electrical, Electronics, and Optimization Techniques*.

- Maldonado, S., Peters, G., & Weber, R. (2020). Credit scoring using three-way decisions with probabilistic rough sets . *Information Science*.
- Mascarenhas, A. B., Perpétuo, C. K., Barrote, E. B., & Perides, M. P. (2020). The Influence of Perceptions of Risks and Benefits on the Continuity of Use of Fintech Services. *Brazilian Business Review*.
- Mathew, S., Jose, A., G, R., & Chacko, D. P. (2020). Examining the relationship between e-service recovery quality and e-service recovery satisfaction moderated by perceived justice in the banking context. *Benchmarking: An International Journal*.
- Mazur, M. (2020, August). Blockchain-Powered New Generation of Global B2B Platforms: A Conceptual Approach .
- Memon, M. A., Cheah, J.-H., Ramayah, T., Ting, H., Chuah, F., & Cham, T. H. (2019). Moderation analysis: issues and guidelines. *Journal of Applied Structural Equation Modeling*.
- Merhi, M., Hone, K., & Tarhini, A. (2019). A cross-cultural study of the intention to use mobile banking between Lebanese and British consumers: Extending UTAUT2 with security, privacy and trust. *Technology in Society*.
- Milan, G. S., S. B., Toni, D. D., & Eberle, L. (2015). Information Quality, Distrust and Perceived Risk as Antecedents of Purchase Intention in the Online Purchase Context. *Journal of Management Information System & E-commerce*.
- Mishra, V., & Singh, V. (2015). Selection of appropriate electronic banking channel alternative: critical analysis using analytical hierarchy process. *International Journal of Bank Marketing*.
- Mohammadi, H. (2015). A study of mobile banking usage in Iran. *International Journal of Bank Marketing*.
- Mokhtar, S. A., Katan, H., & Hidayat-ur-Rehman, I. (2017). Mobile Banking Adoption : The Impacts of Social Influence, Ubiquitous Finance Control and Perceived Trust on Customer Loyalty. *Science International*.
- Mylonidis, N., Chletsos, M., & Barbagianni, V. (2019). Financial exclusion in the USA: Looking beyond demographics . *Journal of Financial Stability*.
- Nasri, W., & Zarai, M. (2014). Empirical Analysis of Internet Banking Adoption in Tunisia. *Asian Economic and Financial Review*.
- Natarajan, T., Balasubramanian, S. A., & Manickavasagam, S. (2010). Customer's Choice amongst Self Service Technology (SST) Channels in Retail Banking: A Study Using Analytical Hierarchy Process (AHP). *Journal of Internet Banking and Commerce*.
- Ndubisi, N. O. (2006). Customers' perceptions and intention to adopt Internet banking: the moderation effect of computer self-efficacy. *AI & Society*.
- OECD. (2020). *OECD/INFE 2020 International Survey of Adult Financial Literacy*.

- Oliveira, T., & Popovič, A. (2014). Understanding the Internet Banking Adoption: a Unified Theory of Acceptance and Use of Technology and Perceived Risk Application. *International Journal of Information Management*.
- Oliveira, T., Faria, M., Thomas, M. A., & Popovič, A. (2014). Extending the understanding of mobile banking adoption: When UTAUT meets TTF and ITM. *International Journal of Information Management*.
- Omarini, A. E. (2018). Fintech and the Future of the Payment Landscape: The Mobile Wallet Ecosystem - A Challenge for Retail Banks? *International Journal of Financial Research*.
- Ong, C.-S., & Lin, Y.-L. (2015). Security, risk, and trust in individuals' internet banking adoption: An integrated model. *International Journal of Electronic Commerce Studies*.
- Ozili, P. K. (2018). Impact of Digital Finance on Financial Inclusion and Stability. *Borsa Istanbul Review*.
- Phan, D. H., Narayan, P. K., Rahman, R. E., & Hutabarat, A. R. (2020). Do financial technology firms influence bank performance? *Pacific-Basin Finance Journal*.
- Pikkarainen, T., Pikkarainen, K., Karjaluoto, H., & Pahnla, S. (2004). Consumer acceptance of online banking: an extension of the technology acceptance model. *Internet Research*.
- Qeisi, K. I., & Al-Abdallah, G. M. (2014). Website Design and Usage Behaviour: An Application of the UTAUT Model for Internet Banking in UK. *International Journal of Marketing Studies*.
- Rahi, S., & Ghani, M. A. (2018). The role of UTAUT, DOI, perceived technology security and game elements in internet banking adoption. *World Journal of Science, Technology and Sustainable Development*.
- Rahi, S., Mansour, M. M., Alghizzawi, M., & Alnaser, F. M. (2019). Integration of UTAUT model in internet banking adoption context - The mediating role of performance expectancy and effort expectancy. *Journal of Research in Interactive Marketing*.
- Ravand, H., & Baghaei, P. (2016). Partial Least Squares Structural Equation Modeling with R. *Practical Assessment, Research, and Evaluation*.
- Rhine, S. L., & Greene, W. H. (2006). The Determinants of Being Unbanked for U.S. Immigrants. *The journal of consumer affairs*.
- Robb, C. A., Babiarz, P., Woodyard, A., & Seay, M. C. (2015). Bounded Rationality and Use of Alternative Financial. *The Journal of Consumer Affairs*.
- Rorissa, A., Demissie, D., & Pardo, T. (2011). Benchmarking e-Government: A comparison of frameworks for computing e-Government index and ranking. *Government Information Quarterly*.
- Rosse, J. N. (1967). Daily Newspapers, Monopolistic Competition, and Economies of Scale. *The American Economic Review*.

- Ryu, H.-S. (2017). What makes users willing or hesitant to use Fintech?: the moderating effect of user type. *Industrial Management & Data Systems*.
- Salimon, M. G., Yusoff, R. Z., & Mokhtar, S. S. (2016). The mediating role of hedonic motivation on the relationship between adoption of e-banking and its determinants. *International Journal of Bank Marketing*.
- Santini, F. D., Ladeira, W. J., Sampaio, C. H., Perin, M. G., & Dolci, P. C. (2019). A meta-analytical study of technological acceptance in banking contexts. *International Journal of Bank Marketing*.
- Sarstedt, M., Henseler, J., & Ringle, C. M. (2011). Multi-Group Analysis in Partial Least Squares (PLS) Path Modeling: Alternative Methods and Empirical Results. *Advances in International Marketing*.
- Sarstedt, M., Henseler, J., & Ringle, C. M. (2011). Multi-Group Analysis in Partial Least Squares (PLS) Path Modeling: Alternative Methods and Empirical Results. *Advances in International Marketing*.
- Schueffel, P. (2016). Taming the Beast: A Scientific Definition of Fintech. *Journal of Innovation Management*.
- Shaikh, A. A., & Karjaluoto, H. (2016). On Some Misconceptions Concerning Digital Banking and Alternative Delivery Channels. *International Journal of E-Business Research*.
- Shaikh, A. A., Karjaluoto, H., & Chinje, N. B. (2015). Consumers' perceptions of mobile banking continuous usage in Finland and South Africa . *International Journal of Electronic Finance*.
- Shankar, A., Jebarajakirthy, C., & Ashaduzzaman, M. (2020). How do electronic word of mouth practices contribute to mobile banking adoption? *Journal of Retailing and Consumer Services*.
- Shareef, M. A., Baabdullah, A., Dutta, S., Kumar, V., & Dwivedi, Y. K. (2018). Consumer adoption of mobile banking services: An empirical examination of factors according to adoption stages. *Journal of Retailing and Consumer Services*.
- Shareef, M. A., Kumar, V. K., & Dwivedi, Y. (2014). Factors affecting citizen adoption of transactional electronic government. *Journal of Enterprise Information Management*.
- Shareef, M. A., Kumar, V., Kumar, U., & Dwivedi, Y. K. (2011). e-Government Adoption Model (GAM): Differing service maturity levels. *Government Information Quarterly*.
- Sharma, S. K. (2019). Integrating cognitive antecedents into TAM to explain mobile banking behavioral intention: A SEM-neural network modeling. *Information Systems Frontiers*.
- Sharma, S. K., & Govindaluri, S. M. (2014). Internet banking adoption in India - Structural equation modeling approach. *Journal of Indian Business Research*.
- Singh, S., Sahni, M. M., & Kovid, R. K. (2020). What drives FinTech adoption? A multi-method evaluation using an adapted technology acceptance model. *Management Decision*.

- Staszkiwicz, P., & Staszkiwicz, L. (2015). Chapter 1 - Introduction to Finance and Financial Markets. In P. Staszkiwicz, & L. Staszkiwicz, *Finance* (pp. 1-17). Academic Press.
- statista. (2020). *Number of bank branches in Europe 2007-2018*. Retrieved from statista: <https://www.statista.com/statistics/940970/number-of-bank-branches-in-europe/>
- Stulz, R. M. (2019). FinTech, BigTech, and the Future of Banks. *Journal of Applied Corporate Finance*.
- Taherdoost, H. (2018). A review of technology acceptance and adoption models and theories. *Procedia Manufacturing*.
- Tam, C., & Oliveira, T. (2016). Literature review of mobile banking and individual performance. *International Journal of Bank Marketing*.
- Tero Pikkarainen, T. P. (2004). *Consumer acceptance of online banking: an extension of the technology acceptance model*. Emerald Group Publishing Limited.
- Thaker, M., Pitchay, A., Thaker, H., & Amin, M. (2019). Factors influencing consumers' adoption of Islamic mobile banking services in Malaysia: An approach of partial least squares. *Journal of Islamic Marketing*.
- Thakor, A. V. (2019). Fintech and banking: What do we know? *Journal of Financial Intermediation*.
- Vinzi, V. E., Chin, W. W., Henseler, J., & Wang, H. (2010). *Handbook of Partial Least Squares - Concepts, Methods and Applications*. Springer Heidelberg Dordrecht London New York.
- Vinzi, V. E., Trinchera, L., & Amato, S. (2010). PLS Path Modeling: From Foundations to Recent Developments and Open Issues for Model Assessment and Improvement. In V. E. Vinzi, W. W. Chin, J. Henseler, & H. Wang, *Handbook of Partial Least Squares*. Springer.
- Vives, X. (2019). Competition and stability in modern banking: A post-crisis perspective. *International Journal of Industrial Organization*.
- Vives, X. (2019). Digital Disruption in Banking. *Annual Review of Financial Economics*.
- Vučinić, M. (2020). Fintech and Financial Stability Potential Influence of FinTech on Financial Stability, Risks and Benefits. *Journal of Central Banking Theory and Practice*.
- Warsame, M. H., & Ireri, E. M. (2018). Moderation effect on mobile microfinance services in Kenya: An extended UTAUT model. *Journal of Behavioral and Experimental Finance*.
- Welcome Sibanda, E. N. (2020). Digital technology disruption on bank business. *Int. J. Business Performance Management*.
- Weston, R. (2006). A Brief Guide to Structural Equation Modeling. *The Counseling Psychologist*.
- Yousafzai, S. Y., Pallister, J. G., & Foxall, G. R. (2003). A proposed model of e-trust for electronic banking. *Technovation*.
- Yousafzai, S., Pallister, J., & Foxall, G. (2009). Multi-dimensional role of trust in Internet banking adoption. *The Service Industries Journal*.

- Yu, C.-S. (2012). Factors Affecting Individuals to Adopt Mobile Banking: Empirical Evidence from the UTAUT Model. *Journal of Electronic Commerce Research*.
- Zainab, B., Bhatti, M. A., & Alshagawi, M. (2017). Factors affecting e-training adoption: an examination of perceived cost, computer selfefficacy and the technology acceptance model. *Behaviour & Information Technology*.
- Zhou, T., Lu, Y., & Wang, B. (2010). Integrating TTF and UTAUT to explain mobile banking user adoption. *Computers in Human Behavior*.

10.APPENDIX

Table 1 – Questionnaire applied

Construct	Item	Type of variable
Gender	Género	Characterization/Moderator variable
Age	Idade	Characterization/Moderator variable
Education level	Escolaridade	Characterization/Moderator variable
Occupation	Ocupação	Characterization/Moderator variable
Income level	Rendimento líquido mensal	Characterization/Moderator variable
Utilization of mobile banking	Já utilizei o serviço bancário móvel (possibilidade de usufruir de serviços bancários através do meu telemóvel).	Characterization/Moderator variable
Perceived awareness (PA)	1. Sei que existe a possibilidade de utilizar o serviço bancário móvel.	Independent variable
	2. Conheço os benefícios de utilizar o serviço bancário móvel.	
	3. Tive algum tipo de formação (por parte do meu banco, ou por ter procurado informar-me, por exemplo) quanto às características do serviço bancário móvel.	
Availability of resources (AOR)	4. A conexão de Internet que utilizo no meu telemóvel não é cara.	Independent variable
	5. A minha conexão de Internet é boa o suficiente para utilizar o serviço bancário móvel em qualquer lado.	
	6. Tenho sempre acesso a uma conexão de Internet de alta velocidade em qualquer lado, através do meu telemóvel, para aceder ao serviço bancário móvel.	
Computing-self efficacy (CSE)	7. Tenho qualificações suficientes para utilizar o serviço bancário móvel.	Independent variable
	8. Tenho qualificações suficientes para utilizar o serviço bancário móvel através do navegador do meu telemóvel.	
	9. Tenho uma capacidade elevada na utilização do serviço bancário móvel.	
	10. Tenho confiança nas minhas capacidades na utilização do serviço bancário móvel.	
Perceived image (PI)	11. Pessoas/empresas que utilizam o serviço bancário móvel para acederem a serviços financeiros têm uma posição de relevo na sociedade.	Independent variable
	12. Pessoas/empresas que utilizam o serviço bancário móvel para acederem a serviços financeiros têm mais prestígio do que aqueles que não utilizam.	
	13. Usufruir do serviço bancário móvel para aceder a serviços financeiros melhora o estatuto social das pessoas/empresas.	
Perceived ability to use (PATU)	14. Aprender a interagir com o serviço bancário móvel é fácil para mim.	Independent variable
	15. É fácil interagir com o serviço bancário móvel.	
	16. Utilizar o serviço bancário móvel é claro e compreensível para mim.	
	17. Consigo facilmente fazer as operações que pretendo quando utilizo o serviço bancário móvel.	
Perceived information quality (PIQ)	18. A informação disponibilizada no serviço bancário móvel está atualizada.	Independent variable
	19. A informação disponibilizada no serviço bancário móvel é fácil de compreender.	
	20. O serviço bancário móvel disponibiliza toda a informação relevante e necessária para corresponder às minhas necessidades.	
	21. O serviço bancário móvel fornece informação correta quanto aos serviços disponibilizados.	
	22. O serviço bancário móvel disponibiliza informação de forma sequencial e sistemática.	

Table 1 – Questionnaire applied (continuation)

Multilingual option (MLO)	23. A disponibilização da opção de usufruir do serviço bancário móvel na minha língua materna pode melhorar a minha utilização do mesmo.	Independent variable
	24. A disponibilização da opção de usufruir do serviço bancário móvel na minha língua materna pode facilitar a minha utilização do mesmo.	
	25. Não consigo usufruir do serviço bancário móvel sem a opção de utilizar o mesmo na minha língua materna.	
	26. Não consigo compreender os serviços disponibilizados no serviço bancário móvel sem a opção de usufruir do mesmo na minha língua materna.	
Perceived functional benefit (PFB)	27. Poder utilizar o serviço bancário móvel em qualquer sítio que me seja conveniente é importante para mim.	Independent variable
	28. Poder utilizar o serviço bancário móvel a qualquer hora que me seja conveniente é importante para mim.	
	29. Utilizar o serviço bancário móvel é mais caro para mim, em termos do serviço disponibilizado, quando comparado com a deslocação a um balcão físico do banco.	
	30. Não demoro muito tempo a usufruir de um determinado serviço a partir do serviço bancário móvel, quando comparado com o serviço tradicional num balcão físico.	
	31. Utilizar o serviço bancário móvel melhora a eficiência das minhas operações financeiras.	
	32. Utilizar o serviço bancário móvel melhora a qualidade das minhas decisões.	
Perceived trust (PT)	33. O serviço bancário móvel é, geralmente, fiável.	Independent variable
	34. É-me garantido que o serviço bancário móvel está operacional.	
	35. O meu banco assume total responsabilidade por qualquer tipo de incidente de segurança no decorrer de uma operação realizada no serviço bancário móvel.	
	36. As políticas tecnológicas e legais do meu banco protegem-me adequadamente de eventuais problemas no serviço bancário móvel.	
Perceived uncertainty (PU)	37. A utilização do serviço bancário móvel não faz sentido para mim na medida em que não contempla contacto direto com um trabalhador do banco.	Independent variable
	38. A interação com o ambiente digital deixa-me desconfortável.	
	39. O resultado da utilização do serviço bancário móvel é incerto para mim, devido à ausência de contacto direto com um trabalhador do banco.	
Perceived security (PS)	40. O serviço bancário móvel fornece uma utilização segura para operações financeiras.	Independent variable
	41. O serviço bancário móvel protege a minha informação de conta.	
	42. O serviço bancário móvel não partilha a minha informação pessoal com outros sites.	

Table 1 – Questionnaire applied (continuation)

Adoption at static stage (MBA-S)	43. Utilizo o serviço bancário móvel para procurar informação referente à minha conta.	Dependent variable
	44. Utilizo o serviço bancário móvel para fazer o download de impressos.	
	45. No futuro, gostaria de utilizar o serviço bancário móvel para procurar informações referente à minha conta.	
	46. No futuro, gostaria de utilizar o serviço bancário móvel para fazer o download de impressos.	
Adoption at interaction stage (MBA-I)	47. Utilizo o serviço bancário móvel para contactar, fazer perguntas ou enviar e-mail ao meu banco.	Dependent variable
	48. No futuro, gostaria de utilizar o serviço bancário móvel para contactar, fazer perguntas ou enviar e-mail ao meu banco.	
	49. Utilizo o serviço bancário móvel para aceder ao apoio ao cliente.	
	50. No futuro, gostaria de utilizar o serviço bancário móvel para aceder ao apoio ao cliente.	
Adoption at transaction stage (MBA-T)	51. Utilizo o serviço bancário móvel para fazer transferências de uma conta para outra.	Dependent variable
	52. No futuro, gostaria de utilizar o serviço bancário móvel para fazer transferências de uma conta para outra.	
	53. Utilizo o serviço bancário móvel para fazer o pagamento de contas.	
	54. No futuro, gostaria de utilizar o serviço bancário móvel para fazer o pagamento de contas.	

