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Mobile Banking Adoption in Peripheral Countries

The Case of Portugal

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by

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Abstract

The present study originates from the theme of innovation, more specifically the innovation of the business model. Over the past few years, business models have gained increasing importance in business and academia because of their extreme importance to the success of any company or entity. In the financial and banking industry, technology has been evolving without any precedents, so banks seek to develop and innovate their business models in order to contribute positively to consumer expectations. Mobile bankig is a successful example. However, a question arises on the demand side, is the consumer ready to adopt such innovation from the banks? This investigation seeks therefore to understand the factors that may explain the adoption of mobile banking as being a bank innovation.

To verify the importance of the dimensions of the model, a quantitative exploratory study was carried out through the application of a questionnaire given to adult individuals with a bank account in Portugal. A research model was created resulting from the combination of the variables identified in the Diffusion of Innovation theory, with the variables of perceived risk and personal innovativeness. The results show that the adoption of mobile banking is supported by relative advantage, compatibility, perceived risk and, finally, personal innovativeness.

Keywords: Business Model, Diffusion of Innovation, Consumer Behaviour, Retail Banking Industry, Mobile Banking.

Table of Contents

List of Figures

List of Tables

Introduction

The retail banking industry has traditionally been known as a highly protected sector, which has experienced changes in recent years, especially concerning the strategic level, which highlighted the need for major restructuring with fundamental implications for the future of the banking sector. In this way, European banks started to feel unprecedented changes in the industry forced mainly by the developments in information technology.

The advance of information and communication technologies (ICTs) has generated new activities resulting either from technological innovation, from the disintegration of value chains as well as from new channels. According to Applegate (2001), these activities then brought about the appearance of new business models or redefined those which already existed.

This technological evolution has made it possible to offer innovative services that are sensitive to the location of customers on the move. Banks, aware of the importance of these changes, are adapting their business models to environmental modifications. Herzberg (2003) pointed out that the continuous improvement of mobile communication devices offered ever more complete and secure ways to manage payments and banking transactions. This is where mobile banking comes in.

Pousttchi and Schuring (2004) define mobile banking as a part of electronic banking (e-banking) and as a form of execution of financial services so that the consumer will use mobile communication techniques and mobile devices. Mobile banking refers to financial services offered with the help of mobile telecommunication devices to bank customers. It allows users to access the bank, anywhere and anytime, in a convenient and fully portable way, and to many financial operations that until recently were accessible only through the computer.

With the growth in the number of smartphones and internet users, and following the increasing wave of digital convergence, banking services through mobile devices promise to be the next big development in terms of banking supply. However, as the diffusion process of innovations is not homogeneous and the pace of innovation differs according to a particular innovation, it is pertinent to explore the factors that may explain the adoption of mobile banking.

The present work has the objective of contributing to the theoretical and practical discussion about the systematization of the study of the intervening variables in the influence of the adoption of an innovation in the business model in the retail banking industry, being mobile banking the innovation chosen to test this influence.

Therefore, this research aims to answer the following question: "Which are the factors that lead the consumer to adopt a new business model of an incumbent company through an innovation?" which leads to "Which are the factors that influence the adoption of mobile banking as being an innovative channel of an established bank?".

This paper is divided into two major parts. Part I begins with a review of the literature on the supply side, which presents a theoretical framework of the main themes with the scope of the evolution of business models and business model innovation. Afterward, a new chapter begins where a theoretical approach is related to the adoption of the innovation by the consumer, focusing on the demand side. This part I does not end without an overview of the current state of the banking industry, focusing mainly on mobile banking and in the specific case of Portugal.

With part II begins the empirical study about the analysis of the factors that may influence the adoption of mobile banking. This part defines the hypotheses and model to be tested, the method, the data collection instruments, as well as the target audience and sample definition. Subsequently, the data collected is analysed and the results achieved are discussed. The work ends with some final considerations and the references that were used throughout this process.

Part I
Literature Review and Theoretical Framework

Chapter 1: Business Model Developments

The constant concern with innovation in business agendas is related to the idea that growth is assumed to be the result of innovation and consequent diffusion (Fagerberg, Srholec & Verspagen, 2010). Innovation is widely recognized as a vehicle for growth (Buisson & Silberzahn, 2010), and in the saga of the search for innovation companies draw new value propositions through new products, services, processes, technologies or business models (Dervitsiotis, 2010). For the purpose of this study, innovation through business model will be given more relevance than the others.

1.1. Business Model: Origin and Concept

A business model is a conceptual structure supported by a company with the purpose to make a profit from its own operations (Teece, 2010). It can be used by small, medium and large enterprises as a business management tool in order to create a pattern for a business to compete in the market place as well as a template

on how the firm is going to make money and how it will work with internal and external players.

Even though the business model concept only gained a growing popularity and become more relevant in the past several years, this expression has been part of the business terminology for a quite long time. The business model term emerged far back in the 1950s with a first appearance in an academic article (Bellman, Clark, Malcolm, Craft & Ricciardi, 1957) and, years after, in a title and an abstract of an academic paper (Jones, 1960). However, according to Nisa and Ravichandran (2013), it really made its first steps by appearing in computing magazines over the 1970s and later, in 1995, for the general public, even before being used for academic purposes. At that time, it was shaped for the field of information and communication technology, where it was mainly used in the sense of mapping and modelling business processes (Doleski, 2015).

By then, while the literature about the usage of the business model expression was not relevant nor even substantial, often authors did not even provide a definition for that term. It was necessary to wait for the Internet revolution over the 1990s, together with related advances in ICTs in order to see a focus on the business model concept and its subsequent enlargement in the business world. Such affirmation can be supported by Osterwalder, Pigneur and Tucci (2005) since they used bibliometrics to detect the origins of the discussion about business models. The authors searched for the specific term in several academic journals in order to study their evolution. Thus, as can be seen in Table 1, the business model term begins to appear in the literature in the late 1990s, gaining another dimension in the beginning of the year 2000.

Year	In title	In abstract	In keywords	In full text
1990	0	4	0	7
1991	0	1	0	10
1992	0	2	0	15
1993	0	5	0	18
1994	0	2	0	18
1995	0	4	0	36
1996	0	14	0	57
1997	1	14	0	66
1998	1	19	0	128
1999	3	42	1	262
2000	16	67	1	491
2001	11	100	7	609
2002	22	109	2	617
2003	30	150	10	667

Table 1: Occurrences of the term "Business Model" in academic journals
Source: Adapted from Osterwalder et al. (2005)

Other academics, such as Ghaziani and Ventresca (2005), analysed the search of all abstracts using the business model term which revealed 166 results between 1975 and 1994 and then an increase for 1563 results between 1995 and 2000. Also Zott, Amit and Massa (2011) made their own research using EBSCOhost database and noted that the concept virtually exploded between 1995 and 2010 along with the popularization and broad diffusion of the Internet.

Timmers (1998) was one of the first authors who worked on a definition of the business model concept stating it is "an architecture for the product, service and information flows, including a description of the various business actors and their roles; a description of the potential benefits for the various business actors; a description of the sources of revenues" (p. 2). In the author point of view, it is essential to align the business model to a well-known marketing strategy in order to comprehend the business mission of a company and to assess its commercial viability.

Over the years, the concept begun to grow and evolve and, with that, it become more sophisticated. However, there have been several and different views concerning what specifically the term means. Doleski (2015) refers that such intrinsic variety of the "business model" has shaped the academic debate and hasn't permitted yet a common accepted and universal definition of the term. Instead, a literature analyses reveals an extensive range of definitions that diverge in their emphases and scope and, consequently, their studies are carried out in different directions.

In one of those directions, academics use a business model as an abstract concept in order to describe a way to create, sale and delivery value to a firm's customers (Gorevaya & Khayrullina, 2015). For instance, Euchner and Ganguly (2014) describe a business model as the means by which a firm creates and sustains margins or growth. Gassmann, Frankenberger and Csik (2014) define the term in an abstract way of how a firm generates value for its customers in order to create an incentive for them to pay for it. Even before that, Amit and Zott (2001), define it as "the content, structure, and governance of transactions designed so as to create value through the exploitation of business opportunities" (p. 511).

Magretta (2002) refers that business models are "stories that explains how an enterprise works" which should answer Peter Drucker's age old questions: who is the customer, what does the customer value, how to make money in a specific business and what is the economic logic that explains how it can deliver value to customers at an appropriate cost. Other academics, namely Euchner and Ganguly (2014), alert for the fact that a business model is not just the means by which a firm creates and captures customer value since it is also related with a firm's competitive environment.

A second line of research is concern about the primarily emphasis on the concept of business that allows researchers to overcome the complexity of the object which is under study and reduce it to a level acceptable to the perception and understanding (Gorevaya & Khayrullina, 2015). This course of action is helpful to the selection and study of the basic elements of a business model and the relationships between them, which normally characterize a firm's business.

For instance, research by Osterwalder and Pigneur (2010) support that a business model can be described as a canvas through several basic building blocks that illustrate how a company intends to make money which cover some of the main areas of a business, such as, customers, offer, infrastructure and financial viability. Also Johnson, Christensen and Kagermann (2008) refer that a business model resides in interlocking four elements that, when work together, create and deliver value for consumers. These four elements consist in customer value proposition, profit formula, key resources and finally, key processes. Teece (2010) points that a business model should articulates logic, data and other relevant evidence to support the value proposition for the firm customers.

Finally, there is still a third trend which observes specific situations and studies the business models of real companies of today (Gorevaya & Khayrullina, 2015). In this line of studies, researchers use a business model to describe and analyse successful companies such as Apple, Xerox, Google, Lego, Dell, Toyota, Ryanair and much more. However, the authors forewarn it should be noted some discrepancies between academics in the literature concerning the terminology used in conceptualizing and formalization these real companies' business models.

Thus, as it can be seen, even though there is not a consensus about a common and universal definition in the literature, most authors agree that a business model is extremely focused on creating a firm's value proposition, describing the reasoning of how an organization creates, delivers and captures that value. As a result, for the development of this paper, it will be used the working definition proposed by Sorescu, Frambach, Singh, Rangaswamy and Bridges (2011) which describes a business model as a "well-specified system of interdependent structures, activities and processes that serves as a firm's organizing logic for value creation (for its customers) and value appropriation (for itself and its partners)". This definition is adaptable with the nature of the value created and serves as an opportunity to introducing the topic of business model innovation will be forward discussed.

1.2. Business Model Innovation

Innovation is a concept that is increasingly present in the life of organizations regarding the ability to respond to the changes in an advantageous way for the consumer as well as the firm itself. According to OECD's (2005, p. 46) Oslo Manual, "an innovation is the implementation of a new or significantly improved

product (good or service), or process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations".

Technology can enable new business models as it opens not previously conceivable ways of doing business, such as, for instance, the impact of the Internet which has revolutionized the way we see business today. Yet, while technology is often a strong driver of innovation, providing impetus for new and better ways to meet customer needs, technological innovation must be accompanied by innovation of business models (Teece, 2010). For the author, without innovation in the business model there can be no "reward" for innovators, that is, the success of technological innovation also depends on the business model.

Therefore, the advance of ICT has generated new activities resulting either from technological innovation, from the disintegration of value chains as well as from new channels. These activities then brought about the appearance of new business models or redefined those which already existed (Applegate, 2001). However, it is important to notice that authors such as Osterwalder and Pigneur (2010) emphasize that this should hardly be considered as recent, since, for instance, the founders of Diners Club introduced the credit card in 1950, were practicing innovation at the level of the business model. The same was true for Xerox when it introduced photocopier leasing and copying in 1959 (Chesbrough & Rosenbloom, 2002).

Innovating a business model is important since this kind of innovation allows companies to commercialize new ideas and technologies as well as they can also view their business model as a source of innovation in and of itself and as a

source of competitive advantage (Massa & Tucci, 2013). This happens because the business model of any organization is constantly under pressure, which comes from possible innovations in technology, changes to the laws in force, changes in competitive positions by competitors, or changes in consumer preferences (Linder & Cantrell, 2000). In practice, innovating a business model is all about replacing outdated models.

Still, to innovate a business model is way more challenging than simply innovate a product or a service. According to Chesbrough (2010), to innovate a business model is an important and a very difficult procedure due to the conflict and tension between the established business model for the existing technology and the one that will need to be adopted to conveniently exploit the emergent technology. Some new models experiments will fail, but they do allow for understanding new approaches, within acceptable loss limits.

However, if the innovation in the business model is correct and, therefore, successful, it also offers superior returns. With discovery-oriented planning, companies can shape uncertainties and obtain new data and financial projections in their experiences. Therefore, from this need to innovate a business model in order to gain advantage and tear up competition in the market, it emerged the business model innovation phenomenon.

Business model innovation may refer to a newly activity system of a company which has the intention to provide a new value proposition for its customers (Amit & Zott, 2010). In other words, it is an innovative structure for value creation as well as value capture (Chesbrough, 2007) represented by a new or significantly improved system of activities in order to generate a new value proposition. Also, for Frenz and Lambert (2012), business model innovation

shows the combinations of changes in management and business strategy, including new sales and new distribution methods, which can be considered as non-technological innovation.

Research shows how a new business model can result by reinventing systematically across three dimensions – viable customer value propositions, specific customer segment and value network for creating and delivering the customer value of a business model, specifically by radically changing the established value propositions, redefining the existing customer base, deconstructing traditional value network and altering the firm's role in the existing value chain (Magretta, 2002).

For the purposes of paper, the perceptions defined by Massa and Tucci (2013) will be followed to differ the concept of business model innovation from other types of business model change. Therefore, these two authors suggest that business model innovation may be conceived in two ways: (1) the design of original business models for new entrants in the market or (2) the reconfiguration of existing business models for incumbents that are already established in the market. For the purposes of this research, the reconfiguration of an existing business model will receive greater relevance.

The first phenomenon can be entitled as business model design, which may refer to the entrepreneurial activity of creating, implementing and validating a business model occurring in a newly formed organization as they go to market. The other one can be indicated as business model reconfiguration referring a phenomenon by which incumbent firms reconfigure organizational resources as well as acquire new ones in order to change their existing business models (Massa & Tucci, 2013). According to the authors, both phenomenon could,

potentially, lead to business model innovation, thus requiring shifting from an existing model to a new one, even though with different degrees or radicalism.

Focusing on the incumbent firms, Kim and Min (2015) came up with a classification regarding their sources of business model innovation, dividing it into two types — original or imitative. In their perspective, an original business model innovation is when an incumbent firm creates a new business model derived from its own technological breakthrough or endogenous reconfiguration. Otherwise, an imitative business model innovation is when an incumbent firm simply adds a new business model that has been already invented by other firms.

Even though business model innovation may result as the product of a new business model or the reconfiguration of an existing one, it only constitutes a subdivision of a larger set comprising the whole product of business model design and reconfiguration activities, which means not all design or reconfiguration efforts will necessarily be a source of business model innovation (Kim & Min, 2015). In other words, the output of design or reconfiguration activities should be characterized by some degree of novelty or uniqueness in order to business model innovation occurs.

There may be, however, some setbacks to the innovation of the business model that can come from several orders, since the inherent changes are not always seen as an added value and the new relations in the value chain appear as potentially problematic for innovation of the business model (Koen, Bertels & Elsum, 2011). In this case, one may be in the presence of a barrier to the innovation of the business model.

In addition, the lack of definition and knowledge about the existing business model is presented by Johnson, Christensen & Kagermann (2008) as one of the main difficulties to boost growth through the innovation of the business model. The authors also highlight the difficulty in recognizing when the success of a company requires a new model, being this factor especially important in established companies. In fact, incumbent firms have great difficulty in crossing the abyss created by new innovations, and this happens because the new model can compete with the current one (Osterwalder et al., 2010). In this way, traditional firms tend to succeed in sustained innovation, but they have difficulties and tend to fail in innovations outside this area, where business model innovation is needed (Koen et al., 2011).

Finally, another issue that is worth mentioning is that business model innovation is always customized and tailored to their functional or core business strategies. For instance, even though Apple and Goggle compete directly with Apple Pay and Google Wallet, if both companies adopted the same business model innovation, one of them would probably not have the same success as the other. Therefore, there is no "one fits all" when innovating a model and there is no general model that a whole industry could use.

Chapter 2: Consumer Perception of Innovation

Even though financial institutions may successfully adapt their business model through innovation, they also face an intimidating challenge which is satisfying technology-prone consumers without distancing those who are slower to adopt new technology. The adoption of a technology or innovation can be defined as the decision to use the same technology or innovation, as Klein and Knight (2005) sustain, and this can happen to a consumer or even an organization.

Consumers adopt technology and product or service innovation essentially for two reasons. The first reason is that they benefit from this adoption, which means the use of technology is advantageous to them and, the second is that they appreciate their own experience of using technology or innovation (Kulviwat, Brunner II, Kumar & Clark, 2007). These motives are sometimes complementary and, when this happens, adoption is complete because it merges reason and emotion, joining what the consumer thinks with what he feels, thus extracting all the potential of technology.

2.1. Theoretical Models of Consumer Adoption

From the point of view of consumer adoption, it is necessary to understand the factors that lead consumers to positively adopt a new technology adopted by a certain company. In this way, theoretical models will be approached from social psychology and the diffusion of new technologies and innovations, in order to describe the relation of factors that influence the decision of the consumer to adopt this modification or not.

This one first line of research has chosen models that use behavioural intent or behaviour as dependent variables to predict the use of technology. Here, one can find the models of social psychology, with the following being referenced: The Theory of Rational Action (TRA), Technology Acceptance Model (TAM) and the Planned Behavior Theory (PBT).

The TRA is one of the most important theories used to explain human behaviour, arguing that people consider their actions before deciding whether or not to have certain behaviour (Ajzen & Fishbein, 1980). According to these authors, attitude towards behaviour, subjective norms and behavioural intention are essential to determine how a person behaves. In fact, attitude towards behaviour contemplates are beliefs that a person possesses that a behaviour will deliver certain results and the assessment of those outcomes. The subjective norms are related to the personal perception of the social pressures directed to the individual for this to adopt or not a certain behaviour. Finally, behavioural intention refers to a willingness to adopt a particular behaviour, which captures motivational factors functioning as indicators of a person's willingness to try to adopt a behaviour or what would be the effort that he or she plans to expend to accomplish it (Ajzen, 1991).

The PBT is an extension of the TRA that seeks to understand the relationship between attitudes and behavioural intentions, focusing on the variable intention, understood as antecedent of the behaviour (Ajzen, 1985). This theory considers situations in which the individual does not have total control over the situation, as well as about their behaviour. Two additional factors have been introduced, to the theory of rational action, perceived control and expectation for behaviour

(Ajzen, 1991). In this way, PBT determines the impact of the three following factors: attitude, subjective norms and perceived control over behaviour.

The TAM, developed by Davis (1989), is one of the most important theories in the area of technology acceptance. According to the author, the main reason people accept new technologies is their perception of how technology can help improve performance, which is called the utility of technology. However, people may decide not to adopt technology that is perceived as useful if they realize that technology is too complex or difficult to use (Davis, 1989). That is, perceived utility and ease of use are the factors responsible for impacting attitude toward adoption, which in turn impacts the behavioural intent of adopting new technologies (Davis, 1989).

These models are quite different from another existing line of research that examined the adoption and use of technology through a diffusion perspective of innovation (Rogers, 1995). This theory will be studied more carefully and with more relevance than the previous ones and gives by the name of Diffusion of Innovations (DOI).

2.1.1. Diffusion of Innovations Theory

The theory of adoption and diffusion of innovations is a theoretical framework to describe either adoption or non-adoption of new innovation. Proposed by Rogers (1995), DOI is one of the most referenced theories in the literature regarding innovation and has been used since the 60s to explain the process of adoption of new technologies through diffusion of innovation (Hernandez & Mazzon, 2007). It analyses and explains the process of how, why and at what rate new ideas and technology spread through cultures (Rogers, 1995).

According to Rogers (1995) "innovation usually has at least some degree of benefit for its potential adopters. This advantage is not always very clear-cut, at least not to the intended adopters. They are seldom certain that an innovation represents a superior alternative to the previous practice that it might replace" (p. 13).

Diffusion occurs progressively when information and opinions about an innovation are shared among potential users through channels of communication. For Rogers (1995) there is a five-stage process of adoption that starts with knowledge, then persuasion, decision (to adopt or reject new technologies), implementation and, finally, confirmation. Accepting this framework, non-adoption can be explained as the final result of an individual process of adoption that failed.

In this way, diffusion is the process by which an innovation is communicated through certain channels over time and within the members of a social system. Thus, the four main elements in the diffusion of innovation are the innovation itself, communication channels, time and the social system (Rogers, 1995). These same elements are represented in figure 1.

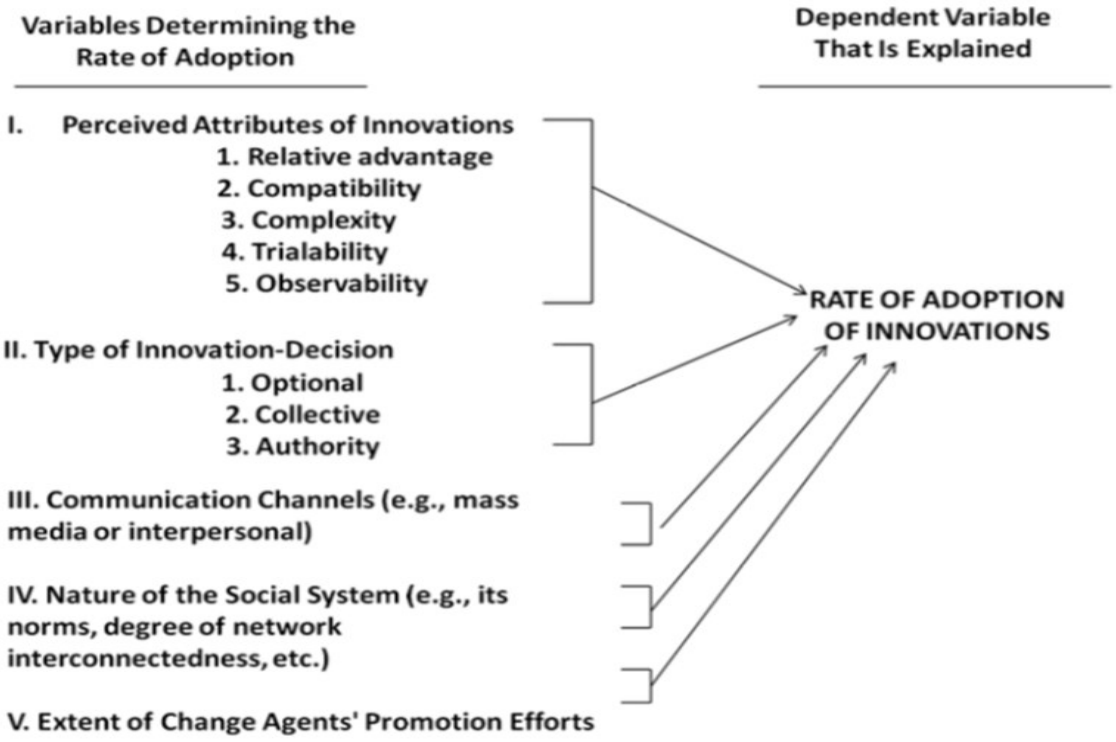

Figure 1: Elements determining adoption innovations.
Source: Rogers (1995).

According to Rogers (1995), a variation of 49% to 87% in the rate of adoption can be explained by the perception that the potential adopter has of the five characteristics known as the perceived attributes of innovations. Therefore, for the purposes of the present investigation, these characteristics will be given greater relevance than the other variables.

2.1.1.1. Perceived Attributes of Innovations

Rogers (1995) describes that it is not possible to assume that all innovations are equal, since while some innovations take a few years to be widely adopted, others can take much longer. Therefore, the author proposes five characteristics that, when perceived by individuals, help to explain the different rates and likelihood of adoption. Some of them are inherent to the innovation, while others concern the adopters themselves and their usage of the innovation. These

attributes are: relative advantage, complexity, compatibility observability and trialability.

The relative advantage is the degree to which innovation is perceived to be superior to the existing alternatives or better than the idea that is being replaced and can be measured by economic profitability, social prestige, low initial cost, and savings in time and effort, greater comfort and immediate reward (Rogers, 1995). Convenience has also been found to be a measure of relative advantage in some innovation studies.

The complexity dimension refers to the degree to which an innovation is perceived as difficult to use or understand (Rogers, 1995). New ideas, simpler to understand, are adopted faster than innovations that seek the development of new skills and understanding of the individual. This means that complexity has a negative relation with the intention of adopting an innovation. In other words, the more complex the innovation, the less intention is to adopt it (Hernandez & Mazzon, 2007).

The variable compatibility is the degree to which an innovation is perceived to be reliable with existing values, past experiences as well as and needs of potential adopters. An idea that is not compatible with its values, norms or practices will not be approved as quickly as an innovation that is compatible (Black, Lockett, Winklhofer & Ennew, 2001). The willingness to adopt a new technology is affected by a prior adoption pattern of related technologies. Hirschman (1980) concluded in his study that previous experience with the product class may lead to greater acceptance of a new product.

The observability factor relates to the degree to which the benefits and attributes of innovation can be observed, imagined or described to potential adopters. The characteristic of observability has been defined by Black et al. (2001) as the magnitude of which an innovation is visible to the other members in a social system. Rogers (1995) describes it as the extent to which an innovation is visible to the members of a social system, and the benefits can be easily observed and communicated to others.

Finally, trialability refers to the degree to which an innovation can be experienced over a limited period of time before actual adoption (Rogers, 1995). Tan and Teo (2000) believe that if customers are given a chance to try the innovation, it will minimize certain unknown fears, and lead to adoption. Innovations that are willing to be judged on their benefits reduce uncertainty for individuals by encouraging them to try out a new idea. An innovation that can be tested represents less uncertainty about its adoption, since it is possible to learn how to use it in practice. The individual, feeling more comfortable with their experimentation, seeing reduced perceived risk, is more likely to adopt it (Black et al., 2001).

The relationship between each of these characteristics and the intention to adopt a given innovation is positive, apart from complexity, which has a negative relation with the intention to adopt, and the more complex an innovation is adopted, the less intention in adopting it by the consumer (Hernandez & Mazzon, 2007).

2.1.1.2. Categories of Adopters

Knowing that innovation does not spread linearly across different segments of a society or social group and that individuals do not adopt innovations at the same time, Rogers (1995) identified five categories regarding the adoption of an innovation. Each category indicates where a consumer stands in relation to others in terms of time or when they adopt a new product or service (Schiffman & Kanuk, 2009). According to Rogers (1995), those categories are: innovators, early adopters, early majority, late majority and, finally, laggards.

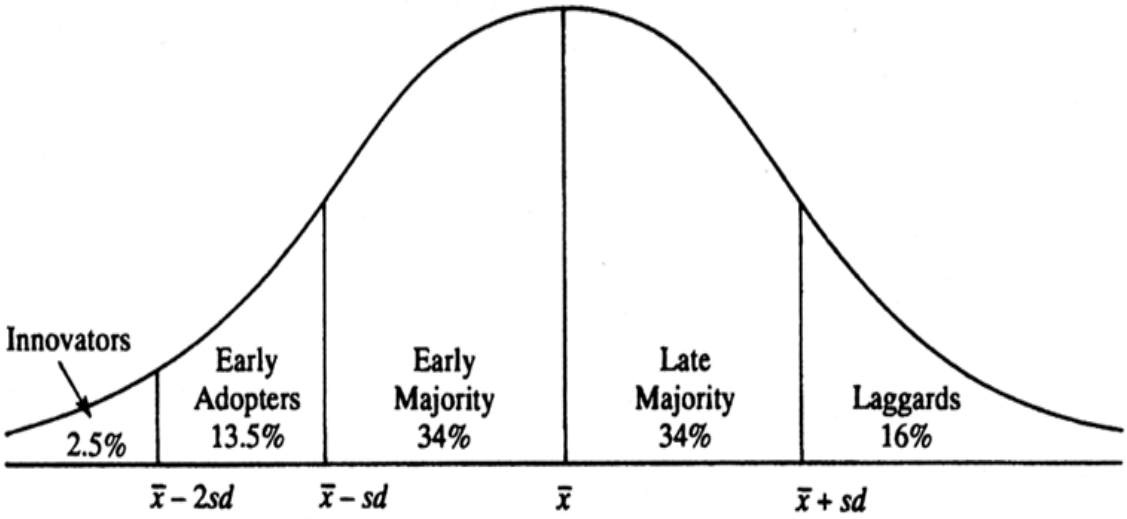

Figure 2: Framework of adopting innovation.
Source: Rogers (1995).

Innovators represents the first 2.5% of members in a system to adopt an innovation, willing to take the risk as they usually have tolerance to it when adopting a new technology which may eventually fail. Innovators are usually young, have the highest social class, have great financial lucidity, they are very social and have a closest contact to scientific sources and interaction with other innovators (Rogers, 1995).

According to the author, early adopters are the next 13.5% of members in an industry sector to adopt innovation. These individuals have the highest degree of opinion leadership among the other adopter categories. They are typically younger in age, have a higher social status, more financial lucidity and an advanced education. They are more socially forward than late adopters at the same time as more discrete in adoption choices than innovators. Realizing judicious choice of adoption will help them maintain in the central communication position.

Early majority represent the next 34% of adopters and they adopt an innovation after a varying degree of time. This time of adoption is significantly longer than the innovators and early adopters. Early Majority tend to be slower in the adoption process, have above average social status, contact with early adopters, and seldom hold positions of opinion leadership in a system (Rogers 1995).

Late majority also represent 34% of adopters, and they will adopt an innovation after the average member of the society. This category approaches an innovation with a high degree of scepticism and after the majority of society has adopted the innovation. These individuals are typically sceptical about an innovation, have below average social status and very little financial lucidity as well as very little opinion leadership (Rogers 1995).

And finally, the author states that the final 16% of adopters are represented by the laggards, being the last category to adopt an innovation. Unlike some of the previous categories, laggards show little to no opinion leadership and have an aversion to change. Individuals in this category tend to be advanced in age,

focused on traditions, have lowest social status, lowest financial fluidity, and in contact with only family and close friends.

Later adopters are more sensitive to interpersonal information and other internal influences and dissatisfaction is more common in later adopters than in early adopters (Parthasarathy & Bhattacherjee, 1998). According to the authors, early adopters have more realistic expectations of services because their initial adoption decision is based on a rational cost-benefit attitude. On the other hand their superior technical and cognitive abilities allow them to use the service more extensively.

Here, it is important to clarify that this adopter classification system is not entirely proportional or symmetrical, since there are three categories of adoption left to the mean and only two to the right.

2.2. Additional Factors Influencing Innovation Diffusion

In addition to the characteristics of innovation found in the model described above, there are others that are equally important when talking about the adoption of internet banking.

Personal Innovativeness

An important variable that may affect the rate of adoption of an innovation is defined as personal innovativeness, which consists in the different reactions that the possible adopters have to a new technology (Yi, Jackson, Park & Probst, 2006). Personal innovativeness is therefore the innate willingness of an individual to experiment and embrace new technologies and their related services (Rao and Toshani, 2007). Personal innovativeness has been examined in innovation

diffusion research (Rogers, 2002). For the purpose of this study, personal innovativeness is considered as an antecedent of technology acceptance process. It is also important to link this attribute with the adopters' categories that was discussed above.

Perceived Risk

The perception of risk is also widely discussed in the existing literature. Bauer (1960), Webster (1969) and Ostlund (1974) introduced risk as an additional dimension in the adoption and diffusion of innovations. According to Schiffman and Kanuk (2000) perceived risk consists of the degree of uncertainty or fear of the consequences that the consumer feels when taking into account the purchase of a new product. The authors also claim that when the consumer perceives little or no risk in acquiring a new product there will be a greater tendency to make the purchase. Laukkanen, Sinkkonen, Kivijärvi and Laukkanen (2007) and found in their research evidences that prove the significant negative effect of the perceived risk on the adoption of innovations.

Demographic Characteristics

According to Rogers (1995), a clear principle of human communication is that the transfer of ideas occurs with more frequency among individuals who are similar. Therefore, it is important to refer to demographic characteristics as an important factor for the adoption of innovation by the consumer. According to Suoranta (2003), demographic characteristics are all important to understanding the adoption, since they could play a critical role in determining how consumers decide about the adoption and usage of new technology-based services.

In fact, there is already a significant body of evidence from empirical studies. Regarding age, for instance, even though Rogers (1995) argues that there is no consistent evidence that this is a variable that influences the adoption of an innovation, Kleijnem, Wetzels and Ruyter (2004) claim that the adoption of new technologies tend to be higher among younger consumers. While other authors, Laukkanen and Pasanen (2008), in a study carried out, reported that the age group that uses the most innovations, is between 30 and 49 years, since they are individuals with a greater propensity to be abreast of the market.

Gefen and Straub (1997) noted that gender has been generally missing from acceptance of technology behaviour research. Even though there is no much research on the impact of gender in adopting innovations, Wan, Ong and Lee (2005) found that males were more inclined to adopt technology than females. Yang (2005) also found that gender influences perceived ease of use and usefulness but in a negative way, contrary to expectations. It has been found that females are usually more apprehensive by security issues than males, while males pay more attention to effectiveness (Amin, Muhammad, Hamid & Lada, 2006).

Additionally, it has been identified in several studies that consumers with a higher income are more willing to adopt a new technology. According to Mattila and Souranta (2004), the adopters of technological innovations are often described as being relatively young, educated, with high income and with superior occupations. In addition, the researchers examined that individual levels of education and prior previous adoptive experience may influence the adoption of new technologies (Agalwal & Prasad, 1997).

Chapter 3: The Retail Banking Industry

Since this work will mainly focus on retail banking, it is important to understand its role in boosting the banking industry. Retail banking is presented as banking services for consumers and for small and medium sized enterprises, provided by commercial banks, which have a turnover no bigger than 10 million euros (OECD, 2011). In developed economies, such as the European Union, consumers and small and medium sized enterprises rely profoundly on the retail banking since they provide several financial needs including savings, investments, credit and payments services (Bapat & Bihari, 2015).

Due to the sector's credit crisis and credit deterioration that led to declining profits and revenues, the retail business took a significant portion of the banking system's total revenue. According to Leichtfuss et al. (2010), in 2008, the year which represents the middle of the economic crisis, retail banking accounted for 55% of the revenues generated by a sample of 140 banks, demonstrating its preponderant role in attracting customers and retaining them.

With revenue growth declining in most markets, retail banking is expected to improve efficiency not only by reducing costs but also by increasing the efficiency of its processes by improving the customer experience. Innovation is the main ally of banks in these terms. Customers are less and less willing to go to banks. For instance, the possibility of transferring money and paying bills through a mobile application allows greater convenience to the consumer and a reduction of costs for the banking sector (Pearson, 2013).

3.1. Evolution in Retail Banking

The retail banking industry has traditionally been known as a highly protected sector, experiencing good spreads at regulated deposit and loan rates and widespread restrictions on entry into the domestic and foreign markets (Hawkins & Mihaljek, 2001). However, it has undergone changes in recent years, especially concerning the strategic level which highlighted the need for major restructuring with fundamental implications for the future of the banking sector.

In fact, over the last several years, the European banks started to feel unprecedented changes in the industry forced by the deregulation of financial services, the establishment of the Economic and Monetary Union (EMU) and, finally, by the developments in information technology (Bikker & Haaf, 2002), causing a global instability in the industry. Leichtfuss et al. (2010) supported this idea when mention that some of the reasons to this change include "the deregulation and opening of international markets, the ongoing regional expansion and globalization of many banks, the expansion of direct and online banking and rising customer expectations".

More currently, at the Cumberland Lodge Financial Services Summit, Mersch (2015) settled that European traditional banking sector have been suffering from changes from new technologies, which includes different payment methods, from new market players, which are threatening the incumbents' dominant positions and from reforms in regulation, which includes BaselIII as well as numerous initiatives to limit the scope of bank activities (Mergaerts & Vennet, 2015) that have introduced more complexity and with that comes an inevitable cost in terms of compliance.

Regulatory changes, compliance and risk management

Due the recent financial crisis, an impressive number of regulations were introduced all across the globe with the purpose to protect the banking sector and the interests of its customers. Even though almost every part of the world is witnessing an increase in regulatory and compliance requirements, in Europe, regulatory pressure is significantly higher.

These regulation changes are causing banks to adopt less dangerous approaches, such as having better credit quality portfolios and to divest themselves of risky or capital intensive businesses, shaping bank attitude towards risk (Kenth, 2015). However, on the other side, these new approaches can also result in an increase of the cost of capital. In its World Retail Banking Report of 2016, Capgemini states that banks are also trying to increase adoption of technology and aggregation capabilities, overhauling information technology infrastructure, in order to keep pace with increasing and changing regulations (Capgemini, 2016).

In the midst of this regulatory pressure, there are non-bank financial institutions, especially the so-called fintech companies, which will be discussed further ahead, that are not subject to the same financial pressures of the banks. In this way, these companies have a greater autonomy to offer competing services to bank customers, establishing specific funds or investing in new challenges (Kenth, 2015). At the same time, banks began to incorporate compliance throughout the organization, through integrated compliance software as a means to respond to rapidly changing regulatory requirements. Furthermore, they also start to put compliance processes in place to prevent risks associated with third-party vendors in order to ensure greater efficiency and effective use

of resources (Capgemini, 2016). For that happens, there must be a cultural change as well as a simplification of processes. However, if the centralization of compliance procedures worked well, the company can use that information regard to knowing its customer.

New competition

Other decisive factor that is forcing banking industry to adopt a new approach is competitiveness. With its increase, banking institutions have the need to improve the products and services they are offering in order to link their customers, with loyalty being one of the sector's core goals.

In the past, banks were primarily concerned with regulatory issues, back-office processes and cost effectiveness and less with customer needs. However, changes with customer behaviours and technological innovation lead to new competitors feeling the opportunity to enter the market. A research carried out by the European Financial Management Association, Efma (2015), banks consider that the threat of new competitors is growing and 72% of them consider the threat of potential competitors is high or very high.

In the current days, the banks' competitors are not just the other banks, as the threat from non-traditional players has been gaining traction in the financial industry. From non-traditional banking providers with a technological focus like PayPal and Square to giant technology companies like Google, Apple and Amazon, there is an increasing incentive for companies to offer payments, investments, finance management lending and others banking services that exclude traditional banks completely. Also, new start-ups created with the purposes to destabilise the sector can be considered as a serious threat to this

specific industry, since these technology companies have offered their customers a set of financial solutions (Eistert, Buhl & Fridgen, 2012).

Another threat is that an increase number of start-ups have beginning to provide financial products traditionally offered by traditional banks, such as stored-value payment cards, mobile payment apps that offers to consumers several tools to manage their accounts (Mariotto & Verdier, 2015). These tools include mobile network operators, mobile device manufacturers, application providers, terminal providers and third party agents. It is clear to say that banks and financial services are now facing an impact on their retail payments business due a special type of start-ups which are called fintech.

The term fintech is a contraction of the words finance and technology. This phenomenon refers to the technological start-ups that are now emerging in order to compete traditional banking and financial incumbents (Darolles, 2016). This type of start-ups covers several services which some of them include crowdfunding platforms, mobile payment solutions, online portfolio management tools and international money transfers. Kotarba (2016) says fintech companies are full with agility in instant design of the technology and the digital area as well as they maintain a strong focus on the customer experience. At the moment, there are 1 934 fintech companies in 58 countries all over the world with a total funding amount of, approximately, 53.96 billions of dollars (Venture Scanner, 2016).

Banks are aware of the danger of a sudden change given technological disruptions. Therefore, instead of competing and in order to defend their market share and customer base, banks are starting to combine their competitor's capabilities with their experience in financial services (Pearson,

2016). For instance, the author also states that banks are now working with working with innovative start-ups or fintechs to boost their innovation performance. These are the results: 41% of banks are working with start-ups as suppliers; 32% are making investments in start-ups, ad-hoc or through a fund and, finally, 27% are running accelerators or incubators, internally or externally.

Customer expectations

Meanwhile, customer expectations have also change. Consumers are demanding more flexibility, an improved experience, better services and more channels to engage with more frequency. All of this while demanding everything quicker and cheaper at the same time. These demands and expectations are now increasing influenced by the advances of digital pioneers in the retail sector, such as Amazon, Netflix and Uber, whose users access their services whenever they need. Therefore, bank customers also expect quick and convenient service from their banks, with simple and intuitive interfaces as well as the ability to switch flawlessly across digital platforms. And, as they demand an increase in the offer of products and services provided by the sector, the pressure of banks to develop their strategy also increases. With a progressively informed and demanding consumer, the traditional, product-oriented banking evolves into a customer-centric banking, focused in the customer and in its loyalty (Beerli, Martin & Quintana, 2004).

Digital technologies to enhance customer experience

Technological development is changing financial institutions while creating new ways for society to interact. Retail banking is one of the sectors that provide a positive experience to its customers. An Accenture (2015) survey found that

36% of global bank customers are extremely satisfied, 33% feels loyal to them and 28% would recommend their providers. However, the same study found that 18% of bank customers switched completely and 27% added new providers. One of the reasons for this is happening is because, despite being satisfied with online customer service channels compared with traditional channels, customers are getting much more comfortable with the technology and want more from their banks. Therefore, with the increased relevance of digital devices, such as mobile and online banking features, being more important than ever to the overall banking experience, banks are pushing them as a way to provide better customer experience throughout services much more cheaply than they can in branches (Capgemini, 2016).

That means that having a friendly, useful, powerful suite of technology products will be an important condition for the manner customers select banks in the future. However, simply being more digital is not the answer as it will not give banks the differentiation they need in order to best serve their customers (Accenture, 2015). Banks now have the opportunity to offer to their customers a more personalize experience as technology is giving them a way to collect useful data from their customers. Hence, banks are bringing all this data into one central location and creating a robust profile of their customers. These profiles are used to deliver tailored and personalized experiences.

Economic and financial crisis

Lastly, the recent crisis, not only led to large losses – and even collapse – for a great number of banks, it also shook the customer base. After the year of 2008, a period marked by the banking crisis that was felt in Portugal, banks started to

rely on its commercial network to attract clients and resources in order to increase assets (Leichtfuss et al., 2010). Even though the global economy started to emerge from the crisis, it became clear that many customers, especially the younger generations, had lost all faith in their banks (Darolles, 2016). Therefore, banks, in addition to seeking to increase their commercial network, also seek to optimize costs. As an example, they are reducing the number of branches in order to make their operations more efficient without neglecting the creation of value for their customers.

Overall, the banking and financial services industry emerged from the crisis to a very different world from the one it was used to, partly as a result of the crisis itself, and partly due to other developments that have been gathering alongside it. These, as stated above, included changes in global economic growth patterns and, consequently, global instability, advances in technology, a new competitive landscape and, finally, changes in stakeholder attitudes, behaviours and expectations.

3.2. Mobile Banking

With the changes that have been detected through the evolution of the banking sector, a number of general tendencies have emerged, shaping the global financial landscape and creating powerful forces that are transforming the retail banking industry. After intensive research into the current state of the banking sector, it was concluded that it is one of the industries that invest most in innovation, the last trend of the sector being the mobility of services. In fact, the case of mobile banking is undoubtedly the one that has received most importance in recent years and, consequently, the present study will focus essentially on this innovation as the most significant trend at the moment.

So, a question must be asked: what is mobile banking? Mobile banking can be defined as "a type of execution of financial services in the course of which – within an electronic procedure – the consumer uses mobile communication techniques in conjunction with mobile devices" (Pousttchi & Schurig, 2004, p. 1). Also Laukkanen and Lauronen (2005) define mobile banking as a new channel where the consumer and the bank interact through a mobile device, which can be a mobile phone or a tablet device. It can also be considered as a subset of electronic banking and even an extension of internet banking having, however, its own characteristics. Here, it should be noted that access to banking services through a computer cannot be considered mobile banking, but rather internet banking, online banking or even home banking.

Mobile banking has allowed consumers to interact with their bank anytime and anywhere, being considered one of the greatest advantages of this technological innovation, such as immediacy and, of course, mobility (Laukkanen & Pasanen, 2008). Another advantage of using these services is that mobile banking simplifies the financial management of consumers, since the information is accessible through a mobile device without space or time constraints (Riivari, 2005). Also, according to Yang (2009), the main incentive factors to the adoption of mobile banking are the efficiency, quantity of information and the low cost of use.

On the other hand, the insecurity of personal information or money is considered as the main obstacle to the use of mobile banking. Cruz, Neto, Munoz-Gallego and Laukkanen (2010) add complexity, lack of information and inadequate devices to these factors. In addition, Koening-Lewis, Palmer and Moll (2010) emphasize risk perception and trust as the main barriers to the adoption

of online mobile services, as well as the perceived lack of credibility insofar as it has been a significant concern for bank customers.

The first steps towards mobile banking started with the computerization of banking services and expansion or remote channels through the introduction of Automated Teller Machines (ATMs). Some years later, with the evolution of the Personal Computer (PC) came the concept of internet banking, followed years later by mobile banking through mobile devices. In this context, banks have become progressively mobile and accessible everywhere by linking mobile technology to the Internet (Laukkanen, 2005).

Having emerged in 2000, mobile banking was provided in the form of SMS exchange between clients and the bank in order to carry out simple banking operations, such as checking the current account balance or transferring funds (Zhou, 2012). According to Akturan and Tezcan (2010), in the early 2000s, mobile banking was already described as the most important distribution channel for retail banking, however, consumer adoption was not as rapid as the new mobile devices. Only when a new generation of mobile phones appeared, did the use of mobile banking begin to accelerate (Riivari, 2005).

Over the years, mobile banking has evolved into a wireless application protocol (WAP) allowing access to the bank through a portal, and more recently, along with the evolution of mobile devices, has taken the form of software applications (Apps) for smartphones or tablets with operating systems such as Android, IOS and others. These Apps, as they offer a better interface compared to the WAP system and the same functionalities, can considerably improve the user experience, due in part to the evolution of the quality of mobile devices (Zhou, 2012).

Mobile banking creates value not only for consumers but also for banks, as it improves customer service, reduces costs, increases business reactivity and proactivity, increases market share and reinforces brand image (Riivari, 2005). In fact, through their Apps, banks can offer a combination of payments, real-time banking, data transmission and access to financial information and services at any time (Akturan & Tezcan, 2012). Thus, it is accepted that mobile phones are a channel for the use of services and have enormous potential in the banking sector (Laukkanen and Lauronen, 2005).

3.3. The Portuguese Banking Scenario

In Portugal, banks sell products and services that mainly include fund raising, funds application and banking services (Caiado & Caiado, 2006). According to these authors, the main services provided by the Portuguese banks to their clients are the transfer of funds, execution of stock orders, purchase and sale of foreign currency, provision of guarantees and, finally, financial consultancy. The supply of goods and services is carried out through the main distribution channels: bank branches (physical space), telephone; ATM or online over the internet or mobile devices. These distribution channels are integrated and often complement each other.

Banking is one of the sectors of the Portuguese economy that has undergone more changes in the last decades, due to Portugal's entry into the European Union, which has led to a profound institutional and economic change (Santos, 2006). In fact, the sector took advantage of the opening of markets and free competition to adopt a proactive strategy for its restructuring and modernization in terms of methods and instruments (Salgueiro, 2002). In addition, there was an

increase in the services provided, either by technological innovations, or by a high degree of reliability, reduction of response times and better adjustment of customer profiles (Salgueiro, 2007).

However, on the other hand, the Portuguese banking system, as happened with several countries of the European Union, was seriously affected by the economic and financial crisis. In 2011, the government was forced to ask for international assistance through the International Monetary Fund to maintain the balance in its public finances. In order to re-establish the economy and keep it running, strong austerity procedures were implemented, leading to lower levels of consumer confidence, a sudden increase in the unemployment rate as well as other consequences that caused Portugal to not attract enough investors to stimulate its economy, nor being able to keep its products as competitive as before in the international market (Banco de Portugal, 2016).

Understandably, it brought consequences for the Portuguese financial institutions. Banks suffered from the overall downturn of the Portuguese economy at the same time they had to deal with industry specific structural changes, such as the penalties introduced by Bank of Portugal at higher interest rates than the market reference. Savings deposits are a major source of revenue for the retail banking, and interest rates are the key factor in shifting demand from the general population to these savings products. This regulation on interest rates, combined with the fall in individual disposable income, was a challenge for financial institutions seeking deposits (Banco de Portugal, 2016).

Portuguese banking, nonetheless, has been recovering in recent years. At the level of technological developments, there is the path of banking automation, namely ATMs, telephone banking, internet banking and, more recently, mobile

banking, advances that have led to a decrease in the importance of the physical contact to the detriment of other forms relationship between clients and banks (Santos, 2006). The technology and information obtained in this way also allow at all times to have a high knowledge of the present and past situation of the customers. The transfer to the bank branch was partly replaced by ATM, later on the internet, and today there is an exponential growth of mobile banking (Caiado & Caiado, 2006).

In fact, a Marktest study indicates that the internet banking service continues to grow in Portugal, having tripled compared to the year of 2003. The study also concludes that, in recent years, customer contact with Internet banking has exceeded telephone contact, while the use of ATMs has outperformed the visits to the branches (Marktest, 2017). More recently, in 2016, results indicate that 2 545 thousand Portuguese people use internet banking, a figure that corresponds to 35% of the continent's residents with an age of over 15 and holders of an open bank account (Marktest, 2017).

Regarding mobile banking, available through the installation of an application on the client's smartphone or tablet, Marktest (2017) states that the mobile banking service was thought of as a form of growth for banking, which, through this service, could reach to some population that would otherwise involve additional costs. According to another Marktest study, in February 2014, about 600 thousand Portuguese people used mobile banking, with the majority being younger individuals aged between 25 and 44 years old, with the percentage of users duplicated between April 2013 and February 2014 (Marktest, 2017).

Part II
Empirical Study

Chapter 4: Methodology

4.1. Hypotheses and Model Definition

Aiming to contribute to the understanding of the readiness to adopt a new banking service such as mobile banking, this investigation tests the validity of the perceived attributes of innovations from DOI theory of Rogers (1995) along with modifications found in the literature that are adequate with what it is intended to study.

This research will have as independent variables the relative advantage, complexity, compatibility, observability, trialability, personal innovativeness and perceived risk. Demographic characteristics, such as age, gender and annual income, will also be considered as variables. Those variables will aim to explain the customers' intention to use mobile banking as a new interaction channel with a bank.

Compared with other banking channels, mobile banking has the advantage of convenience from the inherent mobility, that is, the barrier of space and time no longer exists. Other benefits such as immediacy and affordability to customers

have been reported (Lin, 2011). Also Mattila (2015) refers that the advantages of using mobile banking may be the convenience in the form of access to the bank account, regardless of the location or time, the efficiency in the management of the finances and a better a better overview of banking matters could be relative advantages. This leads to:

H1. Relative advantage will have an effect on mobile banking adoption.

There is considerable amount of empirical research on the mobile technology to suggest that mobile banking services that have very user friendly interfaces, users see them as user friendly, and form positive attitudes towards them (Lin, 2011). On the contrary, much of the existent literature on barriers of mobile banking adoption is predominantly related to technical complexity. Taylor and Todd (1995) consider that the less perceived complexity, the more positive the attitude towards an information system. Hence:

H2. Complexity will have an effect on mobile banking adoption.

Al-Gahtani (2003) discovered that compatibility had a significant correlation with computer adoption and use in Saudi Arabia, being likely that the relation between compatibility and adoption will hold in the context of mobile banking. Also, consumer perception about the compatibility with electronic banking services was found to be positively related to their attitude and use of new technologies (Püschel, Afonso & Hernandez, 2010). This research expects individuals to realize that mobile banking is compatible with their preferences and lifestyle:

H3. Compatibility will have an effect on mobile banking adoption.

Due to the intangibility of digital banking services, this variable may present some difficulties, although in the context of mobile banking, observability is defined as the ability to access banking services at any time and from any location without any delay or queue as well as see the effect of mobile banking transactions immediately and pass on the accessibility benefits to others. Through this exposure, consumer gain knowledge about mobile banking and its benefits, facilitating the adoption of mobile banking (Al-Jabri & Sohail, 2012). Hence:

H4. Observability will have an effect on mobile banking adoption.

The ability to conduct a trial may confirm how easy it is to use mobile banking or, for those who are apprehensive about the service, it may give them the necessary confidence. According to Tan and Teo (2000), if customers are given a chance to experience the innovation, it will minimize some unknown fears, and lead to adoption. With banks providing assistance and demonstrations regarding the usage of mobile banking in a trial period, fears about mobile banking can be minimized and motivate potential adopters to use mobile banking. Thus:

H5. Trialability will have an effect on mobile banking adoption.

Regarding the topic of mobile banking, literature has been validating that users with high personal innovativeness have been found to be more likely to explore and adopt internet banking services. According to Agarwal and Prasad (1998), individuals with a higher level of innovation in information technologies develop more positive perceptions about an innovation in terms of their relative advantages, ease of use and compatibility. Also, innovators have a greater degree of innovation, while laggards are, on the contrary, those with a lower degree of

innovation (Saaksjarvi, 2003). Hence, personal innovativeness is intimately linked to the willingness of consumers and their positive attitudes to learn about new products and services, which is the basis for the adoption of internet banking. This leads to:

H6. Personal Innovativeness will have an effect on mobile banking adoption.

Since the subject matter of the present study is financial products, it is relevant to realize whether perceived risk is negatively related to a current adoption and use of mobile banking services. In this context, the perception of risk is even more important because of the threat of privacy and security concerns (Luarn & Lin, 2005). According to Kim, Ferrin and Rao (2008), consumers are often faced with at least some degree of risk or uncertainty in the use of mobile technology. The perceived risks of loss of information is an important factor customers consider when accessing mobile services (Luarn & Lin, 2005). In addition, there is also the issue of privacy violation, since hackers can access their bank accounts via stolen security codes (Poon, 2007). Finally, some users may also be afraid of loss or theft of a mobile device with stored data (Coursaris, Hassanei & Head, 2003). Therefore, the perceived risk is more likely to negatively affect the adoption of internet banking:

H7. Perceived risk will have an effect on mobile banking adoption.

As previously noted, demographic characteristics have also been used to understand the characteristics that lead consumers to adopt an innovation, such as mobile banking. Income, education, occupation, gender and age are the most widely used identifiers for these investigations (Im et al., 2003). However, despite these studies, the demographic characteristics will not be used to evaluate their

influence in the adoption of mobile banking, since this service does not position itself in a specific target and, on the days that occur, the discrimination by gender, age and others starts to not make sense.

Thus, once considered to be relevant information, the demographic characteristics will be used to describe the sample under analysis.

Therefore, in order to prove the formulated hypotheses, the following model will be applied:

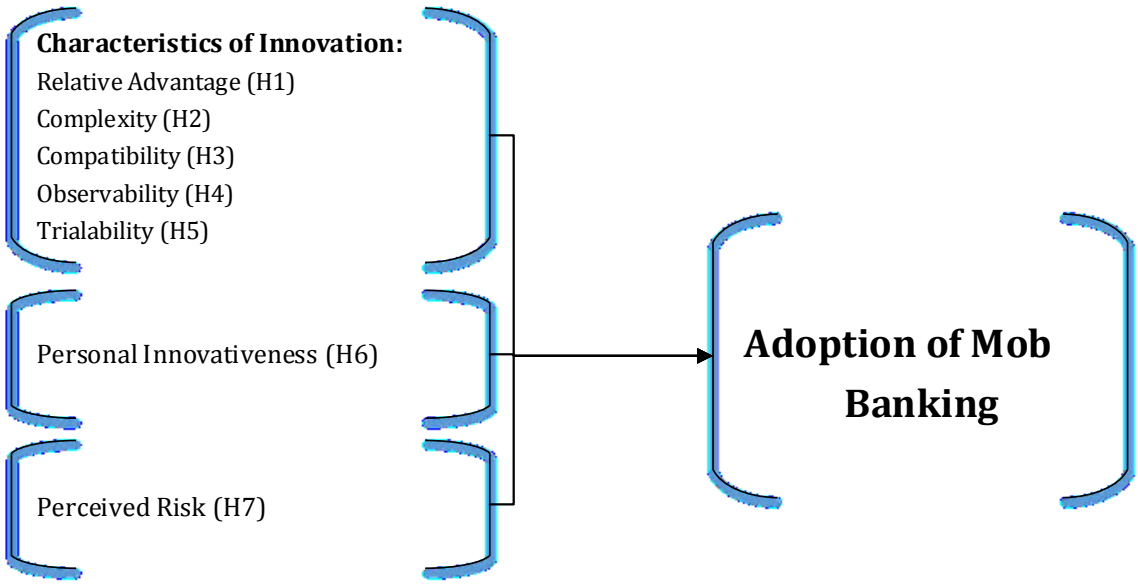

Figure 3: **Proposed conceptual model.**
Source: Elaborated by the author.

The model above illustrates that the characteristics of innovation, such as relative advantage, complexity, compatibility, observability and trialability, were once defined by Rogers (1995), as well as two other variables, personal innovation and perceived risk, as they are also Considered of extreme importance in the literature regarding the subject under analysis.

4.2. Method

A scientific method is characterized by the choice of systematic procedures to describe and explain a given situation under study, being possible to opt for a quantitative or qualitative approach. The quantitative approach is concerned for testing objective theories by examining the relationship among variables which can be measured and analysed using statistical resources and techniques (Creswell, 2014). On the other side, the qualitative approach embraces the study in which the observer is located in the world, constituting, therefore, in a naturalistic and interpretative approach to reality (Denzin & Lincon, 2000).

Therefore, taking into account the strengths and limitations of each of the methodologies as well as the objectives of this study, a quantitative approach be carried out, since it allows a greater neutrality and objectivity, between the investigator and the object, and correlational, that allows to analyse and to measure relations between variables, thus responding to the objective of this study, of primary type, since it is necessary to collect data about the research problem.

However, as Minayo and Sanches (1993) have pointed out, methodologies are not good or bad in themselves, but they are more or less adequate to the resolution of certain problems, the pursuit of certain objectives and the reality that it is propose to know. In this way, the methodological choice should not be a starting point, but rather a construction that is arrived at by the analysis of the reality that one intends to know.

4.3. Data Collection Instruments

The collection of data in this study was basing fundamentally on the survey, more specifically, a questionnaire given to people in general. To complement the information collected by the questionnaire, documentary analysis was also used. According to Lincoln e Guba (1985) data collection should be interrupted when statements begin to become repetitive, because at this stage, these authors say that the saturation point has been reached. It was therefore decided that data collection should be completed when data collection in the study was considered sufficient to avoid repetitive and saturated results.

4.3.1. Documentary Analysis

In order to complement the information gathered by the questionnaire, documentary analysis was used and revealed new significant aspects, being, therefore, a necessary technique for collecting information in this study. This method of inquiry involves the study of existing documents, either to understand their substantive content or to illuminate deeper meanings. These are mainly public documents such as annual reports, market research, studies done by reputed and experienced companies on the subject and many others. It should be noted that the analysis of the documents was more relevant in the response to the objectives already discussed in the previous chapters.

4.3.2. Questionnaire

The largest data collection for this investigation was through the questionnaire. Questionnaires are instruments that researchers use to transform into data the information communicated directly by a person (the subject), being, therefore, an instrument designed to access internal dimensions of a person, such

as the information or knowledge they possess, their values, preferences, attitudes or beliefs, or their past or current experiences. (Tuckman, 2000).

The objective of the questionnaire is to collect quantitative data that allowed the characterization of the target public such as age, gender, education and professional occupation, as well as the survey of their perceptions regarding banking and financial innovation, more specifically, regarding mobile banking. In formulating the questions, an effort was made to eliminate, as far as possible, factors such as ambiguity, imprecision, and assumption.

The data collection was based on social network survey and e-mail database. The questionnaire was available between March 10th and March 20th of 2017, and on average each respondent took 4 minutes to complete their survey. To maintain the quality and effectiveness of this survey research, the researcher chose to have a sample with at least 300 responses. Each respondent will have the opportunity to receive a summary of the search results for the participation, if they so wish, since an email contact was provided at the end of the questionnaire for the same purpose.

4.3.2.1. Questionnaire Design

The questionnaire design consists of closed questions, using a five-point Likert scale, with values between 1 - completely disagree and 5 - completely agree. This scale allows the respondent to choose their degree of agreement or disagreement with a scale of levels. According to Malhotra and Birks (2006), the Likert scale is easy to build and manage as respondents easily understand how to use it and results can be quantified simply. However, it may have the disadvantage that

respondents focus their response in the middle of the scale, 3 - do not agree or disagree.

This questionnaire was designed and developed in an electronic version, using the Goggle Docs platform, forcing all fields to be filled out. The questionnaire begins with the questions about the demographic characteristics, followed by a question about the main bank and whether or not the respondent is a mobile banking user. After that, there are some blocks of questions that allow the response to the established objectives considering the defined variables, which in turn answer the initial question.

Variable	Item	Source
	[Q1] Gender	-
	[Q2] Age	-
	[Q3] Education	-
	[Q4] Occupation	-
	[Q5] Annual Income	-
	[Q6] What is your primary bank?	-
	[Q7] Do you use mobile banking?	-
Relative Advantage	[Q8] Using mobile banking is useful in my daily life.	(Tan & Teo, 2000), (Lin, 2011), (Al-Jabri & Sohail, 2012), (Venkatesh, Thong & Xu, 2012), (Baptista & Oliveira, 2015), (Alalwan, Dwivedi & Rana, 2017).
	[Q9] Using mobile banking increases my productivity.	(Davis, 1989), (Moore & Benbasat, 1991), (Venkatesh, Thong & Xu, 2012), (Alalwan, Dwivedi & Rana, 2017).
	[Q10] Using mobile banking gives me greater control over my finances.	(Moore & Benbasat, 1991), (Tan & Teo, 2000), (Al-Jabri & Sohail, 2012), (Yoon & Steege, 2013).
Complexity	[Q11] Mobile banking requires a lot of mental effort	(Moore & Benbasat, 1991), (Brown, Cajee, Davies & Stroebel, 2003), (Ghobakhloo, Arias-Aranda & Benitz-Amado, 2011), (Maduku, Mpinganjira & Duh, 2016).

	[Q12] Overall, I find mobile banking easy to use.	(Davis, 1989), (Moore & Benbasat, 1991), (Pavlou, 2003), (Venkatesh, Thong & Xu, 2012), (Yoon & Steege, 2013), (Baptista & Oliveira, 2015), (Alalwan, Dwivedi & Rana, 2017).
	[Q13] Learning to operate mobile banking is easy for me.	(Davis, 1989), (Moore & Benbasat, 1991), (Vijayasarathy, 2003), (Lin, 2011), (Miltgen, Popovič & Oliveira, 2013), (Yoon & Steege, 2013), (Hanafizadeh, Behboudi, Koshksaray & Tabar, 2014), (Hanafizadeh, Byron & Khedmatgozar, 2014), (Boateng, Adam, Okoe & Anning-Dorson, 2016).
Compatibility	[Q14] Mobile banking fits well with the way I like to manage my finances.	(Plouffe, Hulland & Vandenbosch, 2001), (Vijayasarathy, 2003), (Lin, 2011), (Al-Jabri & Sohail, 2012); (Hanafizadeh, Behboudi, Koshksaray & Tabar, 2014), (Hanafizadeh, Byron & Khedmatgozar, 2014).
	[Q15] Using mobile banking is compatible with my lifestyle.	(Moore & Benbasat, 1991), (Vijayasarathy, 2003), (Brown, Cajee, Davies & Stroebel, 2003), (Schierz, Schilke, & Wirtz, 2010) (Lin, 2011), (Al-Jabri & Sohail, 2012), (Miltgen, Popovič & Oliveira, 2013), (Hanafizadeh, Behboudi, Koshksaray & Tabar, 2014), (Hanafizadeh, Byron & Khedmatgozar, 2014), (Oliveira, Thomas, Baptista & Campos, 2016).
	[Q16] Using mobile banking is completely compatible with my current situation.	(Moore & Benbasat, 1991), (Oliveira, Thomas, Baptista & Campos, 2016).
Observability	[Q17] I have had a lot of opportunity to observe others using mobile banking.	(Moore & Benbasat, 1991), (Plouffe, Hulland & Vandenbosch, 2001), (Park & Chen, 2007).
	[Q18] With mobile banking, I can see the effect of a transaction immediately.	(Fain & Roberts, 1997); (Al-Jabri & Sohail, 2012).
	[Q19] I have seen how others use mobile banking.	(Kolodinsky, Hogarth & Hilgert, 2004).
Trialability	[Q20] I know how I can experience, in a satisfactory way, the various uses of mobile banking.	(Moore & Benbasat, 1991), (Park & Chen, 2007), (Akturan & Tezcan, 2010).
	[Q21] I would be permitted to use mobile banking on a trial basis long enough to see what it can do.	(Moore & Benbasat, 1991), (Tan & Teo, 2000), (Park & Chen, 2007), (Akturan & Tezcan, 2010), (Al-Jabri & Sohail, 2012).

	[Q22] Before deciding whether or not to use mobile banking, I had the possibility to test it properly.	(Moore & Benbasat, 1991), (Agarwal & Prasad, 1997), (Plouffe, Hulland & Vandenbosch, 2001), (Brown, Cajee, Davies & Stroebel, 2003), (Park & Chen, 2007), (Akturan & Tezcan, 2010).
Perceived Risk	[Q23] I believe that mobile banking is trustworthy.	(Pavlou, 2003), (Gefen, Karahanna & Straub, 2003), (Cheng, Lam & Yeung, 2006), (Miltgen, Popovič & Oliveira, 2013), (Alalwan, Dwivedi & Rana, 2017).
	[Q24] I am concerned about the security aspects of mobile banking.	(Brown, Cajee, Davies & Stroebel, 2003).
	[Q25] Personal information may be known by others when using mobile banking.	(Gerrard & Cunningham, 2003); (Ndubisi & Sinti 2006); (Bélanger & Carter, 2008) (Al-Jabri & Sohail, 2012), (Miltgen, Popovič & Oliveira, 2013), (Yoon & Steege, 2013).
Personal Innovativeness	[Q26] I like to experiment with new technologies.	(Gerrard & Cunningham, 2003), (Yi, Jackson, Park & Probst, 2006), (Ismawati & Mohezar, 2007), (Al-Jabri & Sohail, 2012), (Miltgen, Popovič & Oliveira, 2013), (Oliveira, Thomas, Baptista & Campos, 2016).
	[Q27] When I hear of a new technology, I like to look for ways to experience it.	(Yi, Jackson, Park & Probst, 2006), (Oliveira, Thomas, Baptista & Campos, 2016)
	[Q28] Among my peers, I am usually the first to try out new information technologies.	(Yi, Jackson, Park & Probst, 2006), (Kim & Mirusmonov, 2010), (Oliveira, Thomas, Baptista & Campos, 2016).

Table 2: **Questionnaire's measurement items**.
Source: Elaborated by the author.

4.4. Target Audience and Sample Definition

Before setting the sample, it is necessary to define the target audience. According to Barañano (2008), the population is defined by the set of all elements whose characteristics wish to be studied, while Malhotra and Birks (2006) states that the target audience is the collection of elements or objects that possess the information sought by the researcher and, on which, must be made the appropriate inferences.

Therefore, since this is a study that focuses on activities within digital financial services and that these activities imply access to the Internet, the target audience for this study is composed of individuals of both genres, aged over 18, who own at least one mobile device and have an opened bank account in Portugal.

Regarding the sample, this was obtained through a non-probabilistic sampling process for convenience, where an on-line questionnaire was distributed randomly through social networks and databases. According to Malhotra (2006), convenience sampling is a non-probabilistic sampling technique that seeks to obtain a sample of suitable elements. As strengths, the author stresses lower financial charges, less time and, of course, convenience. Regarding weaknesses, the same author points out the selection bias and the fact that it may not be a representative sample, that is, it does not allow generalization and, therefore, it is more subjective.

Chapter 5: Data Analysis

5.1. Sample Characterization

The present investigation was based on a sample of 420 adult individuals with a bank account operating in Portugal, 258 of whom are mobile banking adopters and the other 162 have not yet adopted this service. Regarding the size of the sample, Hair, Anderson, Tatham and Black (2005) emphasize that the absolute minimum size should obey the minimum proportion of five to ten respondents for each question, which means that for the number of 28 questions, the minimum sample size would be 140 responses to the questionnaire. As a total of 420 questionnaire responses were obtained, the sample thus exceeds the recommended minimum size.

5.1.1. Characterization Regarding the Use of Mobile Banking

The sample is comprised of 420 individuals, of whom 258 are adopters of mobile banking, representing 61.4% of the total sample and the remaining 162 questionnaires belonging to non adopters of this service, which have an importance of 38.6%. This sample have a very representative number of adopters, compared to most previous studies. For example, Püschel et al. (2010) found 37 individuals using mobile banking in a sample of 370 respondents. In another study by Sripalawat, Thongmak and Ngramyarn (2010), a sample of 195 individuals included 74 mobile banking users. This is because mobile banking is starting to become more common due to the banks' efforts to adapt to the new demands of consumers and the new technologies that accompany this evolution.

		Freq.	%
Use mobile banking	No	162	38.6
	Yes	258	61.4
	Total	420	100.0

Table 3: **Usage of mobile banking.**

5.1.2. Demographic Characterization

		Adopters (n = 258)		Non Adopters (n = 162)		Total (n = 420)	
		Freq.	%	Freq.	%	Freq.	%
Gender	Female	116	45.0	83	51.2	199	47.4
	Male	142	55.0	79	48.8	221	52.6
Age	18 - 27 years	168	65.1	108	66.7	276	65.7
	28 - 37 years	48	18.6	30	18.5	78	18.6
	38 years or more	42	16.3	24	14.8	66	15.7
Education	High school	40	15.5	38	23.5	78	18.6
	Bachelor's degree	111	43.0	72	44.4	183	43.6
	Master's or postgraduate degree	103	39.9	51	31.5	154	37.7
	Doctorate degree	4	1.6	1	0.6	5	1.2
Occupation	Student	88	34.1	68	42.0	156	37.1
	Employed worker	144	55.8	80	49.4	224	53.3
	Self-employed	15	5.8	9	5.6	24	5.7
	Unemployed	10	3.9	3	1.9	13	3.1
	Retired	1	0.4	2	1.2	3	0.7
Annual Income	Up to 10.000€	131	50.8	101	62.3	232	55.2
	10.001€ to 20.000€	66	25.6	35	21.6	101	24.0
	20.001€ to 35.000€	44	17.1	17	10.5	61	14.5
	35.001€ or more	17	6.6	9	5.6	26	6.2

Table 4: **Distribution of demographic characteristics.**

As can be seen in the table above, the sample is, in terms of the gender, balanced, with the percentage of male respondents slightly higher (52.6%) than the female percentage (47.4%). Whereas, in the group of adopters, there are more men, in the group of non-adopters there are more women. In the total sample, the age group with the highest percentage is between the ages of 18 and 27 (65.7%) and with literacy at the graduate level (43.6%). These two variables also have the same behaviour in the adopters and non adopters group. In addition, the majority are employed workers (53.3%) and with a low annual income up to 10.000 euros (55.2%). Again, the behaviour repeats itself in the two different groups.

5.1.3. Primary Bank

Taking into account that the sample used is a convenience sample and is not representative of the entire Portuguese banking population, it is verified that the majority of the respondents answered that their primary bank was Santander Totta and Caixa Geral de Depósitos, both with 26.2% according to the table 5. This happens because Santander Totta is a bank with strong university agreements and, as it was seen in the demographic characterization, the majority of respondents are or have been very recently in the university context. On the other hand, Caixa Geral de Depósitos is a state bank with a strong influence in Portugal.

		Adopters (n = 258)		Non Adopters (n = 162)		Total (n = 420)	
		Freq.	%	Freq.	%	Freq.	%
Primary Bank	ActivoBank	23	8.9	2	1.2	25	6.0
	Banco Popular	3	1.2	3	1.9	6	1.4
	BPI	17	6.6	8	4.9	25	6.0
	Caixa Geral de Depósitos	64	24.8	46	28.4	110	26.2
	Millennium BCP	22	8.5	34	21.0	56	13.3
	Montepio	5	1.9	7	4.3	12	2.9
	Novo Banco	29	11.2	16	9.9	45	10.7
	Santander Totta	76	29.5	34	21.0	110	26.2
	Other	19	7.4	12	7.4	31	7.4

Table 5: **Distribution by the primary bank.**

5.2. Reliability and Internal Consistency

The aim of this point serves to validate the constructs that represent the characteristics of innovation – relative advantage, complexity, compatibility, observability and trialability – as well as personal innovativeness and perceived risk. Therefore, in order to analyse the reliability of the data, the Cronbach Alpha test and the item-total correlation of each variable were used to analyse the internal consistency of the scale. Here it is important to note that the scale used in this investigation was 0 to 4.

This part is related to the validity and reliability of the constructs used, that is, we intend to verify if each of the seven constructs obtained, each from 3 items, can be represented by a score (average of 3 items) that will represent This construct. Thus, this investigation follows the indications of Hair et. Al (2009), which suggests an analysis of internal consistency. Therefore, for each one of the constructs will be analysed its reliability that is the measurement of the degree of consistency in the multiple measures of a variable, through the analysis of its internal consistency. The principle underlying the internal consistency of a given

factor is that its individual items or indicators measure the same construct and thus are highly interrelated (Nunnally, 1979).

The type of diagnostic measure to be considered is the reliability coefficient, which affects the consistency of the scale as a whole. The most commonly used measure is Cronbach's alpha (Cronbach, 1951, Nunnally, 1979). The most consensual minimum limit measure is 0.70 and may be 0.60 in more exploratory studies (Robinson, Shaver and Wrightsman, 1991).

Cronbach's Alpha	Reference Values
Excellent	$\alpha \geq 0.9$
Good	$0.9 > \alpha \geq 0.8$
Acceptable	$0.8 > \alpha \geq 0.7$
Questionable	$0.7 > \alpha \geq 0.6$
Poor	$0.6 > \alpha \geq 0.5$
Unacceptable	$0.5 > \alpha$

Table 6: **Cronbach's Alpha reference values.**
Source: Marôco (2011).

Relative Advantage

Starting from the analysis to the variable relative advantage, in the study of construct reliability, the value of Cronbach's Alpha obtained was 0.839 which is an indicator of good reliability. In addition, all items have a good correlation, which means that it is not proposed to change or eliminate any of these items.

	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted	Cronbach's Alpha
[Q8] Using mobile banking is useful in my daily life.	0.736	0.748	0.839
[Q9] Using mobile banking increases my productivity.	0.706	0.774	
[Q10] Using mobile banking gives me greater control over my finances.	0.669	0.807	

Table 7: **Reliability statistics of relative advantage.**

Complexity

In the study of construct reliability, the value of Cronbach's Alpha obtained was 0.706 which is an indicator of reasonable reliability. Therefore, here is also not proposed to change or eliminate any of these items.

	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted	Cronbach's Alpha
[Q11] Mobile banking requires a lot of mental effort.	0.445	0.717	0.706
[Q12] Overall, I find mobile banking easy to use.	0.568	0.560	
[Q13] Learning to operate mobile banking is easy for me.	0.566	0.566	

Table 8: **Reliability statistics of complexity.**

Compatibility

Regarding the construct of compatibility, the value of Cronbach's Alpha obtained was 0.887 which means that is a good indicator of reliability.

	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted	Cronbach's Alpha
[Q14] Mobile banking fits well with the way I like to manage my finances.	0.715	0.902	0.887
[Q15] Using mobile banking is compatible with my lifestyle.	0.845	0.786	
[Q16] Using mobile banking is completely compatible with my current situation.	0.790	0.832	

Table 9: **Reliability of the compability.**

Observability

The value of the Cronbach Alpha obtained was 0.741 which is an indicator of reasonable reliability. However, with the elimination of [Q18], the Cronbach's Alpha increases in a significant way. Therefore, it is proposed to eliminate [Q18] in order to have a stronger Alpha regarding this variable.

	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted	Cronbach's Alpha
[Q17] I have had a lot of opportunity to observe others using mobile banking.	0.750	0.404	0.741
[Q18] With mobile banking, I can see the effect of a transaction immediately.	0.286	0.904	
[Q19] I have seen how others use mobile banking.	0.762	0.385	

Table 10: **Reliability of the observability.**

Trialability

The trialability variable presents a Cronbach alpha of 0.455, which means that it is an inadmissible reliability indicator (<0.6). Also, even if one considers the

elimination of any of the items, the situation would not change. Thus, we can infer that the construct is not reliable, proposing to eliminate it in future analyzes of the variables.

	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted	Cronbach's Alpha
[Q20] I know how I can experience, in a satisfactory way, the various uses of mobile banking.	0.192	0.498	0.455
[Q21] I would be permitted to use mobile banking on a trial basis long enough to see what it can do.	0.307	0.312	
[Q22] Before deciding whether or not to use mobile banking, I had the possibility to test it properly.	0.350	0.216	

Table 11: **Reliability statistics of trialability.**

Perceived Risk

Regarding the reliability study of the construct, the value of Cronbach's Alpha obtained was of 0.789, translating into a reasonable indicator of reliability for this investigation.

	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted	Cronbach's Alpha
[Q23] I believe that mobile banking is trustworthy.	0.641	0.725	0.789
[Q24] I am concerned about the security aspects of mobile banking.	0.722	0.614	
[Q25] Personal information may be known by others when using mobile banking.	0.578	0.807	

Table 12: **Reliability statistics of perceived risk.**

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Personal Innovativeness

Finally, the value of Cronbach's Alpha regarding to the innovativeness personal construct was 0.652, translating into an indicator of reliability, although poor, acceptable.

	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted	Cronbach's Alpha
[Q23] I believe that mobile banking is trustworthy.	0.474	0.547	0.652
[Q24] I am concerned about the security aspects of mobile banking.	0.497	0.506	
[Q25] Personal information may be known by others when using mobile banking.	0.426	0.613	

Table 13: **Reability statistics of personal innovativeness.**

5.3. Differences between Adopters and Non Adopter of Mobile Banking

In the analysis of the T-Test, given that it is a bilateral test, it is directly compared p-value with the level of significance. As can be seen in the table below, since in all variables, the p-value is less than 0.025, we reject the null hypothesis (H0). In this way, we can affirm that, with 95% confidence, there are significant differences between the group of users and non-users of mobile banking, in all scales analysed.

		Mean	Std. Deviation	t	df	Sig. (2-tailed)
Relative Advantage	Adopters	3.4574	0.56957	-13.836	227.188	0.000
	Non Adopters	2.2634	1.00133			
Complexity	Adopters	0.4277	0.49834	5.961	257.479	0.000
	Non Adopters	0.8128	0.72131			
Compatibility	Adopters	3.5000	0.62121	-12.493	247.195	0.000
	Non Adopters	2.4465	0.95384			
Observability	Adopters	2.7765	0.89119	-4.807	299.359	0.000
	Non Adopters	2.2963	1.05733			
Perceived Risk	Adopters	3.0530	0.71141	-7.108	289.580	0.000
	Non Adopters	2.4691	0.88042			
Personal Innovativeness	Adopters	1.6847	0.79373	8.591	304.296	0.000
	Non Adopters	2.4383	0.92244			

Table 14: **T-Test between adopters and non adopters of mobile banking.**

5.4. Logistic Regression

In order to understand the influence of the independent variables – relative advantage, complexity, compatibility, observability, perceived risk and personal innovativeness – in the dependent variable – adoption of mobile banking – a logistic regression model was chosen. Verifying that the dependent variable is of the dichotomous nominal type (yes or no), logistic regression is the technique to be used to model the occurrence, in probabilistic terms. The predictive emphasis of regression with dichotomous dependent variables rests on the probability of occurrence of the "success" achievement of this variable and not on the estimation of the "success" or "failure" event. This model allows to evaluate the significance of each of the independent variables of the model (Maroco, 2010).

Let $\mathbf{Y}_i$ be a binary variable representing the situation of the i-th individual, it is defined that $y_i = 1$ whenever individual i is a mobile banking adopter and, otherwise, $y_i = 0$ when individual i is not. Therefore, $\mathbf{yi}$ is the realization of the dependent random variable, Y_i, where P ($Y_i = 1$) = i and P ($Y_i = 0$) = 1 - i.

Thus, the model can be specified as follows:

$$Logit\ (p) = \ln\left(\frac{p}{1-p}\right) = \ \alpha + \ \beta 1\ x1 + \beta 2\ x2 + \cdots + \ \beta n\ xn$$

$$= \frac{1}{1 + e^{-\ (\propto + \beta 1 x1 + \beta 2 x2 + \cdots + \beta n Xn)}}$$

Where Xi = (Xi1, Xi2, ..., Xin) is a vector of dimension n corresponding to the i-th line of the matrix formed by n explanatory variables, and β = (β1, β2, ..., βn) is the vector of the coefficients of regression.

The evaluation of the quality of the adjustment of the logistic regression will be done by the analysis of several tests and indicators. One of the main measures of evaluation of logistic regression is the log likelihood value (-2LL). This indicator shows the ability of the model to estimate the probability associated with the occurrence of a particular event, with the predictive power of the model being greater than the lower of this indicator. The higher the -2 LL, the worse the adjustment and if it is 0, the adjustment is perfect (Maroco, 2010).

The Cox & Snell R Square test is used to compare the performance of competing models, and the logistic equation with the highest value is preferred. The higher your value the better the quality of fit. Nagelkerke proposed an adjustment to this index so that it could reach 1, having the same purpose as the Cox & Snell R Square test.

The Hosmer and Lemeshow test divides the observations into ten ordered groups, based on the predicted probabilities. Then calculate a chi-square statistic from the frequencies observed and predicted in each of these groups. The purpose of this test is to verify if there are significant differences between the classifications performed by the model and the observed reality.

The purpose of the Wald test is to evaluate the degree of significance of each coefficient of the logistic equation, including the constant. It is intended to verify if each estimated parameter is significantly different from zero.

Analysing the values of the table 15, there can be noticed a decrease of -2 Log as new steps are introduced, indicating an improvement in the model. Additionally, both R^2 measures of Cox & Snell and Nagelkerke indicate that, it is after the step 4 that the mode has a greater power of explanation. Thus, through the analysis of the value of R^2 Nagelkerke, in the model represented by step 4, there is a value of 54.3%, which allows to affirm that the adoption of mobile banking is explained in 54.3% by the independent variables which are part of this model.

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square	Chi-square	df	Sig.
1	376.954[a]	0.353	0.480	2.973	6	0.812
2	362.081[a]	0.376	0.510	7.222	8	0.513
3	350.818[a]	0.392	0.533	13.940	8	0.083
4	345.646[a]	0.400	0.543	12.660	8	0.124

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than 0.001.

Table 15: **Model summary and Hosmer and Lemeshow Test.**

Moreover, the value of Hosmer and Lemeshow ascertained was 12.6604, with a p-value of 0.124. If the value of the Hosmer and Lemeshow statistic was 0.05 or less, then the null hypothesis should be rejected that there is no difference between the observed and predicted values for the dependent variable. Since the statistic is greater than 0.05 (1. 241) then we can not reject the null hypothesis, which indicates that the estimated parameters fit the model in a statistically significant way, that is, that the model fits well with the data.

5.4.1. Logistic Regression: Final Model

Logistic regression was performed, through the Forward Stepwise (Likelihood Ratio) Method, considering the independent variables: relative advantage, complexity, compatibility, observability, perceived risk and personal innovativeness. This method starts from an initial model with only the constant term, adding, step by step, the most significant variables until finding the "best model". The dependent variable was coded where "0" means that it does not use mobile banking and "1" uses the service.

In order to obtain a parsimonious model with the lowest number of independent variables that are explanatory of the greater variance of the model (Malhotra & Birks, 2006), the independent variables with statistical significance go into the model in order of importance.

In determining the model, the first variables to enter were the relative advantage and the compatibility, because they presented the lowest p-value. Following the personal innovativeness and finally the perceived risk. Variables that were considered statistically significant in explaining the dependent variable adoption of mobile banking.

In total, 420 responses of the questionnaire were considered in the model, in which 162 do not adopted mobile banking and 259 responded to be adopters of this service. From the variables included in the model, it can concluded that, for α = 0.05, the statistically significant variables are relative advantage, compatibility, personal innovativeness and perceived risk.

		B	S.E.	Wald	df	Sig.	% Correct Classif.	Exp(B)	95% C.I. for EXP(B)	
									Lower	Upper
Step 1[a]	Relative Advantage	1.969	0.195	101.882	1	0.000	90.3	7.165	4.888	10.502
	Constant	-5.369	0.593	82.010	1	0.000		0.005		
Step 2[b]	Relative Advantage	1.440	0.228	39.835	1	0.000		4.219	2.698	6.597
	Compatibility	0.779	0.208	14.056	1	0.000		2.180	1.451	3.277
	Constant	-6.177	0.656	88.783	1	0.000		0.002		
Step 3[c]	Relative Advantage	1.338	0.231	33.550	1	0.000		3.810	2.423	5.990
	Compatibility	0.698	0.214	10.634	1	0.001		2.009	1.321	3.056
	Personal Innovativeness	-0.567	0.172	10.804	1	0.001		0.567	0.405	0.796
	Constant	-4.469	0.799	31.286	1	0.000		0.011		
Step 4[d]	Relative Advantage	1.340	0.235	32.548	1	0.000		3.817	2.409	6.048
	Compatibility	0.568	0.222	6.559	1	0.010		1.765	1.143	2.727
	Perceived Risk	0.421	0.185	5.182	1	0.023		1.524	1.060	2.191
	Personal Innovativeness	-0.541	0.173	9.796	1	0.002		0.582	0.415	0.817
	Constant	-5.313	0.901	34.743	1	0.000		0.005		

a. Variable(s) entered on step 1: Relative Advantage.

b. Variable(s) entered on step 2: Compatibility.

c. Variable(s) entered on step 3: Personal Innovativeness.

d. Variable(s) entered on step 4: Perceived Risk.

Table 16: **Logistic regression of the final model.**

This is a model that correctly classifies 90.3% of individuals regarding their decision to adopt the mobile banking service. Through Wald statistic, it is possible to verify that the relative advantage is the variable with the greatest

influence (32.549) on the decision to adopt mobile banking, followed by compatibility (6.559), personal innovativeness (9.796) and finally perceived risk (5.182).

Additionally, in the Exp (B) column, which indicates the exponential of the coefficients of the model, and estimates the odds ratio of the dependent variable per unit of the independent variable, it is verified that the chances of adopting mobile banking increase mainly with the relative advantage. Here, it is important to notice that the perceived risk scale is more of a perceived trust scale because it is inverted, therefore, it means that the greater the perceived security/trust (which is the same as the lower the perceived risk) the greater the probability of adopt mobile banking. Oddly, the results for personal innovativeness variable demonstrate an opposite-to-expected behaviour, which will be discussed later.

Therefore, based on the results obtained, the final model can be stated, which allows estimating the probability (π) of adoption of mobile banking as:

$$\frac{1}{1 + e^{-[-5.313+1.340\ relative\ advantage+0.568\ compability-0.421\ perceived\ risk-0.541\ personal\ innovativeness]}}$$

$$= \frac{1}{1 + e^{-[-5.313+1.340 +0.568-0.421-0.541\ ]}}$$

5.5. Hypothesis Validation and Final Model

After the validation of the model, we present the results regarding the validation of each of the previously defined hypotheses:

Hypotheses	Result
H1. Relative advantage will have an effect on mobile banking adoption.	Confirmed
H2. Complexity will have an effect on mobile banking adoption	Not confirmed
H3. Compatibility will have an effect on mobile banking adoption.	Confirmed
H4. Observability will have an effect on mobile banking adoption.	Not confirmed
H5. Trialability will have an effect on mobile banking adoption.	Not tested
H6. Personal Innovativeness will have an effect on mobile banking adoption.	Confirmed
H7. Perceived risk will have an effect on mobile banking adoption.	Confirmed

Table 17: **Hypotheses validation.**

In this way, it follows the final model:

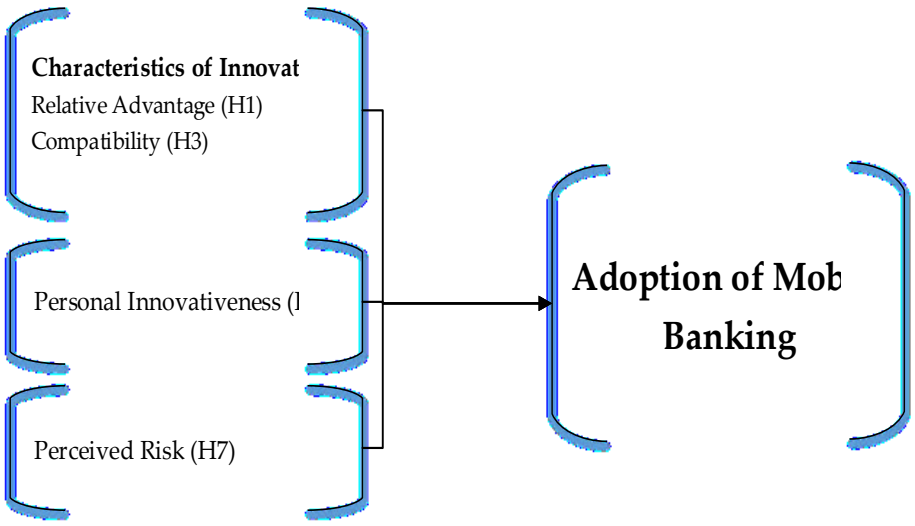

Figure 4: **Final model**.

Chapter 6: Discussion of Results

6.1. Overview

The present research aimed to identify which factors explain the adoption of mobile banking as one of the most recent innovations of the financial and banking sector in recent years. Knowing that technology has evolved drastically and unprecedentedly over the last few years and that mobile devices have become indispensable in the everyday life of any individual, where mobility, more than wanted, is increasingly needed, banks seeks to understand what are the relevant factors in the adoption of this new way of doing banking. In this way, banks are able to better identify the interests of their clients and thus meet their needs and expectations, adapting the way they place their services, products, channels, and ultimately adapting their own business models.

6.2. Discussion of the Findings

During the analysis of the data obtained through the questionnaire, regarding the analysis of the reliability and internal consistency of the scales, it was verified that the variable of trialability should be eliminated, since it had a very low reliability, less than 0.5, which is “unacceptable”, and, in the situation of the elimination of any of the items belonging to the variable under analysis, the Cronbach's Alpha would not increase significantly. One possible justification for this is that, nowadays, consumers have all the information they need in relation to this kind of services. In fact, mobile banking presents itself as an alternative channel to those already existing, such as the ATM or internet banking, which means that the consumer already knows what can expect from it. Therefore, today's consumer does not feel the need to use a trial or a temporary version of

mobile banking services in order to realize and understand the specifics of this channel.

When comparing the results obtained in the mobile banking adopters group with the one of the non adopters, for each of the variables, it was found that adopters have, overall, a more positive attitude towards this new channel. This conclusion can be obtained through the highest mean values achieved in the analysis for the users of the service and the analysis for the T-Test, where it has been proven that there are statistically significant differences between adopters and non adopters, as evidenced by Pürschel (2009). In addition, the T-Test also shows that adopters give greater importance to the variables relative advantage, compatibility and observability compared to non adopters and a less importance to complexity. Interestingly, contrary to what might be expected, the adopters show greater importance to perceived risk and, on the contrary, is considered to have less personal innovativeness than the non adopters group.

Then, the logistic regression used in this research validated that the factors influencing the adoption of mobile banking are the relative advantage, compatibility, perceived risk and personal innovativeness, among which are some of the perceived attributes of innovation identified by Rogers (1995) in DOI theory. The influence of this factors was also proved by Mattila (2015) and Püschel et al. (2010), while Laukkanen and Cruz (2010) only found relevance in relative advantage. The variables observability and complexity were left out since they did not present a sufficient degree of significance to be part of the model. According to the presented results, it can be concluded that the model adjusted by the logistic regression presents good predictive capacities, presenting a correct classification of 90.3%.

The relative advantage was shown to be a positive influence factor, being the variable with the greatest influence on the adoption of mobile banking, as evidenced in the study by Laukkaren and Cruz (2010). This positive influence can be explained by the convenience in the use of the mobile phone, the shorter time spent as well as the speed in the response. The advantage is associated with the total value of the service available to the customer, which can be used at any time and in any place, thus exceeding the space and time barrier. Additionally, mobile banking is also a technology available to any banking customer, who simply need to have a mobile phone with internet connection, which allows to perform several operations with a lower commissioning, compared to the amounts charged if the service is performed by the balcony.

Compatibility was the second factor, considered as a positive influencer of the adoption of mobile banking, also identified by Mattila (2015) and Sripalawat (2010), in their investigations. Respondents felt that mobile banking is a channel compatible with their preferences and lifestyle. The fact that the data were collected through an online questionnaire leads us to conclude that they are individuals with Internet connection, more sensitive to technological innovations, many of them already users of the home banking, confirming what Hirschman (1980) suggests which is that experience with the previous product class may lead to greater acceptance of a new product.

A third variable influencing the adoption of mobile banking, supported by Yi et al. (2006), is personal innovativeness. Defined as "the willingness of an individual to try out any new information technology," personal innovativeness would seem to be a natural fit when examining the technology acceptance process. However, shockingly and contrary to what might be expected, the effect of this variable is negative, which means that the more a person considers himself

as an innovation-oriented individual, the less likely he is to adopt mobile banking.

In fact, this result becomes difficult to explain with the support of the literature, however, this situation may be related to the possibility that the sample in analysis does not consider mobile banking very different from online banking, for instance, and because of that, people with greater personal innovativeness regularly use their computer to consult the services of their bank. In addition, as happened with Lu and Yu (2005) with a similar techonology, because of the educational level of the sample, and since these are financial and banking services, participants may tend to base their decision-making intentions more on rationality than pure curiosity and personality. In any case, the relationship between personal innovativeness and the adoption of mobile banking needs to be tested in future research.

Perceived risk is the last factor that influences the adoption of mobile banking. This same factor had also been identified by a study as being a strong inhibitor of mobile banking adoption (Laukkanen & Cruz, 2010). Since the scale in this analysis was reversed, the perceived risk has in this research a negative influence on the adoption of mobile banking. This situation is due to the fact that, since this is a banking service, which involves monetary and property matters, with an extra sensitivity, individuals want to feel the need for a secure service. In addition, the possibility of the mobile application being accessed and invaded by third parties, who can misuse the data of individuals, becomes an inhibitor to the adoption of mobile banking.

Complexity was one of the factors that did not had an influence on the adoption of mobile banking. Although it is a relevant factor in the studies carried

out by Sripalawat (2010), Laukkanen and Cruz (2010) and Yu and Fang (2009), the results confirm that consumers do not show importance in the variable complexity, which can be verified by their low mean in both groups, thus not considering significant effort in the adoption of this new channel of access to the bank through the mobile phone. This finding is, however, consistent by a previous study from Suoranta (2003). In fact, with the proliferation of the use of mobile phones and the increasing adherence to the electronic means of interaction with the bank, which includes home banking, individuals consider that mobile banking is easy to use, however, this reality does not influence their adoption of the service.

In fact, it is true that banking services typically do not have exhaustive information on the service, so the observability of the service may not be well communicated to the public and better means should be used to attract more consumers to use services mobile banking (Mohammadi, 2015). On the other hand, since banking services require a certain level of privacy and non-transferability, it is understandable that there is a lack of observability when using these services by third parties, thus resulting in a factor that does not influence the adoption of this channel.

6.3. Business Models in Retail Banking

After discussing the results of the mobile banking survey data analysis, it is equally relevant to link this results, obtained by the demand side, that is, what the consumer demands are and what they consider to be important factors, with the supply side, understanding how and what banks, in general, can do to correspond those expectations.

As noted in the literature review, banks can resort to innovating their business models in order to be competitive in the market and remain at the forefront of the industry. In addition, it was mentioned that what is in vogue in the banking sector is the investment in the digitalization of services, partnerships with fintechs and other start-ups, mobile payment solutions, among others, in order to improve the customer experience, while avoiding some costs, optimizing and simplifying the banking processes, being a way to recover some damages caused by the economic crisis and to overcome certain regulatory changes.

Thus, given the aforementioned context, the advancement of technology has allowed the generation of new activities resulting from technological innovation, such as the disintegration of value chains and new channels, such as the online channel. From these activities arise new business models, or adaptations of them, as is the case of online business models.

According to De Young (2005), pure online business models offer advantages not only for customers but also for banks themselves. In fact, the main financial advantage comes from savings and maintenance control costs associated with not having to operate branches. If being branchless significantly reduces physical overhead expenses, and if these savings are not offset by reductions in revenues or increases in other expense matters, then, all else equal, pure online business models will translate into financial benefits for banks.

However, with the analysis performed, it is noticed that there are still factors that lead to the existence of a physical branch. As it can be seen, the variables perceived risk and the personal innovativeness itself proved resistant to the use of mobile banking. Thus, it can be concluded that it is the responsibility of banks to innovate their business models, following the technological trend and even

being disruptive in the sector, however, they should not underestimate the physical part, their branches, as they still attract and retain several clients who prefer this channel.

In fact, traditional/offline models have some advantages themselves. The physical existence of a branch gives the customer a sense of security, human relation and approximation, which is difficult to match in online channels, as stated in Enders and Jelassi (2000). Also, according to the authors, many consumers still prefer to liaise with people directly. For instance, there are clients who prefer to the branch only for the purpose of socializing and have personal contact with agency employees. For this reason, the traditional business model can also represent a social advantage for consumers.

In this way, the click-and-mortar model emerges, which is can be represented as "the best of both worlds". While mortar (physical branch) has advantages in service such as service diversification and customer proximity, on the other hand, click, the online part, has the advantage of applying innovative Internet technology without any cost burden of a physical channel or branch. Therefore, banks which function through a brick-and-mortar business model are expected to operate fewer branches, have lower labour costs, charge lower interest rates on loans, and/or pay higher interest rates on deposits, and grow faster than brick and mortar models, which are still the majority of traditional banks.

Thus, for some click-and-mortar banks, the online channel may function more as an add-on and a complement, rather than a substitute for the branch channel. In this business model, the online channel is best seen as a powerful innovation because it makes new valuable services and new combinations of services available, which is the case of mobile banking.

Chapter 7: Final Considerations

7.1. Conclusions

To innovate a business model is, according to Chesbrough (2010), an important and a very difficult procedure due to the conflict and tension between the established business model for the existing technology and the one that will need to be adopted to conveniently exploit the emergent technology. However, if the innovation in the business model is correct and, therefore, successful, it also offers superior returns.

In this way, business model innovation may refer to a newly activity system of a company or entity which has the intention to provide a new value proposition for its customers (Amit & Zott, 2010), being an innovative structure for value creation as well as value capture (Chesbrough, 2007) represented by a new or significantly improved system of activities in order to generate a new value proposition.

This innovation of business models is very possible due to the advance of technology, especially ICT that has enabled banks to offer innovative and value-added services to the customer. Thus, in the present investigation, mobile banking was considered as the most recent and innovative bank access channel available to customers. Banks have thus become mobile and accessible anywhere through the convergence between mobile technology and financial services.

In order to know and understand the determining factors in the adoption of mobile banking in the case of Portugal, hypotheses were formulated and a research model based on the DOI theory of Rogers (1995), widely used in this

field of research, and was added the variables perceived risk and personal innovativeness, which has been verified in the literature as two equally relevant variables.

It was concluded that there are significant differences between adopters and non adopters of mobile banking in all variables tested in the model. It was also concluded that the relative advantage is the most relevant factor in the adoption of mobile banking, followed by compatibility, personal innovativeness and perceived risk, which were considered the following factors in the level of relevance in the adoption of mobile banking. The variables observability and complexity had no influence on the adoption of mobile banking and the variable trialability did not even obtain internal consistency in order to be tested.

On the other hand, these results lead to a conclusion that there may be factors that pull towards the existence of physical branches. In this way, banks should be aware of these signs and not move, at least for the time being, to a totally online business model, at the risk of losing more traditional customers or that still value the features of the offline bank.

In this way, it is also concluded that, at the moment, a click-and-mortar model would be the best bet for business model innovation, since it has the advantage of being close to customers who prefer a more traditional service while at the same time seeking the advantage of applying innovative Internet technology without any cost burden of a physical channel or branch, thus meeting the demands of the consumers who opt for the online channel.

7.2. Limitations and Future Research

Similar to all other studies, the present investigation has some limitations, the first one regarding the sample based on the survey. As the sample can be considered non-probabilistic, for convenience, not being representative of the population, it constitutes a limitation of the research, since it may not be correctly representing the population defined in the within this investigation.

A second limitation concerns the fact that the questionnaire has been disseminated, mostly through the researcher's personal network, essentially composed of individuals with similar characteristics and who may, indirectly, not once again represent the population in the most correct way. Also, the data were obtained through an online questionnaire, only allowing the collection of data from individuals with access to the internet.

Still regarding the survey, the fact that the design of the questionnaire was planned for the age at scale made it difficult to analyse the results. It is advisable that, in future investigations, an open field is used where the respondent places the year of birth or his current age.

Another limiting factor of this study is related to the fact that only the components of the business model with an exclusive focus on mobile banking have been analysed, leaving aside new innovations such as the digitalization of payments, for instance, and many other virtual advances in the financial and banking sector.

It should be noted that the above-mentioned aspects as study limitations can be considered as part of a larger investigation, which needs to be supplemented

in future research. Therefore, the next step should be to identify more new and up-to-date factors that can influence mobile banking adoption so they can be tested and compared with the importance given to the ones present on this research model.

Also, as there was a slightly different result than expected for personal innovativeness, it is suggested that attention be paid to this variable in order to be developed and deepened in future studies on the subject, finding, in this way, a possible justification for the behaviour that was identified.

Another suggestion is to extend the present study with other banking services considered as innovation, such as digital payments or even new mobile apps, which are increasingly present in today's reality. This study would be an added value, since a detailed analysis of the factors most valued by bank clients will allow to improve relevant aspects in the services, channels and even business models used by the banks, with the objective of increasing the adoption of its clients for new services that may come.

Since the demographic variables were not analysed, it would be equally interesting to study these variables, especially the age factor. As they are the two main generations at the moment, it would be interesting to develop a comparative study between the Millennial generation and the generation traditionally considered as that of their progenitors - the Baby Boomers - within the Portuguese context in an attempt to understand what separates these two age cohorts and what the extent of the changes brought by the Digital Age.

Finally, if the objective is to validate the model of the present investigation as a whole, it is suggested to collect data in a larger and more diversified sample

and to treat the statistical analysis through the analysis of structural equations. It might also be interesting to include in the study qualitative data, focused on the supply side, collected through interviews, for instance, in order to have two complementary perspectives of the same problematic.

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