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Proximity payments:

Drivers and barriers of NFC MPs in Portugal. Exploratory research.

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Abstract

Title: Proximity payments: Drivers and barriers of NFC MPs in Portugal. Exploratory research.

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The dissertation is focused on understanding perception of Portuguese users of Near Field Communication mobile payment systems existing on the market since 2015. NFC MPs have been created to enhance customer experience, increase speed of payment process and ensure higher trust in providers. Being a relatively new system, NFC MPs are not widely spread and are not fully understood by prospected users. Such affects acceptance speed and rate at which the system is adopted by users and providers. In order to analyze the challenges faced by NFC MPs, in-depth interviews were held, followed by an online study conducted next to a pool of 144 respondents. The study has shown that there is existing awareness on the market of NFC MPs, nevertheless there is very low usage rate. Most important barriers to adoption are low understanding of benefits of using the system and low understanding of the process behind the payment system. High perceived fees and risks are likely to prevent adoption on the market. On the other hand, perceived benefits of the systems are ease of use, convenience, having the technology in hand and secure transactions which serve as driver to adoption. There is existing interest on the Portuguese market in NFC MPs which exists mostly amongst the age category of 21 to 25 years.

Keywords: Near field communication, NFC, mobile payments, proximity payments, acceptance, technology acceptance model, perceptions, benefits, drawbacks, adoption.

Resumo

Título: Pagamentos de conveniência: alavancas e barreiras dos pagamentos móveis por NFC em Portugal. Investigação exploratória.

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A presente dissertação aborda a percepção dos sistemas de pagamento móvel Near Field Communication (MPs NFC) no mercado português, existentes desde 2015. Os MPs NFC foram criados para melhorar a experiência do cliente, aumentar a velocidade do processo de pagamento e garantir maior confiança nos fornecedores. Dada a sua existência recente no mercado, os MPs NFC ainda não estão difundidos. Adicionalmente, a amostra considerada mostra que estes ainda não são compreendidos pelos utilizadores. Isto dificulta a velocidade de aceitação e de adopção dos sistemas por parte dos utilizadores. A análise aos desafios enfrentados pelos MPs NFC apresentada nesta dissertação engloba um inquérito on-line realizado a uma amostra de 144 indivíduos. O estudo conclui que o mercado reconhece a existência de MPs NFC. No entanto, a taxa de utilização é reduzida. As principais barreiras à adopção identificadas incluem uma limitada compreensão dos benefícios do uso dos MPs NFC e do processo por detrás do sistema de pagamento. Factores como a percepção do preço e riscos podem dificultar a adopção dos mesmos. Por outro lado, factores como a facilidade de uso, conveniência e segurança podem funcionar como impulsionadores do uso desta tecnologia. O estudo conclui que existe em Portugal interesse pelos MPs NFC, principalmente na faixa etária entre 21 e 25 anos.

Palavras chave: Near field communication, NFC, pagamentos móveis, pagamentos por proximidade, aceitação, modelo de aceitação de tecnologia, percepções, benefícios, desvantagens, adoção.

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List of abbreviations

NFC – Near Field Communication

NFC MPs – Near Field Communication Mobile Payment systems

PU – Primary utilitarian function

PEOU – Performed Ease of Use

PBC – Perceived behavioral control

UICC – Universal Integrated Circuit Card

MCPA – Multicarrier Power Amplifier

RFID – Radio Frequency Identification

NDEF – NFC Data Exchange Format

MIME – Multipurpose Internet Mail Extensions

RTD – Record Type Definition

URL – Uniform Resource Locator

TAM – Technology acceptance model

IoT – Internet of things

Chapter 1: Introduction

1.1 Introduction

The traditional payment methods such as cash and credit/debit cards are slowly but surely being taken over by modern systems which are mostly presented by mobile applications and partly by cryptocurrency. The technological evolution has given people many more payment options which are supposedly more efficient, secure, convenient and fast.

The dissertation will focus on studying potential and actual users' perceptions of the innovative service of Near Field Communication mobile payment systems (NFC MPs). NFC MPs have started evolving in 2003 when the ISO standard 18092 has been officially approved (ISO/IEC, 2019). Nevertheless, the first NFC MP has been introduced by Google in 2011 – called the Google Wallet.

The objective of these systems is to enhance customer experience while making purchases through faster and easier transactions, increase trust in the service providers and increase the demand of products, which support NFC payments. The NFC MP market has been growing since the first introduction in 2014. In 2018 there were over 146 million users of NFC payment systems. Most used system was Apple Pay having over 87 million users, followed by Samsung Pay with 34 million users in second place and Google Pay with 26 million users in third place (Auriemma Consulting Group, 2018).

Nevertheless, the payment systems are still not considered by most of the potential users as credit/debit cards are stated as prevailing, followed by cash itself. Such can be explained by the fact that cards are convenient, fast and easy to use. NFC payment systems, on the other hand, are underused as they are not commonly understood and are not seen as beneficial by potential users (Lu, Yang, Gupta, Cao, & Zhang, 2011).

The research carried out had the intention of understanding the underlying motivations of actual and potential users of using NFC MPs, perceived benefits of the system and drawbacks which serve as barriers to adoption and usage. Furthermore, the future of NFC MPs on the Portuguese market has been assessed.

The study is conducted using 3 types of research: literature review, face-to-face interviews and an online questionnaire. Literature review has covered 19 articles which the author has found to be most relevant to such research. There were 14 interviews conducted which allowed the author to get a grasp of more in-depth information lying inside the minds of actual and

prospected users. Last but not least, the online survey has been carried out next to 144 respondents.

1.2 Problem statement

The problem this dissertation strives to understand is the perspective of Portuguese actual and potential users on the benefits and drawbacks of using Near Field Communication mobile payments. Moreover, the dissertation will assess the readiness of Portuguese users to adopt the new payment method.

1.3 Research questions

Research Question 1: What are the main factors affecting target audience's adoption and usage of NFC MPs?

Hypothesis 1 – There is a positive relation between perceived compatibility with the payment system and the impact on the adoption and usage

Hypothesis 2 – There is a positive relation between users' attitude (perceived usefulness and ease of use) towards the payment system and the impact on the adoption and usage.

Hypothesis 3 – There is a positive relation between users' subjective norm (social pressure) and its impact on the adoption and usage

Hypothesis 4 – There is a positive relation between user's perceived behavioral control and the rate of adoption and usage

Research Question 2: What are the perceived benefits of NFC MPs?

Hypothesis 1 – Technology in hand is a perceived benefit

Hypothesis 2 – Possibility to use any NFC embedded reader is a perceived benefit

Hypothesis 3 – Ease of use is a perceived benefit

Hypothesis 4 – High security level and control over transactions is a perceived benefit

Research Question 3: What are the perceived drawbacks of NFC MPs?

Hypothesis 1 – Low personal innovation level is an obstacle to adoption of NFC MPs

Hypothesis 2 – High perceived risk and fees are a drawback in adoption of NFC MPs

Hypothesis 3 – Personal traits are a possible obstacle to adoption of NFC MPs

Research Question 4: What are the future trends of NFC MPs in Portugal according to potential users?

Hypothesis 1 – There is an existing interest on the Portuguese market for NFC MPs

Hypothesis 2 – To facilitate adoption, there is a need in increased understanding of NFC MPs by users, trust and incentives they offer

Hypothesis 3 - To facilitate adoption, there is a need in increased advertising of NFC MPs

Research Question 5: Do demographics have an influence on the users' adoption of NFC MPs?

Hypothesis 1 – Younger users are more likely to use NFC MPs

1.4 Managerial and academic relevance

From a managerial point of view, this study would be of major importance for providers of Near Field Communication payment solution systems (specially providers of NFC embedded handsets) which are interested in increasing the number of users of their services and products as well as the general increase in the acceptance of the proximity payment system on the market. The study will show the most important obstacles on the way to higher adoption rates from the perspective of customers. Moreover, the research will prove useful for testing technology acceptance model for a new technological product or services on the Portuguese market.

In terms of academic relevance, the research provides additional information regarding existing researches on the topic of near field communication and proximity payment systems acceptance of an already existing product. The research contributes to the existing literature on users' acceptance of new technologies and to the proximity payment systems as a service. It also adds relevant information of Portuguese users' acceptance of new technologies which allows for further development and in-depths studies.

1.5 Structure of the dissertation

The dissertation is divided into 5 chapters: introduction, literature review, methodology, data analysis, and conclusion. Chapter 1 presents the introduction and overall scope of the problem, research questions and hypotheses. Chapter 2 presents the relevant literature review related to the most important aspects of the study. Chapter 3 presents the methodology which has been used throughout the study. Chapter 4 presents results of quantitative research already analyzed and presented in the order of research questions. Chapter 5, as the final one, contains the main findings of the research, limitations and suggestions for future research.

Chapter 2: Literature review

2.1 Emergence of the NFC payment solutions

The Near Field Communication system was patented in 1983 but approved as ISO 18092 standard just in 2003 (ISO/IEC, 2019). The NFC forum was originally formed by Nokia, Philips and Sony to bring companies together and work on NFC and promote device compliance. Currently the forum is run by over 175 member companies (Hamblen, 2012). Nevertheless, Philips and Sony are considered as innovators in this field as they were the first to manage to unify the existing communication technology supported by an internal chip (an embedded NFC microprocessor) that enabled data transfer within a maximum distance of 10 cm from the NFC reader (Ramos-de-Luna, Montoro-Rios, & Liebana-Cabanillas, 2015). The two first NFC payment applications which were launched on the market were the Google Wallet launched in 2011 and ISIS Join Venture – a joint venture formed of AT&T, T-Mobile, and Verizon Wireless - the three largest mobile network operators in the U.S. – launched in 2012. Google Wallet was developed by Google in 2011 to offer several benefits for consumers and merchants. For consumers, Google Wallet allowed to tap, pay and save money at the point-of-sales, aiming to improve their shopping experience. On the merchant side, the application aims to enable businesses to strengthen their customer relationships by offering faster, easier shopping with relevant discounts and loyalty rewards. ISIS has been working since 2010 in order to deliver a similar NFC payment method which was launched in 2012 (Chae & Hedman , 2015). Since 2007, the number of mobile devices that include this technology has increased dramatically. Currently, as stated by the NFC World (2016) three out of four smartphones produced incorporate a NFC chip and also most tablets, although Apple has decided to block the NFC function on their devices so they can only be used for mobile payment operations with Apple Pay (NFC World , 2019).

2.2 Most used NFC mobile payments nowadays

Since the initial launch of the NFC payment methods, there were a lot of attempts of organizations to create e-wallets which would be compatible with handsets. Based on the research carried out by the Auriemma Consulting Group in 2018, the top three most used NFC MPs up till now are the following:

	Payment method provider		
	Apple Pay	Samsung Pay	Google Pay
<i>Running system</i>	iOS	Android	Android
<i>Date of initial release</i>	October 2014	August 2015	May 2015
<i>First compatible phone</i>	iPhone 6	Samsung Galaxy S6	Any Android phone released after 2015
<i>Users in 2018 (#)</i>	87 Million	34 Million	25 Million
<i>Users in 2018 (%)</i>	77	17	6
<i>Other supported devices</i>	Apple Watch, MacBook	Samsung Galaxy Watch	Mobile watches
<i>Other supported services</i>	Apple Pay Cash	MST-based readers	–

Table 1 – Most used near field communication mobile payment systems

2.3 Functional model of NFC mobile payments

Near Field Communication (NFC) provides a new wireless technology that enables short distance communications and low-level energy consumption between technologies in the environment, which is the basis of Internet of Things (IoT). NFC is an evolution of Radio Frequency Identification (RFID) technology, created mainly for use by mobile devices (Gómez-Nieto, Ruiz , & García, 2016). The three crucial elements within an NFC system are:

Mobile devices with NFC chip.

Smartphones are the most well-known and used mobile devices. They allow users to take advantage of different options offered by NFC ecosystems and normally act as active elements within the NFC system.

NFC Readers.

These devices capable of accessing information from other NFC devices and sending it to other elements for processing. They are also in active mode during interactions.

NFC Tags.

These are RFID tags without an integrated feed source. They are in passive mode within the NFC system.

The initiator of communication is always an element that functions in active mode (e.g. smartphone with a NFC chip) and the receptor (e.g. NFC reader) which can be an element that

functions in active or passive mode, depending on the interaction that is in place. In order for the exchange of data to take place between two devices or an NFC tag, a standardized format has been created by the NFC Forum called NFC Data Exchange Format (NDEF) that allows storage and transport of different types of information, such as Multipurpose Internet Mail Extensions (MIME) messages, Record Type Definition (RTD) or smaller sizes such as Uniform Resource Locators (URLs).

NFC’s strong points are: flexibility, ease of use, independence of devices, and methods of communication and speed of communication, which is practically instantaneous, without the need to pair devices, setting it apart from other wireless communication technologies, such as Bluetooth. Its energy consumption is minimal and due to its short range, communications are very secure. However, its low transmission speed (424 Kbps) does not allow for large files transfers, although this inconvenience is made up for by its ability to intercommunicate with other technologies (Wi-Fi, Bluetooth) that permit this (Gómez-Nieto, Ruiz , & García, 2016).

The visual representation below presents a clearer view of the steps to be taken in order for the NFC MP to function within a specific merchant.

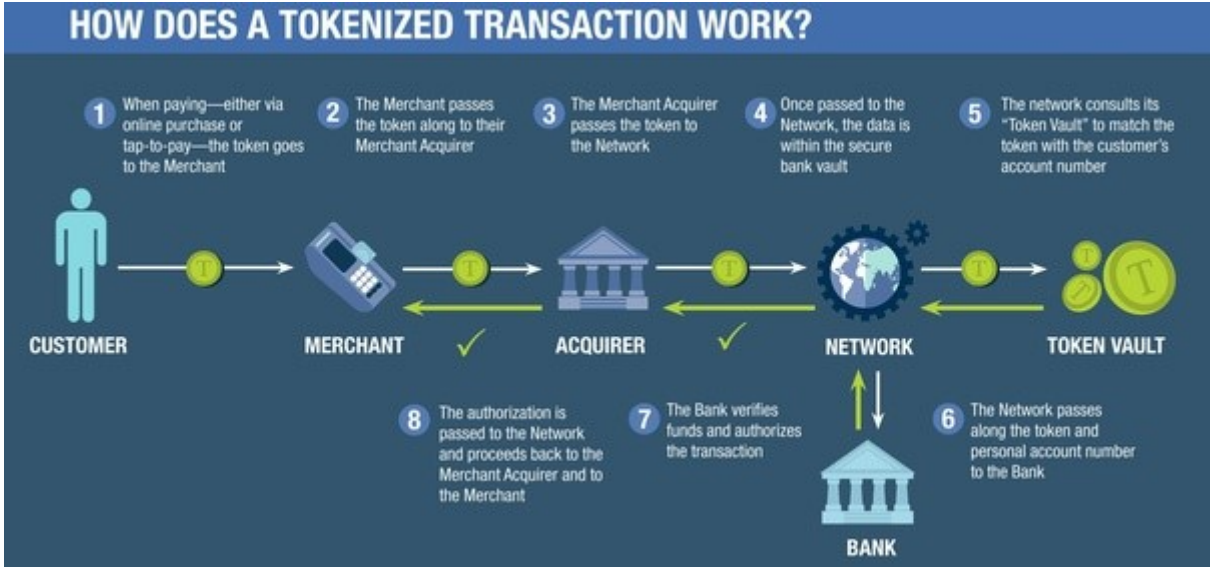


Figure 1 – Tokenized transaction service (Agashe, 2019)

2.4 Business Models for NFC based mobile payments

In order to incorporate the NCF MPs into the markets it is crucial to understand what the tripping points on the road to success are. Due to the fact that NFC payments require a costly investment from the side of merchants, clear understanding of the business model and the drivers of users’ intentions is of high importance.

Based on the Google Wallet and ISIS, the following business model for mobile payments is proposed by Chae et al in 2015, which includes five main dimensions: value service, value network, value architecture, value finance, and threats. The elements cover all aspects of value proposition by the company to customers, explain the complicated nature of mobile payment industry, requirements for technological arrangements, requirements for economic viability of the offering and the inclusion of the environment. (Chae & Hedman , 2015) The business model framework considers a broad range of facets that are seen as highly relevant in the mobile payment domain. The value service element depicts the nature and aspects of the new service and ensures that these are delivered to the right target segment and through the relevant distribution channels. In order to successfully deliver the desired value service, mobile wallet providers need to check that their given resource base is strong and configured in a way that adds to their core competencies. Building a strong and sustainable value network significantly enhances the efficacy of the m-payment service. As highlighted through the cases, value networks provide valuable expertise as well as other complementary resources and benefits that strengthen the potency of the wallet services. The value finance element includes the financial attributes incurred and generated through delivering value to customers and originating from the a fore-mentioned constellations of the four value elements. Lastly, the framework regards potential threats that are apparent in the emerging and volatile market of mobile payments. So, given the broad coverage, the framework appears to provide a comprehensive tool for researchers and practitioners to study and analyze current and future mobile payment solutions.

Nordlund et al. have also been examining the business model in 2012 and came up with conclusions which overlap with the business model of Chae et al. In order to facilitate the widespread adoption of NFC, the stakeholders, including financial institutions, mobile network operators, handset manufacturers, merchants and payment providers, must all work together to create an open, fully secure and interoperable infrastructure (Nordlund, Bentsen, & Gaus, 2012).

Moreover, during the research the authors came up with 4 following possibilities of the NFC business model development in the future.

1. The mobile network operator issues the UICC in a collaborative model.
2. The mobile network operator issues the UICC in a bilateral model.
3. The handset manufacturer issues an embedded SE in a bilateral model.
4. The MCPA service provider issues a microSD in a standalone model.

In current setup, business model #3 (The handset manufacturer issues an embedded SE in a bilateral model) is widespread, as three out of four of the handsets created after year 2014 have an integrated NFC chip which is used with the NFC readers embedded in the payment terminals (NFC World , 2019).

2.5 The Extended Technology Acceptance Model

Technology Acceptance Model (also referred to as TAM) has been developed by Fred Davis in 1986 to explain the behavior of computer usage. Davis has used the theory of reasoned action developed by Martin Fishbein and Icek Ajzen from 1975 as the ground for the TAM. The goal was to provide grounding for the computer acceptance behavior (Chau, 1996). The model has gained considerable theoretical and empirical support in predicting technology acceptance among potential users and decision makers (Wu & Lu, 2013). Nevertheless, Ashraf et al. in their study “The Application of the Technology Acceptance Model Under Different Cultural Contexts: The Case of Online Shopping Adoption” have claimed that TAM by itself is not enough as it does not reflect the full picture of underlying motivation behind specific actions. Such led to the development of the extended technology acceptance model which had an intention of showing that there is more to be considered. The research has been carried out in Pakistan and Canada (Ashraf, Thongpapanl, & Auh, 2014). The extended TAM theorizes that there are five key elements which have the most influence on the user’s acceptance/adoption of technology, which are:

1. Users’ acceptance of a new technology depends primarily on its function (referred to as PU);
2. Ease or difficulty with which its function can be performed (referred to as PEOU).
3. Trust
4. Perceived behavioral control
5. Culture

According to Fred Davis, the most important elements are the users’ acceptance of a new technology depends primarily on its function (PU) and ease or difficulty with which its function can be performed (PEOU). Davis believed that these two key beliefs about a new technology, PU and PEOU, determine a person’s intention to adopt a new technology (Davis, 1989). In addition to PU and PEOU, an important factor involved in technology adoption is trust. One of the key reasons customers use the Internet but do not actually purchase online is lack of trust in e-retailers as customers perceive online transactions to be risky. Perceived Behavioral Control (PBC) acts as a proxy for actual control. In situations in which users have low control over their

behavior or volitional control is missing (e.g., in the case of shopping online), PBC acts as an important predictor of behavior. Cultural norms and beliefs have a strong influence on how people in a society perceive, behave, and make decisions. McCort et al. have defined culture as “the complex whole which includes knowledge, belief, art, morals, custom and any other capabilities and habit acquired by man as a member of society.” Previous research has emphasized the importance of prevalent culture because it influences customers’ innovativeness, as stated by Geert Hofstede (1999), and decision making as stated by Naresh Malhotra (1993). Moreover, as stated by Rogers (2003), culture is highly integrated and interrelated with age which has great impact on acceptance and adoption of various innovation types.

2.6 Analysis of intentions to use NFC mobile payments

As NFC MPs are a relatively new technology, several researches have been conducted to understand what are the driving factors which affect the use of such technology on the psychological level of users. Moreover, it is a way to examine how is the technology acceptance model (TAM) suitable in case with mobile payments.

Ramos-de-Luna et al. have carried out a research to determine the most important intentional factors which create higher probability of users to adopt the NFC MP system. The research has been carried out next to Spanish users. Based on previous researches carried out by Yang et al. (2011) and Lu et al. (2013), the authors decided to launch an online questionnaire with pre-determined 16 hypotheses. The intention was to help prove the hypotheses which were aimed at understanding the relations between attitude and intention to use NFC MPs.

The first and the most influential variable on the intention of use of a proposed payment system is the perceived compatibility with the system of payment. It stands out as a decisive factor to increase the intention to use the new payment system. The second most important variable is the attitude toward the use of payment system, confirming the TAM bases, showing that attitude is a key antecedent of intention to engage in a behavior to use the payment system. The third most important variable corresponds to subjective norm - defined as a “person’s perception that most people who are important to him think he should or should not perform the behavior in question” (Gerhardt Schierz, Schilke, & Wirtz, 2010). It’s high relevance is due to the development and high rate of user acceptance of mobile communication technologies. Individuals value highly the opinions of those who are considered opinion leaders. Last but not least, the level of personal innovation shows a significant relation with the intended use of a specific new tool. (Ramos-de-Luna, Montoro-Rios, & Liebana-Cabanillas, 2015)

Another study which has been carried out by Yang et al. (2013) has also reached similar outcomes. The research was carried out next to Chinese users and was aimed at understanding whether behavioral beliefs, social influences, and personal traits have an effect on the intentions to accept mobile payment systems or not. The research was a cross-sectional field study through an online questionnaire partly based on refined and rephrased researches conducted previously by other authors.

The results were such that all three variables had a significant and direct personal influence. It can be explained by the following reasons. Those who do not understand new technologies, specifically in the field of mobile systems, tend to rely on people whom they would consider opinion leaders. Personal traits have both direct and indirect influence on the acceptance probability as they tend to increase the believed benefit perceptions. Finally, perceived fee, relative advantage and perceived risks do not have significant influence on the adoption probability anymore (Lu, Yang, Gupta , Cao, & Zhang, 2011).

2.7 Obstacles and benefits leading to usage of NFC mobile payments by users

Having analyzed the intentions and concerns of users regarding NFC payments studied by Lu et al. (2011) and Ramos-de-Luna et al. (2015), the following benefits and obstacles from the side of users can influence the adoption and usage rate of NFC MPs.

Benefits:

- Technology in hand;

As previously mentioned, the needed technology (NFC chip embedded handsets) is already on the market since 2014-2015 (depending on the brand). Moreover, NFC embedded card readers have been on the market for 11 years since their introduction in 2008.

- Possibility to use at any NFC embedded reader;

Any NFC chip handset can be used with any NFC reader as they operate on the same radio frequency.

- Ease of use;

As soon as the user adds the card to his payment system, it is already available for use. Putting the handset next to the NFC reader will fulfill the payment process, if the security verification (Face ID/Fingerprint) has been passed. (Apple Inc., 2019)

- High security level and control over transactions.

A tokenized transaction passes an 8-level security path before proceeding with the payment, making it even more secure than a credit/debit card (Agashe, 2019). Moreover, transaction will not be complete unless the security verification has been passed which requires Face ID or fingerprint scan to be completed.

Obstacles:

- Low personal innovation level:

- Low understanding of new technologies;

Being relatively new, the NFC payment process requires deeper understanding of the technology behind it due to the fact that it is a disruptive technology. It requires great changes in existing pattern of behavior. (Trott, Market adoption and technology diffusion, 2017)

- Low understanding of advantages;

Without a basic understanding of the technological background of any innovation it becomes hard to see, what are the advantages of any innovative product over its predecessor (Trott, Market research and it's influence on new product development, 2017). Thus, trust in the service or product is affected.

- High perceived risk;

People who are unaware of the technology and security protocols behind mobile payment systems are afraid that their data will be available to providers of these payment solutions. In example, users are afraid that Apple or Samsung will get information regarding all their transaction costs, bank account details etc. which is not correct (Lexology, 2015).

- Personal traits;

Some of the personal traits might lead to prospected users to disbelief in new technology as they are lacking innovative skills and desire to be up to date with new products and services.

- High perceived fees.

Without understanding the technological background of NFC payment, people believe that there is an additional cost payed by the user or the merchant from every transaction completed. As bank fees are around 2.5% of every completed transaction (Saxena & Manjesh, 2019), an additional fee over the existing one creates a feeling of overpaying.

2.8 Current and future trends for mobile payment systems

Jeffuss et al. in their research on the future of mobile electronic payments have tried to conclude the current and future trends of mobile payment systems and what motivates them. The study has been carried out in the U.S. to both users and merchants. With new technologies such as tokens and hidden transaction information, the mobile electronic payments market continues to evolve. It appears that the token system that Google Pay and Apple Pay use is the future of mobile electronic payments (Jeffuss, Zeltmann, Griffin, & Chen, 2017). Apple Pay and other providers of NFC MPs have the potential to solve many of the concerns and issues associated with mobile payment applications, magnetic stripe cards and similar payment methods. One of the main arguments against NFC technology is the investment required by consumers and merchants (Salmony, 2017). Consumers have no problem adopting the new technology when it is built into the phone they purchase. As an example, Apple has over 800 million iTunes accounts and each one of them has a credit card attached to them (Krause, 2014). As consumers already have the technology in hand, the incentive to use Apple Pay is much greater. It is up to the merchants to offer the correct equipment at point of sales to process NFC payments. Having an enormous customer base Apple Pay is expected to have a real chance of disrupting the mobile electronic payments market. Apple Pay is easy to use, and it is more secure than any other competing mobile electronic payments method. As Samsung Pay and Google Pay have been developing lately too, it is inevitable that motivation to use NFC payment methods will rise dramatically. In addition, new point of sales system terminals have an NFC chip inside which allows the use of any NFC embedded device that supports such mobile payment systems as Google Pay, Samsung Pay and Apple Pay. Moreover, the promise of increased security provided by NFC MPs appears to add an additional service to the market by serving as a security guarantor which is a real innovation to the market of mobile payments.

2.9 Current situation of NFC mobile payments in Portugal

In order to understand the current situation in Portugal, the offered physical stores supporting NFC MPs were analyzed through the MB Way website. MB Way uses NFC MP as one of the possible payment solutions (MBWay, 2018).

MB Way is a project launched in 2015 by Multibanco in Portugal in order to facilitate online and offline payments, instant money transfer and other banking services with the help of a handset (SIBS, 2015). As stated by MB Way in 2018, there are currently 3669 stores in the area of Great Lisbon, where usage of NFC payment systems is accepted. In total in Portugal there are 12 175 stores where NFC payments are accepted. As NFC MPs are run on the same system,

it means that all of those stores allow the usage of NFC MPs. The stores include: food retailers, clothing, restaurants, sport equipment stores, cosmetics, pharmacies, hotels, transportation etc. (MBWay, 2018). Such means that every person owning an iOS-based or Android-based phone issued after 2015 with an embedded NFC chip has the opportunity to use NFC MPs in Lisbon and in Portugal in general.

2.10 NFC mobile payments profit model

In order to understand the financial feasibility of any innovative product, it is important to assess its profit model. Such will provide an understanding over what does the new product deliver to the developers and owners. The following is an overview of what Apple, Samsung and Google receive from users of their mobile payment systems.

Apple Pay	There are no fees payed by users or merchants for a transaction. Apple receives usually 0.15% of the transaction from the issuer of the card (e.g. Visa, Mastercard, Maestro etc.). Moreover, Apple Pay, being the first NFC MP on the market, drives the consumers’ willingness to purchase Apple Pay supporting products (Lexology, 2015).
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Samsung Pay	Samsung does not receive anything from users/merchants/banks/card issuers. Samsung has released their system to encourage the transaction fee free purchasing. Samsung states that it is a motivational factor for customers to consider purchasing a Samsung phone. Moreover, transaction fee free process is more accepted by banks and card issuers which makes the service more attractive from the market perspective (Peters, 2016).
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Google Pay	Google provides a similar fee-free transaction service like Samsung. Google is receiving profits from sponsor ads which are fee-based. Ads pop up on Google Place from those, who want to exist on the platform and be available to customers (Winkelman, 2018).
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Table 2 – profit models of most used NFC mobile payment systems

Chapter 3: Methodology and data collection

3.1 Research method

Concept evaluation of NFC MPs is based on Bloom's taxonomy (Adams, 2015). Such means taking the existing concept of NFC MPs which is an incremental innovation introduced roughly 5 years ago and studying it through the three following approaches.

First one is the literature review. This step is intended to help understand what kind of data is already available, what studies have been carried out and what are the main findings. Moreover, literature review helps understand whether there are aspects which have not been fully studied and present a blank spot in the topic.

The second step is the qualitative research. This step has been carried out on the basis of the "burrito launch" concept, where the author invites a person for a conversation on the topic. The person is not prepared before the interview and does not know the topic of the interview. Such gives the author a full and complete picture of the actual situation of NFC MPs from a more in-depth perspective. Qualitative research highlights the intentions of usage, ideas and feelings toward the service which are not affected by previous preparations. Such is done to ensure that the dissertation's findings are not compromised and are relevant and reliable.

Last but not least, the quantitative research is carried out. It is based on the in-depth findings from interviews and literature review which has been studied. Quantitative research is carried out to a wider set of respondents with the intention of quantifying previously gathered data which gives the opportunity to further analyze and come up with relevant conclusions.

3.2 Research tools

3.2.1 Qualitative research

The qualitative analysis was carried out next to 14 respondents aged between 20 and 53 years old. Two respondents are over 35 years, 9 between 25 and 35, 3 – under 25. The sample consisted of 4 female respondents and 10 males. All of them are residents of Portugal and more specifically – Lisbon, thus all interviews have taken place in Lisbon. The interviews generally took between 15 and 30 minutes depending on the flow. In some cases, the interviews lasted 15 minutes as respondents had little knowledge so they were not able to elaborate on opinions. In other cases, interviews took 30 minutes as respondents appeared to be more knowledgeable in specific topics and gave much more open and deep answers. Such drove the interviewee to ask respondents to elaborate more on their thoughts and beliefs. Interviews took place in places

which would suit the respondents, such as Catolica building, in a bar or on the street. Generally, the interviews were divided into 2 parts: first part was concerned with demographics, general purchasing behavior, preferred payment methods and smartphone usage. Second part was focused on understanding the current tendencies of knowledge, usage and perceptions of respondents regarding NFC MPs.

Gained insights

12 out of 14 respondents stated that they spend money on a daily basis. The range of activities differs, but mostly the money is spent during the week on transportation, parking, lunch or dinner with friends and colleagues, daily grocery shopping. During the weekends, respondents claimed to spend money on grocery shopping more than during the week, clothing and entertainment activities such as going out. The most preferred type of payment is debit/credit cards. They are easy to use, almost weightless and do not take space. Moreover, payment with a card is convenient as it gives the opportunity to pay the exact amount without having to wait for change or calculating own coins, which is often a problem with cash. Cash and mobile applications were stated an equal amount of times as the second preferred type of payment. To 2 out of 14 respondents cash gives a perception of higher control over personal spending. Moreover, respondents that chose cash also stated that it gives a higher perception of security as outside entities have less information regarding spending of the respondents when using cash. Mobile payment applications are barely used. That is due to low perception of benefits carried by this payment type over cards and sometimes the complicated process of setting up the application. Another two very important aspect mentioned by respondents is that mobile payment applications deliver the feeling of higher insecurity as outside entities (such as application owners, outside systems and banks) receive more information about the user and that transaction fees are considered considerably high. On top of that, mobile applications are not advertised enough so a lot of respondents have no idea of their existence. Only 2 respondents use mobile payment applications as they consider themselves tech geeks and are interested in latest developments. Other respondents refer to themselves as followers. Last but not least, for some of the respondents it is hard to switch from their preferred payment methods to payment applications as it is a process that requires time and effort.

11 out of 14 respondents own phones which do support NFC payment systems as they were released in late 2015 or later. Nevertheless, the idea of NFC MP concept is not widely spread amongst them. Only 4 out of 14 respondents have stated that they know for sure that their phone

supports NFC MPs. 2 respondents were not sure, and the rest didn't know at all. After a short explanation about the NFC technology, benefits and possible drawbacks, respondents stated that they would be most likely to try NFC payments which fit the operating system of their phone. The reasoning behind such decision is mostly that respondents instantly referred to these payments as fast, convenient and easy to use. Specifically, respondents which had previous positive experience with mobile payment applications were much more eager to try NFC MPs. Respondents did not care much about the security, as NFC payments made via phone are perceived more secure than even cards, so it was not a decisive factor for them. One of the benefits stated by every female interviewed was that having a trustable NFC MP will ease their life as they would not need to walk around with a purse which contains only a wallet. The opportunity of just having to take the phone and paying with it sounds very incentivizing.

Nevertheless, almost every respondent stated that the decision is not definitive as there is low trust in these payment methods mostly due to low understanding of the process and lack of trust in the brand name. Even brand loyal customers stated that they are insecure about trusting the brand of phones they use with something as intimate as card and transaction information. Out of the three brands, Google was perceived as the least trustworthy, Samsung as mediocre and Apple as the most. Still, respondents who were brand loyal to the brand which offered own NFC MP (e.g. loyal to Apple which provides Apple Pay) were much more likely to adopt the payment method without having a trial period.

As the final point, even though at the moment of interviews majority of users have never used an NFC mobile payment system, everyone believed that there is definitely a place for it in the future. Such is because technology is constantly evolving, and it is doing so in order to ease and enhance the life of people which are striving to lesser the efforts of their actions. Such means that NFC payments, which will require just a piece of technology in hand of the user, are believed to prevail cards and cash in the period of next 50 years. Nonetheless, it is important to mention that adoption of NFC payments depends a lot on the level of development of a specific country. As mentioned by respondents, such countries as Canada, US, China, North Korea will probably be the first ones to switch to NFC payments. Countries like Portugal will take more time and will follow only after the technology has proved to be sustainable and trustworthy.

3.2.2 Quantitative research

The survey has been carried out next to 144 respondents. Out of those, 109 were fully completed and out of them 100 were Portuguese respondents. The 100 answers were the ones used as the major interest was in understanding the perceptions of Portuguese residents and not tourists or people from other countries.

The online survey has been intentionally divided into 5 question sets, each representing a specific topic to be covered. First set was aimed at understanding general purchasing habits of respondents and consisted of 5 questions. The questions were aimed at understanding the frequency of money spending, preferred payment method, attributes of the method, usage of mobile payment applications and the reasons for doing so.

The second question set, consisting of 3 questions, was intended to get a grasp on the consumers handset in possession and the reasons for having it through asking questions regarding the brand of currently owned handset, how old it is.

Third question set was aimed at perceptions and understanding of NFC MPs concept by the respondents and was covered by 11 questions. In the beginning of the set (between questions 3 and 4) a short visual explanation has been introduced in order to drive the answers in a more direct way and separate respondents based on their perceptions and usage habits. The questions had to provide the data regarding respondents' interest and usage of new technologies, perceived innovativeness, familiarity and perceptions of NFC MPs and current rate of usage.

The fourth set represented by 2 questions has been aimed at understanding respondents' vision of the future of NFC MPs by asking questions regarding their perceptions of the future, and some attributes which made them believe in the choice they made.

Last but not least, fifth question set was aimed at gathering demographic data of respondents collected through 7 questions. Questions were meant to deliver the data regarding age, gender, income, occupation, education level and believes in personal traits of respondents.

3.3 Scales of measurement

During the construction of the survey, various types of measurement scales were used in order to make sure that the gathered data is quantifiable and available for further analysis with SPSS. The measurement scales implemented were similar to those used in the research done by Lu et al. (2013) and Yang et al. (2011). Likert and bipolar scales were used mostly in questions regarding service attribute, features, perceptions and feelings. Knowledge level was tested in questions 14, 18, 19 (where 1=no knowledge to 5=very knowledgeable); importance level was

tested in questions 22, 23, 30 (where 1=not important at all to 5=very important); agreement level was tested in questions 3, 5, 6, 26, 27, 28, 29, 34 (where 1=strongly disagree to 5=strongly agree); frequency was tested in question 24 (where 1=never to 5=always); interest level was tested in questions 12 and 25 (where 1=not interested at all to 5=interested a lot); involvement level was tested in question 13 (where 1=not involved at all to 5=involved a lot). Moreover, dichotomy questions (where 0=no and 1=yes) were used in questions 4 and 20 in order to separate different parts of the survey in terms of their relevance to the respondent.

Chapter 4: Data results

4.1 Data collection

Data has been collected between the 23rd of April and 7th of May 2019 for 15 days. The online survey has been pre-tested by 3 people using 6 different devices to ensure flow and meaningfulness of questions imposed. These people had not participated in the actual study. The survey has collected 144 answers, out of which 109 were fully completed and have been used for further research. Out of those, 100 were Portuguese resulting in 91.7% of population of interest.

4.2 Sample characteristics

The respondents' pool is composed of 100 respondents. 55% are male and 45% female. In terms of age, the majority (49%) is represented by 21-25 years group. It is followed by the 26-30 group (18%) and under 21 age group (14%). Over 31 group (which includes age groups of 31 to 35, 36 to 40 and over 40) represents the total of 19%. By occupation, the biggest groups of respondents are students and employed professionals represented by 54% of respondents and 37% respectively. In terms of education, the majority of respondents has obtained a bachelor's degree until now represented by 41% followed by masters' degree (33%). Respondents which have obtained just the high school degree are in third place with 16% followed by those holding a post-graduate degree (8%) and a PhD (2%). Last but not least, in terms of income, the majority (43%) has the income of 500 euros per month or below, followed by 25% having over 1500 euros per month. The income groups of 500-1000 euros per month and 1000-1500 are represented both by an equal 16%.

4.3 Descriptive statistics

Out of the sample of 100 Portuguese respondents, 64% have stated that their most preferred payment method is credit/debit card (table 1). Such is due to the fact that it is considered as the easiest ($\bar{x} = 1.41$), most secure ($\bar{x} = 1.52$), fastest ($\bar{x} = 1.44$) and most convenient ($\bar{x} = 1.63$) (table 2). 55% of respondents have said that they use mobile payment applications. Those, having stated that they do use them, the most important attributes are speed ($\bar{x} = 1.33$), convenience ($\bar{x} = 1.33$) and simple to use ($\bar{x} = 1.49$). Those who do not use mobile payment applications state that the most important factors for them are low need of usage ($\bar{x} = 1.91$), low understanding of how they work ($\bar{x} = 2.53$) and not liking to pay with their phones ($\bar{x} = 2.82$) which serve as drivers to non-usage. The average age of a phone, as stated by the respondents, is 1-2 years (37%) and less than 1 year (32%) in second place. The most mentioned reasons for having the

phone is receiving it as a present from someone (29%), followed by buying the phone due to being brand loyal (23%) and buying it as it was on a discount (20%).

Generally, respondents consider themselves innovative and interested in new emerging technologies ($\bar{x} = 3.72$). Nevertheless, the awareness of the general concept of NFC payments is relatively low with (41%) and functional understanding of the system is even lower (28%).

The awareness and understanding of such systems as Apple Pay, Samsung Pay and Google Pay is below average (41% of respondents know a little about these methods and 32% have no knowledge).

	Percent	Valid Percent	Cumulative Percent
Cash	24	24.0	24.0
Credit/Debit card	64	64.0	88.0
Mobile application	8	8.0	96.0
Online payments	4	4.0	100.0
Total	100	100.0	100.0

Table 3 – Respondents’ most preferred payment methods

	N	Minimum	Maximum	Mean	Std. Deviation
Easy	100	1	5	1.41	.830
Secure	100	1	5	1.52	.882
Fast	100	1	5	1.44	.857
Convenient	100	1	5	1.63	1.089
Trustworthy	100	1	5	1.66	.867
Risk-free	100	1	5	2.34	1.017
Valid N (listwise)	100				

Table 4 - Reasons to use the chosen payment method

Majority of the questions have been imposed on an inverted scale, where 1=highest value and 5=lowest value (e.g. 1=Strongly agree to 5=strongly disagree). Thus, further on, mean values below 3 (=moderate) are those considered valuable and reliable. In case of different measurement scales, the explanation to values will be provided.

The technology acceptance model (TAM) by Fred Davis (Davis, 1986) has highlighted that there are factors which are of extreme importance when it comes to acceptance and adoption of new systems and tools. As it has been extended by Ashraf et al., the online survey has been based on these two researches simultaneously and had the intention of finding out whether the

mentioned factors do have an effect on the adoption of NFC payment systems on the Portuguese market. After a careful analysis of the gathered data, it can be seen that there are various factors which influence adoption and usage of NFC payment systems from the perspective of users.

As observed from the data, consumers are generally aware of the NFC payments system as means yield a value higher than average 3 ($\bar{x} = 2.12$). Such means that Portuguese users are mostly aware of the general concept of NFC MPs and whether their phone supports it or not. For them, the adoption factors of most importance are: ease of use ($\bar{x} = 1.54$) and convenience ($\bar{x} = 1.59$). They are followed by secure transactions ($\bar{x} = 2.20$), subjective norms ($\bar{x} = 2.30$) and high control over transactions ($\bar{x} = 2.57$).

Furthermore, it was important to understand which of the existing factors of NFC payment systems are considered by actual and potential users as benefits, and which are obstacles. Based on the research by Lu et al. (2011) and Ramos-de-Luna et al. (2015), the following attributes have been tested in order to understand whether they are perceived as benefits or not: technology in hand, possibility to use any NFC embedded reader, ease of use, high security level and high control over transactions.

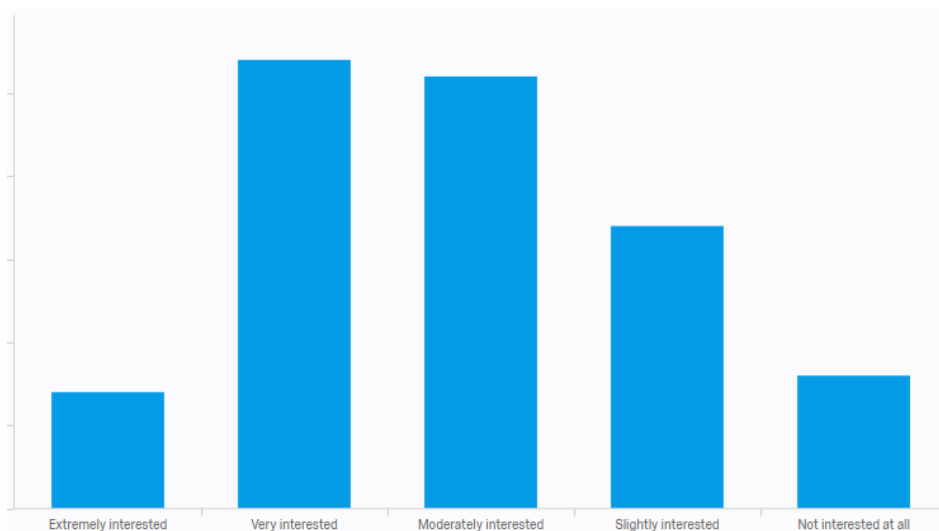
The research has shown that all five factors are considered to be beneficial having the means under the value of 3 (=neither agree nor disagree) as the scale has been from 1 (=Strongly agree) to 5 (=Strongly disagree). First, “easy to use system” is considered to be of highest benefit as it has the lowest mean ($\bar{x} = 1.48$). Second is “having the technology in hand” with the next lowest score ($\bar{x} = 1.67$). Third – “secure transactions” ($\bar{x} = 1.68$). Following, “having the possibility to use the phone with any NFC embedded reader” and “highly controlled transaction system” are in fourth and fifth places ($\bar{x} = 1.73$ and $\bar{x} = 1.79$) respectively.

Next, according to the same research carried out by Lu et al. (2011) and Ramos-de-Luna et al. (2015), the drawbacks have been analyzed. The most important perceived drawbacks of technology and specifically NFC payments are: low personal innovation level, high perceived risks associated with the system, high perceived fees and personal traits.

Following the research findings, it has found that perceived needed innovation level to use NFC MPs is considered important as it is below the average 3 (=neither agree nor disagree) having the mean of 2.500 thus proving one of the hypotheses. Inverted questions have been used to assess importance of high fees and risks. As assessment of risks and fees as drawbacks has been done using inverted questions, it means that high values of M are correspondents of importance and perception of factors as drawbacks. With the high means ($\bar{x} = 4.160$) for perceived high

risks of transactions and high means for the perceived high fees ($\bar{x} = 4.020$), it is clear that they are representatives of drawbacks of NFC MPs.

Further, the future trends of NFC mobile payment systems have been analyzed. Based on the study of Jeffuss et al. (2017) which has been studying the future of mobile electronic payments, the current research had the intent to understand whether NFC MPs have a future on the Portuguese market. Paul Trott (2017) built on the theory and has carried out and explained in his book “Innovation management and new product development” in 2017, the questions were imposed. The data has shown that there is a general existing interest on the Portuguese market which is slightly above average ($\bar{x} = 2.896$).



Graph 1 – Interest in usage of NFC MPs according to Portuguese users

Nevertheless, there are factors which prevent potential users from adopting NFC mobile payment systems. The factors bearing most significance are: the lack of understanding of NFC payment systems ($\bar{x} = 3.63$) in first place followed by lack of understanding of benefits gathered with the usage of NFC payment systems ($\bar{x} = 3.35$). Lack of advertising is not of high importance ($\bar{x} = 2.96$) and below average.

As mentioned by Everett Rogers (2003) stated in “Diffusion of Innovations”, that majority of innovators and early adopters who are the target audience of NFC payment systems (as they have a different culture) are under the age of 30. In order to be able to determine whether there is a difference between adoption likelihood of NFC payment systems dependent on the age, the data has been assessed. It is seen that the group most likely to adopt the new payment method is between 21 and 25 years of age ($\bar{x} = 2.67$). On the contrary, the age group of 31 to 35 have the least willingness of doing so ($\bar{x} = 3.6$) amongst all respondents.

4.4 Inferential statistics

Research Question 1: What are the main factors affecting target audience’s adoption and usage of NFC MPs?

Hypothesis 1 – There is a positive relation between perceived compatibility with the payment system and the impact on the adoption and usage

The hypothesis has had the intention of assessing the relation between perceived compatibility and the impact on adoption. The variables which have been used are: “Now that you have seen the explanation of NFC mobile payment systems, do you think/know if your phone supports NFC payments?” as dependent and Have you ever used Apple Pay, Samsung Pay and/or Google Pay? as independent.

As stated by Ashraf et al. (2014) in their study, perceived compatibility (having under 7 levels on the scale) is considered as categorical. Thus, giving the opportunity of using the ANOVA to test the hypothesis. As it can be seen, both groups of respondents (those who have used NFC MPs and those not) are mostly aware of the fact that their phones support NFC payments. Such is proved by the means of those used NFC mobile payment systems (\bar{x} =1.61) and those not (\bar{x} =2.27). As the scales of measurements were 1 =definitely yes to 5=definitely not, means under the value 3(=might or might not) are considered as proof. Moreover, as the significance level (the p-value) is below 0.05 (p =0.008), the difference between the groups is highly significant. Nevertheless, as majority of respondents has never used NFC MPs even knowing their phones support it, such means that there is no relation between awareness of compatibility and the rate of adoption and usage.

	N	Mean	Std. Deviation	Std. Error	95% CI for Mean			
					Lower Bound	Upper Bound	Minimum	Maximum
Yes	23	1.61	.988	.206	1.18	2.04	1	5
No	77	2.27	1.047	.119	2.04	2.51	1	5
Total	100	2.12	1.066	.107	1.91	2.33	1	5

Table 5 – Relation between perceived compatibility and the impact on the adoption and usage

ANOVA					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	7.809	1	7.809	7.306	.008
Within Groups	104.751	98	1.069		
Total	112.560	99			

Table 6 – ANOVA for relation between perceived compatibility and the impact on the adoption and usage test

Hypothesis 2 – There is a positive relation between users’ attitude (perceived usefulness and ease of use) towards the payment system and the impact on the adoption and usage.

To test this hypothesis, a binary logistic regression has been run next to the gathered data. In order for the hypothesis to be proved, the significance level of an attribute has to be below $p=0.05$. Out of the following data, it can be inferred that convenience is of high importance and has an impact on the adoption and usage rate having *Wald* of 3.901 and the significance level $p=0.048$. Ease of use is not highly significant as $p=0.532$ which is much above the significance level of 0.05.

Variables in the Equation						
	B	S.E.	Wald	df	Sig.	Exp(B)
Easy to use	.705	1.128	.391	1	.532	2.025
Convenient	2.203	1.115	3.901	1	.048	9.051

Table 7 – Binary logistic regression for relation between attitude towards the payment system and the impact on the adoption and usage

Hypothesis 3 – There is a positive relation between users’ subjective norm (social pressure) and its impact on the adoption and usage

In order to test this hypothesis, the gathered data was first split into 2 categories (as in the research performed by Wu et al., 2013). The split criteria was the respondents’ answer to question “Have you ever used Apple Pay, Samsung Pay and/or Google Pay?”. Further, descriptive statistics have been run next to the split new groups and the question on the influence of subjective norms. The question has been analyzed on the scale from 1=least important to 5=most important. The first category (bearing N=23 respondents) is those who replied positively to the imposed question. The results are presented in table 8. Having the mean ($\bar{x} = 2.30$) below the medium 3, it means that for users of NFC payments belonging to a part of a social group is of relatively low importance and has no impact on the adoption.

Actual users of NFC MPs						
	N	Minimum	Maximum	Mean	Std. Deviation	
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic
I want to be part of my social group which uses it	23	1	5	2.30	.213	1.020
Valid N (listwise)	23					

Table 8 - Relation between users’ subjective norm (social pressure) and its impact on the adoption and usage of active users

The second category (bearing N=77 respondents) is those who replied negatively to the imposed question. The results are presented in table 9. Having the statistic mean ($\bar{x} = 2.99$) below the medium 3 as in first case, it means that for users of NFC payments belonging to a part of a social group is of relatively low importance and has no impact on the adoption. Nevertheless, as the mean is higher, it could be inferred that for those that have never used NFC payment, subjective norms have a higher influence on adoption and usage rate.

Non-users of NFC MPs						
	N	Minimum	Maximum	Mean	Std. Deviation	
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic
No one in my social group uses it	77	1	5	2.99	.154	1.352
Valid N (listwise)	77					

Table 9 - Relation between users' subjective norm (social pressure) and its impact on the adoption and usage of not-users

In order to make sure the analysis is correct, a one sample t-test has been run next to the data. The results obtained prove the previous analysis. Moreover, one sample t-test adds value by showing that the population means are statistically significantly different, having the p -value <0.05 ($=0.000$).

One-Sample Test						
	t	df	Sig. (2-tailed)	Mean	95% CI of the Difference	
				Difference	Lower	Upper
Have you ever used Apple Pay, Samsung Pay and/or Google Pay?	41.849	99	.000	1.770	1.69	1.85
No one in my social group uses it	19.382	76	.000	2.987	2.68	3.29
I want to be part of my social group which uses it	10.839	22	.000	2.304	1.86	2.75

Table 10 – One sample t-test for relation between users' subjective norm and its impact on the adoption and usage

Hypothesis 4 – There is a positive relation between user's perceived behavioral control and the rate of adoption and usage

Hypothesis 4 has been tested by running the binary logistic regression. As in previous cases, in order for the hypothesis to be proved valid, the significance level has to be below ($<$) 0.05. As it is presented in the table below, out of 2 variables, only one has proved to be significant. High

control over transaction fees, having the highest *Wald* of 6.754 and the *p*-value=0.09, has proved to have a significant influence on the adoption and usage rate. Secure transactions, on the contrary, have proved to have no effect as the *p*-value=0.096 which is above 0.05.

		Variables in the Equation					
		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1 ^a	Secure transactions	-1.098	.661	2.763	1	.096	.333
	High control over transactions	-1.248	.480	6.754	1	.009	.287

Table 11 - Binary logistic regression for relation between perceived behavioral control and the rate of adoption and usage

Research Question 2: What are the perceived benefits of NFC MPs?

Hypothesis 1 – Technology in hand is a perceived benefit; *Hypothesis 2* – Possibility to use any NFC embedded reader is a perceived benefit; *Hypothesis 3* – Ease of use is a perceived benefit; *Hypothesis 4* – High security level and control over transactions is a perceived benefit

In order to answer this research question, descriptive statistics test has been conducted. The test which has been run allowed the author to be able to come up with the answer to all 4 hypotheses which were imposed previously having to run just one test. The attributes which have been tested are the following: technology in hand, possibility to use any NFC embedded reader, ease of use, high security level and control over transactions. The intention was to find out whether all mentioned attributes are perceived as benefits of NFC MPs, or not.

In order for the tested factors (attributes) to be considered as important and seen as benefits by potential or actual users, the mean per each has to be lower than 3(=neither agree nor disagree) as the scale has been from 1=strongly agree to 5=strongly disagree. First of all, easy to use system is considered to be of highest benefit as it has the lowest mean (\bar{x} =1.48). Second, having the technology in hand is highly important with the second highest mean (\bar{x} =1.67). Third place is possessed by the secure transactions factor (\bar{x} =1.68). Following, having the possibility to use the phone with any NFC embedded reader and highly controlled transaction system are both of high importance (\bar{x} =1.73 and \bar{x} =1.79 respectively).

	N	Mean	Std. Deviation
	Statistic	Statistic	Std. Error
Having the technology in hand is a benefit	100	1.67	.080
Having the possibility to use my phone with any NFC reader (payment terminal) is a benefit	100	1.73	.081

Easy to use system is a benefit	100	1.48	.076	.759
Highly secure transactions are a benefit	100	1.68	.093	.931
Highly controlled transaction system is a benefit	100	1.79	.102	1.018
Valid N (listwise)	100			

Table 12 – Analysis of perceived benefits of NFC MPs

Research Question 3: What are the perceived drawbacks of NFC MPs?

Hypothesis 1 – Low personal innovation level is an obstacle to adoption of NFC MPs;

Hypothesis 2 – High perceived risk and fees are a drawback in adoption of NFC MPs

Both hypotheses have been assessed at the same time using one sample t-test. The questions which have been assessed are: I need to be innovative to understand and use NFC mobile payment systems; I will use NFC mobile payment systems even if I believe they are risky; I will use NFC mobile payment systems even if I believe that transaction fees are high. All three research questions have been assessed on the scale from 1 to 5, where 1=strongly agree to 5=strongly disagree. Firstly, the innovation level has been assessed as it is intended to have an influence on the adoption and usage rate. As seen from the data, perceived needed innovation level to use NFC MPs is considered quite important as it is above the average 3 (=neither agree nor disagree) having the mean of 2.500. Such means that respondents generally believe that innovation level is important for adoption and usage of the systems.

In order to understand whether perceived risk and fees are important for adoption and usage rates, inverted questions have been imposed. Such means, that the higher the mean, the more important it is (controversially to the imposed scale system in the questionnaire).

It is shown by the data that perceived risk of transactions are of most importance having the mean of 4.160 followed by perceived transaction fees in the second place with the mean of 4.020. Moreover, the *p*-value is lower than 0.05 (=0.000), which makes all three attributes very significant in the research.

	One-Sample Test					
	t	df	Sig. (2-tailed)	Mean Difference	95% CI of the Difference	
				Lower	Upper	
I need to be innovative to understand and use NFC mobile payment systems.	23.196	99	.000	2.500	2.29	2.71

I will use NFC mobile payment systems even if I believe they are risky	40.697	99	.000	4.160	3.96	4.36
I will use NFC mobile payment systems even if I believe that transaction fees are high	38.857	99	.000	4.020	3.81	4.23

Table 13 - Analysis of perceived drawbacks of NFC MPs

Hypothesis 3 – Personal traits are a possible obstacle to adoption of NFC MPs

The hypothesis has had the intention of assessing the impact of personal traits on the adoption and usage rate. A linear regression has been run to test the hypothesis. The variables which have been used are: “Would you be interested in trying NFC mobile payment systems?” as dependent and personal traits attributes as independent variables.

The considered values must have a *p*-value under 0.05 in order to be of highest importance. From the model below, it can be seen that the most influential factors are “Innovative” having the *p*-value=0.024 and “Trendy” with the *p*-value=0.003. Such data means that people who perceive themselves as trendy and innovative are much more interested in trying NFC MPs. The hypothesis is proved.

	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
(Constant)	1.219	.425		2.868	.005
Honest	.010	.196	.006	.049	.961
Open-minded	-.046	.187	-.029	-.246	.807
Innovative	.375	.162	.320	2.312	.024
Curious	-.030	.160	-.025	-.186	.853
Trendy	.314	.102	.340	3.079	.003
Determined	.048	.144	.038	.336	.738

Table 14 – Influence of personal traits on adoption of NFC MPs

The ANOVA table (12) indicates that the regression model predicts the dependent variable on a significant level. The **regression row presents the significance level of 0.001**. This indicates the statistical significance of the regression model that was run. Here, the $p < 0.05$, which indicates that the regression model statistically significantly predicts the outcome variable.

ANOVA ^a						
Model	Sum of Squares	df	Mean Square	F	Sig.	
Regression	25.260	6	4.210	4.471	.001 ^b	
Residual	65.909	70	.942			
Total	91.169	76				

Table 15 – ANOVA test for influence of personal traits on adoption of NFC MPs

Research Question 4: What are the future trends of NFC MPs in Portugal according to potential users?

Hypothesis 1 – There is an existing interest on the Portuguese market for NFC MPs

One sample t-test has been run in order to see whether there is an existing interest in NFC MPs among all Portuguese respondents. The obtained score was statistically higher than the population sample normal score, $t(76)=23.203$ with $p<0.05$. It has been taken that respondents would be interested if the means of the group are below 3 and represent higher than moderate interest (as 1= extremely interested, 3= moderately, 5=not interested at all). The mean, as it can be seen is 2.896 which means that the interest is higher than moderate and proves the hypothesis of existing interest on the market of Portugal. The 95% *CI* is between 2.65 and 3.14.

One-Sample Test						
	t	df	Sig. (2-tailed)	Mean	95% CI of the Difference	
				Difference	Lower	Upper
Would you be interested in trying NFC mobile payment systems?	23.203	76	.000	2.896	2.65	3.14

Table 16 – One-sample t-test of interest on the Portuguese market for NFC MPs

Hypothesis 2 – To facilitate adoption, there is a need in increased understanding of NFC MPs by users, trust and incentives they offer; *Hypothesis 3* - To facilitate adoption, there is a need in increased advertising of NFC MPs

Assessing hypotheses dealing with the influence of increased understanding, trust, benefits and advertising which have or have not an influence on the adoption and usage rate, the following can be inferred. As the questions have been assessed on the scale from 1=least important to 5=most important, the factors with highest means are of most influence on the user. It is seen that most important factors are: I have no understanding of how it works ($\bar{x}=3.636$); I do not

see the benefits ($\bar{x} = 3.351$); I do not want outside parties to have information regarding my spending ($\bar{x} = 3.052$) which can be interpreted as lack of trust in the system. The factor of increased advertising: I have never heard of it ($\bar{x} = 2.961$) is slightly below the level of moderate importance thus leaving it out of scope of most influential factors. Moreover, scores were normally distributed and there were no outliers. Having all the significance level (p -values) $= .000$ means that there are statistically significant differences between the means of the groups.

One-Sample Test						
	t	df	Sig. (2-tailed)	Mean Difference	95% CI of the Difference	
					Lower	Upper
My phone does not support it	16.122	76	.000	2.844	2.49	3.20
I do not trust new services	17.364	76	.000	2.325	2.06	2.59
I do not trust the brand	14.709	76	.000	2.130	1.84	2.42
I have never heard of it	17.858	76	.000	2.961	2.63	3.29
I have no understanding of how it works	24.229	76	.000	3.636	3.34	3.94
No one in my social group uses it	19.382	76	.000	2.987	2.68	3.29
I do not see the benefits	21.395	76	.000	3.351	3.04	3.66
I do not want outside parties to have information regarding my spending	18.826	76	.000	3.052	2.73	3.37

Table 17 - One-sample t-test of tools to facilitate adoption

Research Question 5: Do demographics have an influence on the users’ adoption of NFC MPs?

Hypothesis 1 – Younger users are more likely to use NFC MPs

The hypothesis has had the intention of assessing whether age has an impact on the interest in adoption and usage. The variables which have been used were: willingness to use NFC payment systems as dependent and age as independent.

In order to research this hypothesis, one-way ANOVA test has been run because there was no intervention throughout the survey and no repeated questions bearing the same idea during the survey have been imposed.

The question has been assessed on the scale from 1 to 5, where 1=extremely interested and 5= not interested. To consider existing interest amongst the age groups, it is taken that means higher than 3(=moderately interested) are representatives of existing interest from a specific age group. In the presented case, it is clearly seen that the group of people who would be most interested in trying NFC payment systems are those aged between 21 and 25 having the lowest mean of 2.67. The second group with high interest its 36-40 with the second highest mean of 2.80. Third place is possessed by the youngest age group of those under 21 with the mean of 2.92.

The mentioned age categories 21-25 and 36-40 are represented by N=36 and N=5 respectively. As the age samples are small, and significance is hard to obtain, the between groups difference is insignificant as p -level =0.449. In order for the difference to be significant, p -level would have to be lower than ($<$) 0.05.

	N	Mean	Std.	95% CI for Mean				
			Deviation	Std. Error	Lower Bound	Upper Bound	Minimum	Maximum
Under 21	12	2.92	.900	.260	2.34	3.49	2	5
21-25	36	2.67	1.042	.174	2.31	3.02	1	4
26-30	15	3.13	1.407	.363	2.35	3.91	1	5
31-35	5	3.60	.894	.400	2.49	4.71	3	5
36-40	5	2.80	.837	.374	1.76	3.84	2	4
Over 40	4	3.25	1.258	.629	1.25	5.25	2	5
Total	77	2.90	1.095	.125	2.65	3.14	1	5

Table 18 – Descriptive statistics for age groups’ willingness to use NFC MPs

ANOVA					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	5.769	5	1.154	.959	.449
Within Groups	85.400	71	1.203		
Total	91.169	76			

Table 19 – ANOVA test for age groups’ willingness to use NFC MPs

Chapter 5: Conclusions and future research

5.1 Conclusion

This study has sought to research and understand the current perceptions on Near Field Communication mobile payment systems (NFC MPs) of Portuguese potential and active users. NFC MPs, being a new concept introduced just in 2015, has not gained much popularity in Portugal and is not widely used even though it is a system compatible with any NFC embedded reader such as wireless payment terminals. The general idea of NFC MPs is to give users an opportunity to enhance their payment experience by offering much faster, easier and convenient payment method – payments with a credit or debit card embedded through an application into the phone. On top of the mentioned benefits there are also security, none or very low transaction fees and low transaction risks. The study has been carried out referring to Apple Pay, Samsung Pay and Google Pay, as these are the most common and most used NFC MPs in the world.

As NFC MPs are a new service in the world, the first one of five objectives was to understand the main factors which affect the adoption and usage rate by the target audience. As the research has shown, perceived compatibility with the existing payment system has no affect. That is explained by the fact that Portuguese users are aware in most cases that their phones support NFC MPs, but do not use them.

Users attitude does have an effect on the adoption. Users value convenience of the system they are using a lot. On the other hand, ease of use is of much lower importance, almost next to none. Subjective norms which are presented in the form of social pressure (influence from the side of the society) have no influence at the adoption and usage rates. Perceived behavioral control which has been presented by high control over transactions and security of transactions has an impact on the adoption rate only in terms of high controlled transactions. Such means that currently, actual and potential users care much more about high control over their transactions, than actual security level.

The second objective of the research was to find out what are the perceived benefits of NFC MPs. The tested factors where: technology in hand, possibility to use any NFC embedded reader, ease of use of the system, high security level and control over transactions. As the research has shown, all 5 factors were considered as benefits are of high importance. Most important was the ease of use, followed by technology in hand. In third place was possessed by secure transactions. Compatibility with any NFC embedded reader and highly controlled transactions were fourth and fifth by importance.

The third objective was to find out what are the perceived drawbacks of NFC MPs. Lu et al. (2011) in their research have highlighted the most important factors, which have been used as the basis. The following have been tested: personal innovation level, perceived risks and perceived fees. As the results have proved, personal innovation level is considered to be of high importance as it can be an obstacle in adoption, if users are not innovative and cannot understand the system. High perceived fees and high perceived risks are both major drawbacks. Such can be explained by the fact that those users who are not aware of the functionality behind the system will believe that the system is either very unreliable (risky) or will cost a lot to use (high fees).

The fourth objective had the intention of understanding whether NFC MPs have a future on the Portuguese market, according to the respondents. First of all, the research has shown that there is an existing interest on the market throughout potential users. Nevertheless, in order to facilitate the existing interest and increase the adoption rate, companies-providers of handsets with NFC chips have to deal with some personal issues their target audience might have. There is a high need in increased explanation over the idea of NFC MPs, as the research shows that potential users do not understand the system. On top of that, potential users have to be aware of the benefits such as speed, ease of use, security. And as the research showed, the awareness of benefits is very low.

Last but not least, the fifth objective was supposed to show whether demographics such as age have an influence on the adoption and usage. The research has shown that younger age groups are more willing to try NFC MPs. The group with highest interest was those between 21 and 25. Interestingly, group between 36 and 40 have shown the second highest interest. Nevertheless, it is possible to conclude that the highest interest to NFC MPs exists in the age groups below 25.

Concluding all the findings, it can be stated that Portugal is a market willing to adopt NFC MPs. There is general need of creating higher awareness within the target audience which is those below 25 and partially between 36 and 40. NFC MP providers need to increase the perception of benefits and understanding of functionality by their prospected users.

5.2 Limitations and future research

One of the main limitations which has to be taken into account is the small pool of respondents. The current research has been carried out next to 100 Portuguese with the age categories skewed to the young generation (48% is under the age of 25). It is important to consider this, as the actual active and potential users of NFC MPs are those, who are employed and have the opportunity to independently consider the payment methods they want to use and have the financial means to do so.

Another limitation which should be considered is that the author of the research is not Portuguese and does not have perfect knowledge of the language. Such might compromise, in a way, the initial data gathering process in the form of qualitative analysis. Miscommunication might have occurred throughout the held interviews which could have led to lower understanding of the topic by the respondents.

In terms of the future research, the following is advised: an in-depth study next to a much larger pool of respondents. An important aspect is to have a wider sample of active users of NFC MPs. The presented research has a pool of only 23% active users versus 77% non-users. Ideally, the distribution would be 50% users versus 50% non-users in a much bigger sample of respondents in order to get a much clearer understanding of perceived benefits and drawbacks of the innovative payment system. Such information will give the opportunity for future research and more importantly for the implementation of future payment services or reinvention of strategies of current NFC MP providers.

On top of that, it is important to research how retailers and wholesalers perceive such payment systems. As the NFC embedded readers are already present in every store, in the form of a wireless payment terminal, it is still unclear why there is such low awareness of NFC MPs.

Last but not least, an important aspect which has to be studied is the banking system of Portugal. The in-depth study will provide reliable information regarding the future possibilities of NFC MPs on the market, benefits and drawbacks of the systems from the banking perspective.

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Appendices

Appendix 1 – Interview questionnaire

1. What is your name?
2. How old are you?
3. What is your gender?
4. Where do you reside?
5. How often do you spend money?
6. What is your preferred type of payment? Why this one?
7. Have you ever used a mobile payment system/application?
8. Why yes/no? Do you believe it is secure/not secure, easy to use/not easy, you want to be perceived as an innovator?
9. What phone (brand/model) are you currently using? Why exactly this one but not a different brand/model?
10. Do you know what is NFC MP? Could you name the ones you know?
11. Do you know how does NFC MP work?
12. Do you know if your phone supports NFC MP?
13. If your phone would support NFC MP, would you try using it? / Do you use your NFC MP?
14. Why do you use it/not use it? What do you find beneficial/unfavorable? (identification of personal traits/fears/intentions etc. by guidance through phrasing and using specific words)
15. Do you believe that there is a place in the future for payment systems which require just an element of technology (e.g. phone/watch) next to the user? Do you think NFC payment systems have a future amongst those?

Appendix 2 – Survey questionnaire

Dear Participant,

The survey you are about to take has been created within the scope of the final step of the Masters program at Catolica-Lisbon School of Business and Economics - masters dissertation.

Please keep in mind that there are no wrong and right answers to the questions.

The survey will take you about 10 minutes to complete. Please, be as honest as possible.

Thank you very much for your interest and collaboration!

Alex Kozachenko

Section 1 – General purchasing habits

1. How often do you spend money?
 - Every day
 - 3-4 times a week
 - Once a week
 - Less than once a week
2. What is your most preferred payment method?
 - Cash
 - Card
 - Mobile application
 - Online payments
3. Please rate (scale 1-5) the following attributes when it comes to payment method you chose:

	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree
Easy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Secure	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fast	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Convenient	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Trustworthy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Risk-free	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

4. Do you use mobile payment applications?
 - Yes, I do
 - No, I don't
5. Why do you use mobile payment applications? (you can choose multiple)

	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree
Its convenient	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Its fast	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Its simple to use	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Its secure	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
They make me feel trendy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

6. Why do you not use mobile payment applications? (you can choose multiple)

	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree
I don't trust them	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I don't feel the need	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I just don't like the phone payments	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I do not understand how they work	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am not aware of them	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Section 2 – Current handset

7. What phone brand are you currently using?

- Apple
- Samsung
- Huawei
- Xiaomi
- Sony
- Other: _____

8. How old is your phone?

- Less than 1 year
- 1-2 years
- 2-3 years
- 3-4 years
- Over 4 years

9. Why do you have this phone?

- I have received it as a present from someone
- I have received it from my company
- I bought it because I am brand loyal

- I bought it because I want to have the most innovative phone on the market
- I bought it because I want to be seen by others as fashionable
- It was on a discount in the store
- I don't care about the phone as long as I can call and text, so I chose the cheapest one

Section 3 – NFC MP questions set

10. How would you rate your level of interest in new emerging technologies? (where 1 = Not interested at all; 5 = Interested a lot)

1	2	3	4	5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

11. How would you rate yourself in terms of new technology adoption and usage? (where 1 = Not involved at all; 5 = Involved a lot)

1	2	3	4	5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

12. How would you rate your knowledge of Near Field Communication (NFC) mobile payment systems?

	1	2	3	4	5
General concept of NFC	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Functionality understanding	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Near Filed Communication (NFC) mobile payment systems are applications issued with the phone which operate with an NFC chip already pre-installed in the phone. The phone chip connects to the payment terminal via radio waves used to transmit information (e.g. make a payment).

13. Now that you have seen the explanation of NFC mobile payment systems, do you think/know if your phone supports NFC payments?

Definitely yes	Probably yes	Might or might not	Probably not	Definitely not
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

14. How would you rate your knowledge of Apple Pay, Samsung Pay and/or Google Pay?

A great deal	A lot	A moderate amount	A little	None at all
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○	○	○	○	○
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15. Have you ever used Apple Pay, Samsung Pay and/or Google Pay?

- Yes
- No

16. Please, rate the following reasons to start using Apple Pay, Samsung Pay and/or Google Pay. (1 = least important; 5 = most important)

	1	2	3	4	5
I was curious to try a new service offered by my phone	○	○	○	○	○
I like to follow new trends	○	○	○	○	○
I want to be part of my social group that uses it	○	○	○	○	○
I wanted a more secure payment service	○	○	○	○	○
I wanted a faster payment method	○	○	○	○	○

17. How often are you using NFC mobile payment systems nowadays? (where 1 = Never; 5 = Every time I pay)

1	2	3	4	5
○	○	○	○	○

18. Please, rate the statements regarding why have you not tried using Apple Pay, Samsung Pay and/or Google Pay. (1 = Least important; 5 = Most important)

	1	2	3	4	5
I do not trust new services	○	○	○	○	○
I do not trust the brand	○	○	○	○	○
I have never heard of it	○	○	○	○	○
I have no understanding of how it works	○	○	○	○	○
No one in my social group uses it	○	○	○	○	○
I do not see its benefits	○	○	○	○	○
I do not want outside parties to have information regarding my spending	○	○	○	○	○

19. Would you be interested in trying NFC mobile payment systems?

Extremely interested	Very interested	Moderately interested	Slightly interested	Not interested at all
○	○	○	○	○

20. How would you rate the following attributes of NFC mobile payment systems?

Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree

Secure transactions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Easy to use	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Convenient	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Trustworthy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Risky	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
High transaction fees	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
High control over transactions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

21. How would you rate the following attributes regarding the possibility to use NFC mobile payment systems?

	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree
Having the technology in hand and always with you is a benefit	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Having the possibility to use my phone with any NFC reader (payment terminal) is a benefit	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Easy to use system is a benefit	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Highly secure transactions are a benefit	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Highly controlled transaction system is a benefit	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

22. Please rate the following statements regarding personal traits:

	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree
I need to be innovative to understand and use NFC MPs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I will use NFC MPs even if I believe that they are risky	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I will use NFC MPs even if I believe that transaction fees are high	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Section 4 – Future trends of NFC MPs

23. How much do you agree with the following statement?

NFC mobile payment systems will prevail other payment methods in the future.

Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree
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<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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24. Please, rate which of the following best relate to your reason to think NFC mobile payment systems will prevail? (where 1 = Least important; 5 = Most important)

	1	2	3	4	5
Technology evolves	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
People want to have effortless solutions to their issues	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
People are conservative	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
There is a need on the market	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It is a general tendency in which NFC MPs will prevail over other payment methods	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Section 5 – Demographics

25. What is your age?

- Under 21
- 21-25
- 26-30
- 31-35
- 36-40
- Over 40

26. What is your gender?

- Male
- Female

27. What is your occupation?

- Student
- Part-time employed
- Part-time employed and part-time student
- Employed
- Unemployed
- Retired

28. What is your level of education?

- High school
- Bachelor
- Post-Graduation
- Master
- PhD

29. What is your monthly income?

- below 500 per month
- between 500 and 1000 per month
- between 1000 and 1500 per month
- over 1500 per month

30. How would you rate the following attributes regarding yourself?

	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree
Honest	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Open-minded	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Innovative	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Curious	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Trendy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Determined	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

31. Where do you reside?

- Portugal
- Other: _____