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Article

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An empirical investigation on University students' perceptions toward contactless card adoption and use for financial transactions

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Abstract
Economic crisis and bailout period have greatly changed almost every single aspect of the country. Greeks were violently forced to alter their daily habits. Regarding their payment practices, capital controls and cash withdrawal limits have forced them to cashless financial transactions. Thus, the purpose of this research paper is to investigate individuals' perceptions toward the adoption and use of contactless cards for face-to-face monetary transactions focusing on University students. This type of payment method is based on the Near Field Communication (NFC) technology and has already provided to the cards from the world's largest companies in financial services and payment systems, such as Visa and MasterCard in the last years. Additionally, the differences between adopters and non-adopters of contactless cards are examined, as well as the characteristics and preferences of the individuals who utilize them for their daily purchases. The results are expected to provide both academia and the industry a holistic view of Greeks' perceptions toward NFC cards payments.

Keywords: contactless cards, NFC, perceptions, financial transactions, adoption, use

JEL classifications: M30, M390

Introduction

Since last decade, the wide use of cards as a regular payment method for face-to-face purchases is a fact. A considerable number of consumers choose them in their daily transactions worldwide, especially in the developed countries. For example, in the USA there was a 61.7% increase in the credit cards' purchase volume (Statista, 2016) in 2010-2016 period and almost half of all transactions were conducted by cards in 2016 in Europe (European Central Bank, 2017). However, in the developing world, as well as some developed countries, individuals still continue to use the traditional payment method; that is cash, for the vast majority of their financial transactions.

Regarding Greece, one of the vital changes that have taken place as a result of the economic crisis and the bailout period was the great change in individuals' payment methods. Capital controls and cash withdrawal limits have forced Greek to greatly change their payment practices. In particular, according to Euro2day (2017), Greeks used cards for the 7.5% of their buys before capital control period,

whereas by the end of 2017 almost the 18% of their purchases were paid by cards; and estimations mentioned that even more are expected to adopt them in the near future. Even elderly people who had never thought of paying other than cash, got used to this harsh change of their payment practices. Furthermore, the results of the European Central Bank (2017) showed that there was a 13.5% increase in the total number of transactions by cards in a 12 month period in Greece (2015-2016).

At the same time, Near Field Communication (NFC) technology has started to be integrated in monetary cards. The world's largest companies in financial services, cards and payment systems, such as Visa and MasterCard, have already provided NFC technology to their cards in the last years. NFC is "a wireless communication technology that enables transfer of data over distances of up to 10 cm by combining technologies from Radio-Frequency IDentification (RFID) and contactless smart cards" (Madlmayr, 2008, p. 563). Therefore, individuals can conduct contactless financial transactions much faster with considerable improvements in efficiency and effectiveness. According to Euro2day (2017), more than 10% of the total number of transactions was conducted by contactless cards in 2016 in Greece (Euro2day, 2017). This considerable volume of transactions depicts that Greeks seem to be positive to take advantage of the NFC technology in their daily financial transactions.

Thus, in order to obtain a thorough standpoint of Greeks' perceptions toward contactless cards, the present paper aims to investigate adopter and non-adopters insights regarding this method of payment focusing on University students. It is the first part of an ongoing study on this research area. The results are expected to provide vital information to both academia and the industry. It is worth mentioning that adopters are individuals who have used contactless cards for monetary transactions before, whereas non-adopters are individuals who have never utilized them.

The rest of the paper is organized as follows. In the next session the literature review is presented. This is followed by the applied research methodology and the results of the empirical study. The last section concludes with a discussion commenting on the data gathered and recommends some ideas for possible future research directions.

Literature review

As far as it is concerned, various studies have examined contactless cards acceptance and further use. The vast majority of them have focused on their adoption stage and their impact on individuals' daily routine. For example, Dutot (2015), Leong et al. (2013) and Tan et al. (2014) provided the factors that influence contactless card behavioral intention. Similarly, Pal et al. (2015) and Ramos-de-Luna et al. (2016) examined the determinants of the NFC payment system intention. According to the aforementioned literature review, some of the basic characteristics of contactless card use are: convenience, ease of use, usefulness and compatibility.

Particularly, **convenience** is defined as "the degree which an individual believes that paying by a contactless card generates time and place utility, without being complicated as well". Convenience has been greatly examined in the marketing and consumer behavior

literature (e.g., Jih, 2007; Ng-Kruelle et al., 2002). According to Clarke (2001), convenience is highly connected to the elements producing time and place utility for users. Thus, in the NFC technological scientific field, it is considered as one of the most important factors for its success (Xu & Gutierrez, 2006).

Ease of use is generally defined as "the extent to which using a new idea, technology, or innovation is expected to be relatively free of physical, emotional, or psychological efforts for prospective adopters, thus, enabling them to improve their job-task outcomes" (Phonthanukitithaworn et al., 2016). Teo et al. (1999) mentioned that when an information system is believed to be less complex to be utilized, the rate of such technology to be accepted will be higher. Moreover, several researchers argued that perceived ease of use is not only considered as a key factor for the adoption of a technology, but it impacts on the long-term use of it as well (e.g., Guriting & Ndubis, 2006; Ramayah, 2006). Dutot (2015) and Wei-Han Tan et al. (2014) proved the positive effect of perceived ease of use on the contactless card adoption.

In the context of NFC technology, **usefulness** refers to "the degree which an individual believes that paying by a contactless card would enhance his/ her job performance". According to Diffusion of Innovation (DOI) theory, users are only willing to accept innovations if those innovations provide a unique advantage compared to existing solutions (Rogers, 2003). With regards to contactless technology, Dutot (2015) and Ramos-de-Luna et al. (2016) proved the positive influence of perceived usefulness on NFC payment systems' use, and Wei-Han Tan et al. (2014) its positive impact on contactless credit cards utilization.

Compatibility refers to "the extent to which an individual believes that contactless card utilization fits with his/her lifestyle and the way he/ she likes to manage his/ her finances and pay his/ her purchases". Chen (2008) claimed that m-payment services are likely to be highly desirable when people find that using such services is compatible with their lifestyle and social image. Thus, compatibility is aligned with user's intrinsic characteristics, such as characteristics that generally reflect an individual's social image and requirements, personal values, lifestyle, beliefs, and experiences (Rogers, 2003). In the context of NFC payment services, Lu et al. (2011), Phonthanukitithaworn et al. (2016) and Ruangkanjanases & Sirikulprasert (2018) confirmed that compatibility impacts on their adoption. Furthermore, Yang et al. (2012) and Phonthanukitithaworn et al. (2016) verified that compatibility impacts both current and potential m-payment individuals' intention to adopt relevant services.

Apart from the aforementioned characteristics, there have also been some others that can impact on the adoption and further use of this method of financial transactions. For example, **trust** is defined as "the degree which an individual believes that contactless card payments along with their related mechanisms offer a confidential procedure, and the entities involved in the contactless process are trustworthy as well". As far as it is concerned, numerous researchers have already investigated the key role of trust in using an innovation. According to Meharia (2012) and Ming-Hsien et al. (2009), trust plays a vital role not only on individual's behavioral intention but his/ her actual behavior as well.

Furthermore **security**, which refers to "the degree which an individual perceives that contactless card payment systems provide secure mechanisms for conducting monetary transactions and sending/ receiving data". It is obvious that it is extremely important for every firm to launch mechanisms for their e-payment methods with the aim to ensure the security of customer transactions and generate confidence, thus, improving attitudes toward them (Ramos-de-Luna et al., 2016). In the mobile security field, conceptualized as the likelihood of privacy intrusion -personal data, financial data, etc.- or interception, security has been confirmed to be a key concern among individuals (Lwin et al., 2007). Therefore, it is believed that the higher the sense of perceived security among individuals the higher the chances them to adopt and use contactless cards.

Moreover **social influence**, which in the examined scientific field, refers to "the degree which an individual believes that his/ her relatives and friends can affect his/ her contactless card use". In general, social influence refers to the level an individual perceives that significant others, such as friends or relatives, believe that he/ she should adopt a technological innovation (Fishbein & Ajzen, 1975). The fundamental hypothesis is that people tend to interact with their social interactions for consultation and for diminishing their concerns which arise due to uncertainty from adopting and using an innovation (Karahanna et al., 1999).

Finally, **anxiety** which is defined as "the degree which an individual believes that paying by a contactless card makes him/ her feel nervous, uncomfortable or even scared". Hence, according to Faqih and Jaradat (2015), anxiety is a nasty emotional state characterized by feelings of tension and fear, thus, an increased anxiety toward technological innovations will lead to less favorable perceptions of the technology adoption and acceptance. Thus, it is believed that the higher the perceived anxiety of an individual the lower the contactless card adoption and use rates.

Based on the aforementioned extended literature review, the provided characteristics of contactless cards are about to be investigated. Their examination is expected to provide useful hints regarding University students' perceptions toward this financial transaction payment method.

Research methodology and results

To study consumers' perceptions toward contactless cards use, a self-designed electronic questionnaire was developed and administered from March to May 2018 to Greek students of the Western Macedonia University of Applied Sciences. The selection of University student respondents for primary research has been successfully used in many studies (e.g., Saprikis, 2013; Shead et al., 2012). Prior distribution, the questionnaire was reviewed by two academicians. A pilot study of thirty three responses helped to identify possible problems in terms of clarity and accuracy. Thus, feedback from the pilot testing was very useful in refining the questionnaire. In the data collection process, seventeen participants gave incomplete answers and were dropped from the analysis. As a result, the final sample consisted of 202 adopters and 89 non-adopters of contactless cards. The demographic characteristics of the respondents are presented in Table 1.

Apart from demographic characteristics and contactless card preferences (adopters only) questions, each questionnaire item was measured based on a 5-point Likert scale. Additionally, all items were designed on the basis of the aforementioned comprehensive literature review and prior empirical studies approved for their validity and reliability, but modified to fit the context of the study. Details of the scales are provided in Table 2.

Regarding the data analysis techniques, the research is primarily descriptive in nature. Thus, apart from descriptive statistics that used to describe the demographic characteristics of the sample and adopters' preferences, the Mann-Whitney non-parametric test was selected and applied to statistically compare the perceptions of Greek University students toward contactless card utilization. This test was preferred instead of the t-test parametric test and Analysis of Variance (ANOVA) because the data of the study were not normally distributed.

Table 1: Demographics of the sample

Demographic Characteristics	Adopters	Non-Adopters
Sex:		
Male	94	55
Female	108	34
Age:		
18-24	182	85
25-34	15	4
35-44	3	0
>54	2	0
Place of stay:		
City	42	18
Town	29	11
Small town	100	44
Village/ Countryside	31	16

Table 2: The operational definition of research variables

Research variables	Operational definition
Convenience	CONV1: I think paying by contactless cards is convenient because it is usually with me
	CONV2: I think paying by contactless cards is convenient because I can use it anytime
	CONV3: I think paying by contactless cards is convenient because I can use it in any situation
Perceived Ease of Use	PEOU1: I think paying by contactless cards is easy
	PEOU2: I think learning to pay by contactless cards is easy
Trust	TR1: I trust contactless card payment procedure
	TR2: I trust involved parties in a contactless card payment
Perceived Usefulness	PU1: I think you save time when you buy via

	contactless cards
	PU2: I believe that paying by contactless cards will enhance my effectiveness
	PU3: I believe that paying by contactless cards will enhance my efficiency
Compatibility	COMP1: I believe that using contactless cards fits well with the way that I like to conduct my payment transactions
	COMP2: I believe that paying by contactless cards fits well with the way I like to manage my finances
	COMP3: I believe that paying by contactless cards fits well with my lifestyle
Security	SEC1: I believe contactless card payment systems are secure to send and receive data/ information
	SEC2: I feel secure to pay by contactless cards
Social Influence	SI1: I will pay by contactless cards if my friends and relatives use them
	SI2: People who can influence my behavior believe that I should pay by contactless cards
Anxiety	ANX1: Using contactless cards to pay makes me feel nervous
	ANX2: Using contactless cards to pay makes me feel uncomfortable
	ANX3: I feel unrest about using contactless cards to shop online

Adopters' preferences regarding contactless cards' utilization

Both males and females preferred to use contactless cards in quite the same products and services (Table 3). Supermarkets and shoes & clothing stores topped the list, followed by mini markets & kiosks and coffee stores, bars & restaurants (Table 3). However, male adopters utilized them in a great extent in gas stations (47.9%) as well. Additionally, based on survey's results, male adopters used it in a broader variety of provided products and services than females. Regarding the preferable contactless card type, almost 3 out of 4 used debit cards and about 1 out of 10 preferred to pay by credit card or used both debit and credit cards as well (Table 4). Concerning the amount of money per purchase that contactless cards were utilized, both male and female adopters take advantage of them to purchases up to 25€ (~69%) to almost the same extent, where PIN (Personal Identification Number) is not required in the POS (Point-Of-Sale) terminals. Furthermore, a considerable number of them, especially males (50%), also used them in buys ranged from 25€ up to 100€ (Table 5). Regarding the frequency of contactless card use, a considerable percentage of respondents used them almost daily and a large number of them quite often (Table 6). The acceptance of University students to this quite new method of card payment is really promising in Greece. It goes without saying that individuals at this age group are regarded as pioneers in the adoption of new ICT devices and applications. Therefore, financial institutions, enterprises and large companies in financial services, cards and payment systems, such as Visa and MasterCard strongly based their future investments on contactless technological solutions in young adults' attitude toward relevant services provided.

Table 3: Types of preferred products and services for contactless card use

Types of products/ services	Male	Female
Supermarkets	85 (90.4%)	100 (92.6%)
Coffee, bars and restaurants	32 (34.0%)	31 (28.7%)
Hotels	19 (20.2%)	17 (15.7%)
Shoes and clothing	54 (57.4%)	76 (70.4%)
Gas stations	45 (47.9%)	20 (18.5%)
Mini markets and kiosks	40 (42.6%)	41 (40.0%)
Home equipment	22 (23.4%)	19 (17.6%)
Other	21 (22.3%)	18 (16.7%)

Table 4: Type of preferred contactless card

Type of preferred contactless card	Male	Female
Debit card	70 (74.5%)	82 (75.9%)
Credit card	11 (11.7%)	14 (13.0%)
Debit and credit cards	13 (13.8%)	12 (11.1%)

Table 5: Amount of money per purchase where contactless card is used (multiple choice question)

Amount of money/ purchase (in €)	Male	Female
<=25€	64 (68.1%)	75 (69.4%)
26€-100€	47 (50.0%)	39 (36.1%)
>100€	17 (18.1%)	15 (13.9%)

Table 6: Frequency of contactless card use

Frequency	Male	Female
Every day	18 (19.0%)	11 (10.2%)
2-3 times a week	26 (27.7%)	35 (32.4%)
Once a week	17 (18.2%)	22 (20.4%)
One time every two weeks	13 (13.8%)	21 (19.4%)
Once a month	20 (21.3%)	19 (17.6%)

Gender perceptions toward contactless card use

Male and female University students' perceptions toward contactless card use were examined for possible differences between each other. Overall, the results showed that female students perceived the

benefits of the contactless card monetary transactions to a greater extent than males (Table 7). In specific, there is a statistically significant difference in the sense of convenience as it was believed that there is a great advantage to having a contactless card with you, as well as learning how to use it. Females believed that it is much easier to understand how contactless cards operate compared to males. Moreover, the advantage of saving time was believed to be a great benefit of contactless cards and females perceived it to a greater extent. Furthermore, females mentioned that this way of paying for their purchases fitted well with the way that they liked to conduct their payment transactions and it is much more compatible to them than male respondents.

On the other hand, males perceived that social influences play a vital role in using contactless cards for financial transactions. In particular, they mentioned that friends and relatives opinions do matter a lot to them. Furthermore, they were much more concerned about contactless card monetary transactions compared to females. As a results, all examined questionnaire items related to social influences and anxiety revealed statistically significant differences between the two groups.

Table 7: Males versus females' perceptions regarding contactless card use - Mann-Whitney test results

Questionnaire items	Gender	Mean rank	Mann-Whitney U	Asymp. Sig. (2-tailed)
CONV1: I think paying by contactless cards is convenient because it is usually with me	Male Female	135.68 156.83	9041.500	0.023
CONV2: I think paying by contactless cards is convenient because I can use it anytime	Male Female	140.56 151.71	9768.500	0.227
CONV3: I think paying by contactless cards is convenient because I can use it in any situation	Male Female	145.90 146.11	10564.000	0.983
PEOU1: I think paying by contactless cards is easy	Male Female	142.44 149.74	10048.500	0.419
PEOU2: I think learning to pay by contactless cards is easy	Male Female	137.34 155.09	9288.000	0.035
TR1: I trust contactless card payment procedure	Male Female	147.82 144.09	10307.500	0.692
TR2: I trust involved parties in a contactless card payment	Male Female	147.78 144.14	10314.500	0.700
PU1: I think you save time when you buy via contactless cards	Male Female	132.09 160.59	8507.000	0.002
PU2: I believe that paying by contactless cards will enhance my effectiveness	Male Female	137.17 155.26	9263.500	0.056
PU3: I believe that paying	Male	137.48	9309.000	0.066

by contactless cards will enhance my efficiency	Female	154.94		
COMP1: I believe that using contactless cards fits well with the way that I like to conduct my payment transactions	Male Female	136.64 155.82	9184.500	0.043
COMP2: I believe that paying by contactless cards fits well with the way I like to manage my finances	Male Female	136.89 155.56	9222.000	0.060
COMP3: I believe that paying by contactless cards fits well with my lifestyle	Male Female	140.77 151.49	9800.000	0.259
SEC1: I believe contactless card payment systems are secure to send and receive data/ information	Male Female	144.44 147.64	10346.500	0.733
SEC2: I feel secure to pay by contactless cards	Male Female	146.27 145.72	10539.500	0.954
SI1: I will pay by contactless cards if my friends and relatives use them	Male Female	157.73 133.69	8831.500	0.011
SI2: People who can influence my behavior believe that I should pay by contactless cards	Male Female	157.18 134.27	8913.500	0.015
ANX1: Using contactless cards to pay makes me feel nervous	Male Female	158.33 133.06	8741.500	0.007
ANX2: Using contactless cards to pay makes me feel uncomfortable	Male Female	158.13 133.27	8771.500	0.007
ANX3: I feel unrest about using contactless cards to shop online	Male Female	155.78 135.74	9041.500	0.036

Adopters' versus non-adopters' perceptions toward contactless card use

With the exception of social influence measurement items, all questions did reveal statistically significant difference between adopters and non-adopters regarding their perceptions toward contactless card use (Table 8). It goes without saying that adopters felt less anxious and more secured to take advantage of the NFC technology, therefore, it seems to trust it much more compared to non-adopters. Moreover, they perceived to a greater extent the usefulness, the easiness and the convenience of this payment method; and they believed that contactless cards fitted well with the way they liked to manage their finances and lifestyle. The aforementioned results came as no surprise. People who have paid by contactless cards can definitely perceive their benefits. On the other hand, individuals who had never used them before were much more sceptical and could not realize the advantages of their utilization. The fact that friends and relatives impact was the same between examined groups might be attributed to the fact that daily contactless financial transactions in various POS terminals is a common situation for every individual;

no matter if he/ she use contactless technology or not. Thus, his/ her active or passive involvement in such transactions makes him/her have a thorough viewpoint which cannot be greatly influenced by friends and family opinion.

Table 8: Adopters versus non-adopters contactless card use perceptions - Mann-Whitney test results

Questionnaire items	Contactless Card use	Mean rank	Mann-Whitney U	Asymp. Sig. (2-tailed)
CONV1: I think paying by contactless cards is convenient because it is usually with me	Adopters Non-Adopters	166.82 98.74	4782.500	0.000
CONV2: I think paying by contactless cards is convenient because I can use it anytime	Adopters Non-Adopters	162.31 109.98	5694.500	0.000
CONV3: I think paying by contactless cards is convenient because I can use it in any situation	Adopters Non-Adopters	159.81 114.65	6199.000	0.000
PEOU1: I think paying by contactless cards is easy	Adopters Non-Adopters	164.83 103.26	5185.500	0.000
PEOU2: I think learning to pay by contactless cards is easy	Adopters Non-Adopters	159.15 116.16	6333.500	0.000
TR1: I trust contactless card payment procedure	Adopters Non-Adopters	164.05 105.04	5343.500	0.000
TR2: I trust involved parties in a contactless card payment	Adopters Non-Adopters	156.12 123.03	6944.500	0.001
PU1: I think you save time when you buy via contactless cards	Adopters Non-Adopters	160.41 113.30	6079.000	0.000
PU2: I believe that paying by contactless cards will enhance my effectiveness	Adopters Non-Adopters	160.56 112.94	6047.000	0.000
PU3: I believe that paying by contactless cards will enhance my efficiency	Adopters Non-Adopters	157.94 118.90	6577.000	0.000
COMP1: I believe that using contactless cards fits well with the way that I like to conduct my payment transactions	Adopters Non-Adopters	164.86 103.20	5180.000	0.000
COMP2: I believe that paying by contactless cards fits well with the way I like to manage my finances	Adopters Non-Adopters	164.93 103.04	5165.500	0.000
COMP3: I believe that paying by contactless cards fits well with my lifestyle	Adopters Non-Adopters	162.09 109.48	5738.500	0.000
SEC1: I believe contactless card payment systems are secure to send and receive	Adopters Non-Adopters	155.86 123.62	6997.500	0.002

data/ information				
SEC2: I feel secure to pay by contactless cards	Adopters Non-Adopters	162.37 108.85	5682.500	0.000
SI1: I will pay by contactless cards if my friends and relatives use them	Adopters Non-Adopters	145.65 146.79	8919.000	0.912
SI2: People who can influence my behavior believe that I should pay by contactless cards	Adopters Non-Adopters	146.04 145.92	8981.500	0.991
ANX1: Using contactless cards to pay makes me feel nervous	Adopters Non-Adopters	133.23 174.98	6410.000	0.000
ANX2: Using contactless cards to pay makes me feel uncomfortable	Adopters Non-Adopters	131.27 179.44	6013.000	0.000
ANX3: I feel unrest about using contactless cards to shop online	Adopters Non-Adopters	130.55 181.07	5868.000	0.000

Conclusions and suggestions for future research

The scope of this paper is to examine University student perceptions' toward the adoption and use of contactless cards for face-to-face financial transactions. The fact that Greeks almost violently were forced to cashless transactions because of capital controls and cash withdrawal limits has revealed an area of further study. Changing your usual practices is not easy especially in a country where the adoption of new technological solutions has not greatly appreciated so far. Therefore, this empirical study is the first part of an ongoing investigation that aims to shed light on this really promising payment method.

In specific, the fact that almost 70% of the sample has used NFC cards shows their dynamics and potential ability. Females seem to be more acceptable to them (76.1%), thus, it came as no surprise that they perceived the benefits of the contactless card for monetary transactions to a greater extent than males. On the other hand, the statistically significant influence of males from their friends and family to adoption or not contactless cards is a quite important piece of information; and it definitely needs further investigation with the aim to reveal possible underlying influential factors.

Moreover, the results show that University students use this type of cards for a wide variety of products and services. Additionally, they utilize them not only for small amount of money purchases when PIN is not required, but also for transactions greater than 25€. Thus, NFC technology seems to be considerably acceptable. The research also proved that adopters do realize the benefits of NFC technology to a much greater extent than non-adopters. These results came as no surprise. Individuals who have used them before have perceived the advantages that this payment method can offer them. Therefore, they are not so concerned and felt more secured about them. They also perceive the usefulness, the easiness and the convenience of this payment method to a greater extent; and they believed that contactless cards are trusted and fitted well their daily routine and habits.

On the other side, despite the fact that the aforementioned results provide meaningful implications the research can be further improved by overtaking some important limitations. First, only simply statistics were applied; namely descriptive statistics and the Mann-Whitney non-parametric test. Second, the study was limited to the examination of eight basic characteristics. It is expected that a couple of others might impact on NFC cards adoption and use as well. Third, it is to be emphasized that these findings are limited to a sample of students from a specific University. Therefore, similar studies could be conducted in other higher education institutions in the country in order to have a thorough understanding of Greek University students' perceptions toward contactless cards. Moreover, considering a large and representative sample of the total population of the country could definitely give a more accurate view; and increase the validity of the study. For example, a sample based on the Hellenic Statistical Authority would definitely provide much more significant outcome regarding Greeks perceptions toward contactless card adoption and use for their daily financial transactions.

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