DEVELOPMENT OF A TECHNOLOGY ACCEPTANCE MODEL FOR MOBILE PAYMENT SYSTEMS

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ABSTRACT

DEVELOPMENT OF A TECHNOLOGY ACCEPTANCE MODEL
FOR MOBILE PAYMENT SYSTEMS

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This thesis aims to develop a technology adoption model by inspecting acceptance of mobile payment (MP) systems literature from different perspectives. This study can be divided into two main parts. In the first part of the thesis, acceptance of mobile payment systems is examined in detail. In the second part, a technology acceptance model is developed by using the findings of literature. Related literature is reviewed from 2005 to end of March 2018. Literature review provides information about studies' location, sample size, theoretical background, research method, statistical analyses, constructs and significant relationships. As a result of literature review, 11 factors are derived. The factors are validated by an expert panel. Afterwards, a technology acceptance model is proposed based on analysis of the literature. To test the hypotheses of model, a measuring instrument (questionnaire) is formed. Data is collected from 378 participants, however 302 of them are used in the analyses. The model is tested by employing Partial Least Squares – Structural Equation Modelling (PLS-SEM). After obtaining results, inter-factor relations are added to the model from literature for testing. In the end, final version of the model is created. Results are fortified with interviews made with participants of the questionnaire. Final findings show that, use of mobile payment systems is affected most by usefulness and compatibility.

Keywords: Mobile Payment, m-payment, Technology Acceptance, Technology Adoption, PLS-SEM

ÖZ

MOBİL ÖDEME SİSTEMLERİ İÇİN
TEKNOLOJİ KABUL MODELİ GELİŞTİRİLMESİ

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Bu tez çalışması, mobil ödeme sistemlerinin kabulünü ayrıntılı biçimde inceleyerek, bir teknoloji kabul modeli geliştirmeyi hedeflemektedir. Bu çalışma iki ana kısımdan oluşmaktadır. Tez çalışmasının ilk kısmında, mobil ödeme sistemlerinin kabulü detaylı olarak incelenmiştir. İkinci kısımda, bir teknoloji kabul modeli, literatür taramasının sonuçları kullanılarak geliştirilmiştir. İlgili literatür 2005 yılından 2018 yılının Mart ayı sonuna kadar taranmıştır. Literatür taraması ile çalışmaların yeri, örneklem büyüklüğü, teorik dayanakları, araştırma yöntemleri, istatistiksel analizleri, model elementleri ve model ilişkileri hakkındaki bilgiler sağlanmıştır. Literatür taramasının sonucunda, 11 faktör elde edilmiştir. Çıkarılan faktörler, uzman grup tarafından incelenerek onaylanmıştır. Daha sonrasında, literatür taramasının sonuçlarına dayanarak bir teknoloji kabul modeli önerilmiştir. Modelde yer alan hipotezleri test etmek için, bir anket oluşturulmuştur. Anket ile 378 katılımcıdan bilgi toplanmıştır, ancak 302 katılımcıdan toplanan veri çalışma kapsamında kullanılmıştır. Model, "Kısmi en küçük kareler – Yapısal Denklem Modeli" (PLS-SEM) yöntemi ile test edilmiştir. Sonuçlar elde edildikten sonra, faktörler arası ilişkiler literatürden alınarak modele eklenmiştir. Sonuç olarak, modelin son hali oluşturulmuştur. Sonuçlar anket katılımcıları ile yapılan görüşmeler ile desteklenerek raporlanmıştır. Çalışmanın bulguları mobil ödeme sistemlerin kabulünün en çok kullanışlılık ve uyumluluk faktörlerinden etkilendiğini göstermektedir.

Anahtar Sözcükler: Mobil Ödeme, Teknoloji Kabul Modeli, PLS-SEM

To My Family

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LIST OF ABBREVIATIONS

ANOVA	Analysis of Variance
CFA	Confirmatory Factor Analysis
DOI	Diffusion of Innovations
EFA	Exploratory Factor Analysis
ELM	Elaboration Likelihood Model
ICT	Information and Communications Technology
IT	Information technology
LDC	Least Develop Countries
MP	Mobile Payments
PLS	Partial Least Squares
POS	Point of Sale
SEM	Structural Equational Modelling
SMS	Short Message Service
TAM	Technology Acceptance Model
TPB	Theory of Planned Behavior
TRA	Theory of Reasoned Action
UTAUT	Unified Theory of Acceptance and Use of Technology
WAP	Wireless Application Protocol

CHAPTER 1

INTRODUCTION

As it can be observed in daily life, transaction processes are an important part of our lives. One of the transaction method is mobile payments. Mobile payments are generally defined as the payment conducted by using a mobile phone. Both Android and iOS devices support various mobile payment systems. In some cases, it is necessary to link the mobile payment device to a financial source such as a card or account. However, in some cases, it is not compulsory. (Wang, Hahn, Sutrave, 2016)

According to the report (Square, n.d.) volume of mobile payments are expected to increase enormously by 2020. Therefore, the importance of mobile payments is expected to increase as well. In addition, mobile broadband subscriptions are also increasing in all around the world. On the left side, compound annual growth rate from years 2012 to 2017 (estimate) is given in Figure 1, and on the right side current state can be examined. (ITU, 2017)

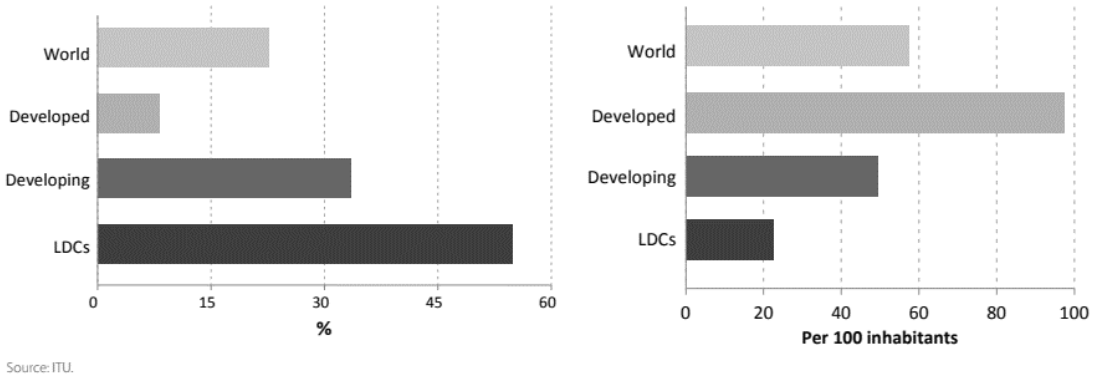

Figure 1 Current state and growth of Mobile Broadband Subscriptions

Mobile payment methods can be grouped differently with respect to different perspectives. According to ITU-T Technology Watch Report, "The Mobile Money Revolution Part 1: NFC Mobile Payments" published in May 2013, Proximity mobile payments and Remote mobile payments can be considered as the two main groups of this technology. Proximity payment (e.g. NFC, Bluetooth, QR, mobile wallet etc.) is the method that requires a point of sale (POS) device and a mobile phone together at the same place; whereas, remote payment (e.g. SMS, Mobile Billing, USSD, WAP, etc.) method does not require the mobile payment device and vendor to be at the same place. Those mobile payment methods can be examined in more detail as follows:

A. Remote Payment Methods

SMS (Short Message Service) payment method is one of the very common type of remote mobile payment method. In this method, buyer uses a cell phone to send a text message to pay for goods and services. Later, the charges are generally reflected to consumer's phone bill. (ICEMD, 2016)

WAP – Wireless Application Protocol is a remote payment method. In this method, by employing web pages or using applications downloaded to mobile devices, consumers can make a payment. This payment method has benefits such as being quick and easy to use. (ICEMD, 2016)

Online wallets use WAP technology to conduct payment processes. It is used for a remote payment. User choses the mobile wallet whilst buying from a website (or webstores such as Google Play Store or Apple Store). After that, user is asked to enter a PIN, or any other security measure is employed. Companies such as Apple Pay, Google Wallet, Amazon Payments and PayPal are the examples of the providers of this technology. (ICEMD, 2016) (Pan, 2015)

B. Proximity Payment Methods

One of the most commonly encountered method of proximity mobile payments is Near Field Communication (NFC). It enables its users to have contactless payment experience. The consumer brings the mobile phone near to the POS device or another type of card reader, shortly after the transaction is completed. This method is commonly used at retail stores and transportation vehicles. (ICEMD, 2016) This payment method is also referred as "Tap and Go". NFC technology requires shorter distances, compared Bluetooth payment technology. However, it is a safer method of payment. (Blue Pay, n.d.)

Bluetooth payment is a proximity mobile payment method. This method works like NFC payment method; however, it provides a longer distance (up to 50 meters) for the payment process. In addition, this method works faster compared to NFC. The major providers (e.g. Google and Apple) in the market focus on NFC type of payments. (Business Insider, 2016)

Mobile wallets are used for proximity mobile payments. Mobile wallet is an application which keeps user's bank account or credit card information. Through the application user can pay without a credit card, but with mobile phone. In some cases, authentication can be asked from user by entering a PIN or thumbprint authorization. Payment mostly occurs through NFC. Android Pay, Samsung Pay and Apple Pay are some of the popular providers of mobile wallet. (Square, n.d.)

All around the world the adoption papers are studied with different type of technologies. In those papers, different technology adoption models are employed. Some of the models (or theories) used are; Diffusion of Innovations (DOI) by (Rogers, 1995), Theory of Reasoned Action (TRA) by (Fishbein & Ajzen, 1975), Technology Acceptance Model (TAM) by (Davis, 1989), and Unified Theory of Acceptance and Use of Technology by (Venkatesh et al, 2003).

1.1 Problem Statement

Mobile payment technology has been developing since its earlier stages. Many mobile payment methods are used by adopters of this technology. Considering the technological development in mobile payment technology, and extensive literature of technology adoption models; the current state of the related field needed to be examined in more detail to better understand current situation. This research deals with that problem by providing a systematic review of the literature and related results from several perspectives. Literature is reviewed with respect to following points:

- Number of studies with respect to years
- Location
- Theoretical background
- Mobile payment type
- Properties of the samples
- Research method and analysis
- Significant relations

Another problem this study deals with is determining the factors that affect adoption of mobile payment technology. To deal with this problem, a technology acceptance model is developed in the study based on the results of literature review. The initial model tests the effect of various factors (usefulness, ease of use, security, compatibility, innovativeness, new technology anxiety, enjoyment, knowledge, social influence and cost) on use of mobile payments technology.

1.2 Research Questions

This paper tries to answer following questions:

- What is the state of the technology acceptance of mobile payment systems literature?
- What factors are affecting use of mobile payment technologies? How are those factors affecting each other?

To answer the main questions given above, various sub-questions are asked in this study:

- Which technology adoption models are employed in the literature?
- How much can the models explain the variance on use of mobile payments?
- What type of research design is used in the studies?
- Which constructs are used in the models?
- When are the studies conducted?
- Where are the studies conducted?
- Which relations are significant in the mobile payment acceptance literature?
- Which of the factors extracted from literature review are significantly affecting use of mobile payment acceptance technologies?

1.3 Purpose and Significance of the Study

This thesis study focuses on the current state of "adoption of mobile payment systems" by reviewing the available literature from 2005 to 2018. By doing so, it is aimed to better understand the current state of literature and form a mobile payment acceptance model to better predict the factors affecting use of the related technology.

Similar, studies exist in the literature. However, for the literature review part; most of them are specific to just one country or use an older or shorter range of studies as sample. Although, literature review studies in this field have been conducted before several times; to best of my knowledge, this study offers a different perspective by grouping constructs from a broader literature. Moreover, in this study, after a comprehensive literature review a model is proposed based on the constructs used in other studies. The study is also different by providing a mobile payment acceptance model after a thorough literature review. Finally, during the literature review any study conducted in Turkey relating to this topic did not appear. Therefore, to best of my knowledge, this research has not been conducted with this culture.

1.4 Research Methodology

Different methodologies of research are employed in this study in order to reach the goal of this research. In other words, mixed research methodology is employed. In literature review part, descriptive methodology is used. For statistical analyses quantitative methodology is employed. For the interpretation of results both quantitative and qualitative methods are used.

The literature of mobile payment adoption technologies is inspected. Then, the findings are gathered together to form an initial model for technology acceptance of mobile payments. After, that a measuring instrument is prepared to analyze factors affecting use of the related technology. Research is concluded with a final model and its related statistical findings. Statistical findings are fortified with interview results.

Literature review in this study is conducted as follows. First, research questions and related sub-questions are identified. After that, keywords are selected to determine the search criteria. Then, selected databases are searched with the determined search criteria. Results are coded in spreadsheet to manage them easier. Then, results are evaluated. PLS-SEM is used to conduct statistical analyses. Final version of the model is cross-checked with interviews. All results are reported at the end. The stages of the work conducted in this research are given below in Figure 2.

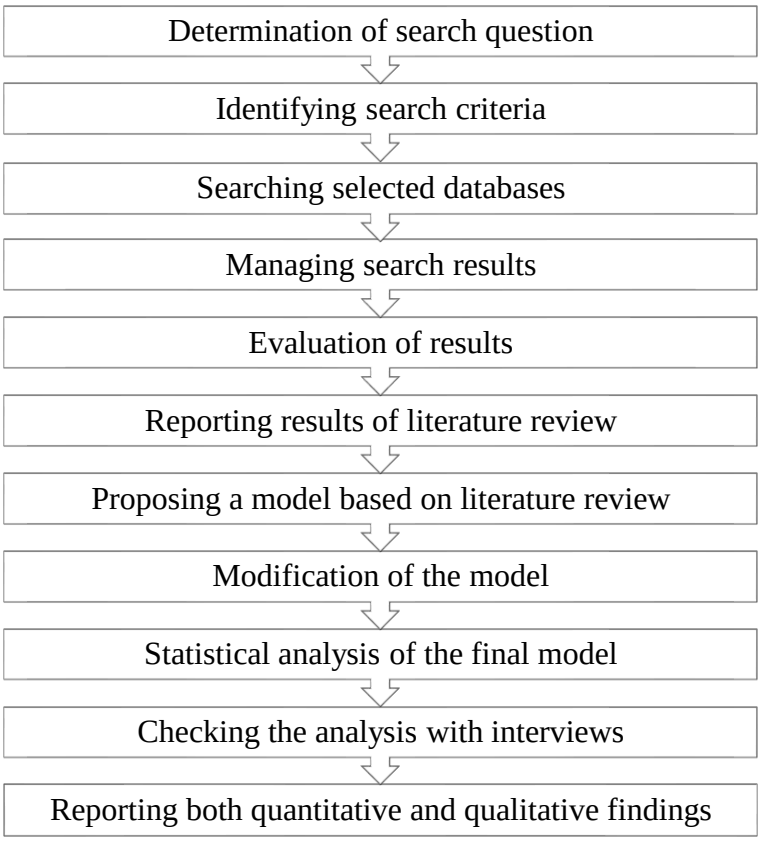

Figure 2 Steps of Research

1.5 Rest of the Study

Remaining sections of the study is organized as the following: In Chapter two, the literature of technology adoption models and related studies are reviewed. The findings related to literature review are reported. In third chapter, research methodology is provided along with initial model proposition. In fourth chapter, quantitative data analyses and related findings are reported. Chapter five continues with discussions and final conclusions.

CHAPTER 2

LITEREATURE REVIEW

Many technology adoption studies are conducted in Information Systems. In this section, major models and theories affecting the related literature is given. Moreover, studies are reviewed systematically for the specific area of mobile payment adoption. The process of systematic review is also given in this section.

2.1 Literature Review of Major Technology Adoption Studies

In this part, some of the major technology adoption models from literature are discussed briefly. They are given as follows:

2.1.1 Diffusion of Innovation Theory

Foundations of this theory is formed by Rogers in 1962. (The first edition of the book) This theory is one of the fundamental theories affecting Technology Acceptance Model. Today, the book has more than 90.000 citations in Google Scholar. In this theory, communication channels, time, social system and innovation are the main structures. Five characteristics of an innovation are given as relative advantage, compatibility, complexity, trialability and observability. The mentioned characteristics can be observed in Figure 3. Adopters of innovation are also examined in this theory. They are given in five categories: innovators, early adopters, early majority, late majority and laggards. (Rogers, 1995)

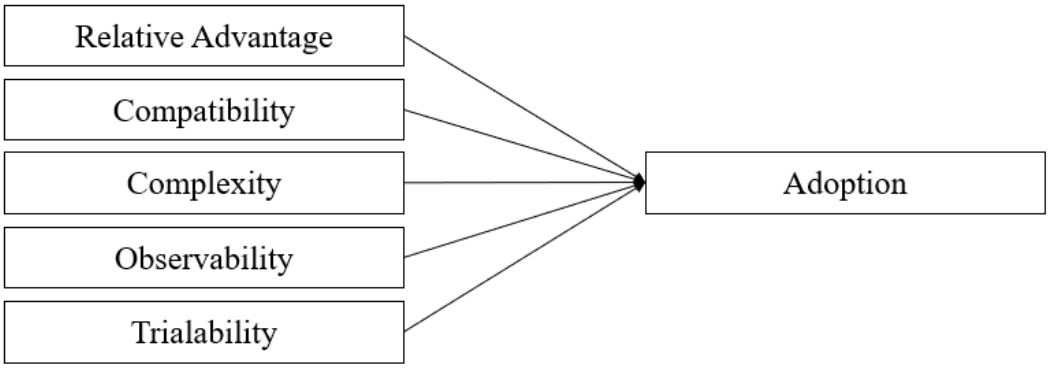

Figure 3 Diffusion of Innovation Theory

According to Rogers, definitions of constructs used in the theory are given below in Table 1 (Rogers, 1995).

Table 1 Constructs of DOI

Constructs	**Definition**
“Relative Advantage”	"the degree to which an innovation is perceived as being better than its precursor"
“Compatibility”	"the degree to which an innovation is perceived as being consistent with the existing values, needs, and past experiences of potential adopters"
“Complexity”	"the degree to which an innovation is perceived as being difficult to use"
“Observability”	"the degree to which the results of an innovation are observable to others"
“Trialability”	"the degree to which an innovation may be experimented with before adoption"

2.1.2 Theory of Reasoned Action

Fishbein and Ajzen generated this theory in 1975. There are three main constructs of this theory: behavioral intention, attitude and subjective norm. This study originates from social psychology. In this theory, attitude is affected by behavioral beliefs and subjective norms are affected by normative beliefs. Attitude and subjective norms affect intention together. Actual behavior is tried to be determined with intention. The model is given in Figure 4 (Fishbein & Ajzen, 1975).

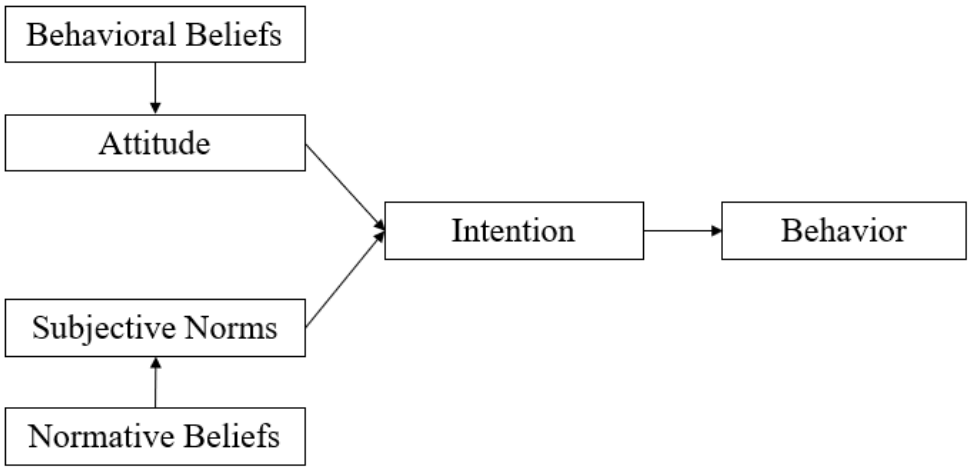

Figure 4 Theory of Reasoned Action

This model uses several constructs. The definitions of constructs used in “Theory of Reasoned Action” are given below in Table 2 (Fishbein & Ajzen, 1975).

Table 2 Constructs of TRA

Constructs	**Definition**
“Attitude”	"Sum of beliefs about a particular behavior weighted by evaluations of these beliefs"
“Subjective Norms”	"Influence of people in one's social environment on his behavioral intentions; the beliefs of people, weighted by the importance one attributes to each of their opinions that will influence one's behavioral intention"
“Behavioral Intention”	"Function of both attitudes toward a behavior and subjective norms toward that behavior which has been found to predict actual behavior"

2.1.3 Theory of Planned Behavior

This theory is developed by Ajzen. It is formed after TRA. As an addition to TRA, the theory is extended with control beliefs affecting perceived behavioral control. As a result, behavior and intention are affected by perceived behavioral control. TPB can be seen in Figure 5 (Ajzen, 1991).

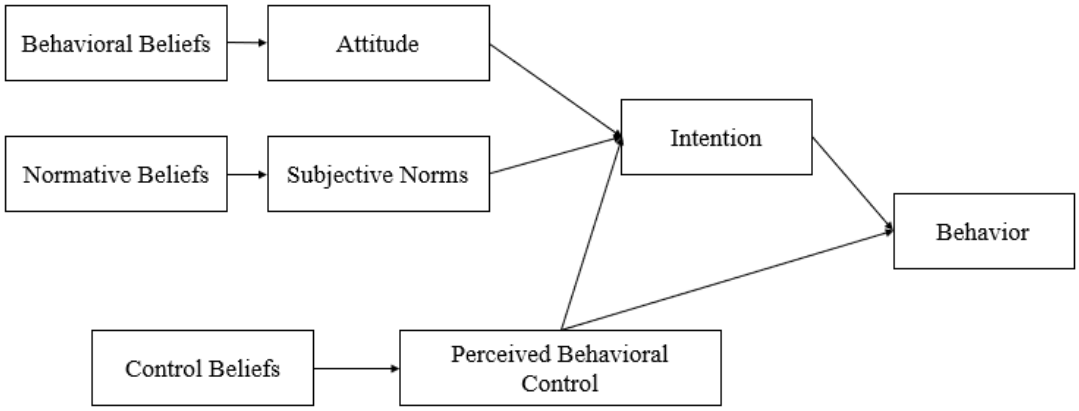

Figure 5 Theory of Planned Behavior

Constructs of TRA are almost the same with TPB, except the construct Perceived Behavioral Control. The definitions of the constructs used in the theory are given below in Table 3 (Ajzen, 1991).

Table 3 Perceived Behavioral Control - TPB

Constructs	Definition
“Perceived Behavioral Control”	"People's perception of the ease or difficulty of performing the behavior of interest which in turn depends on the self-efficacy which is the judgments of how well one can execute courses of action required to deal with prospective situations"

2.1.4 Technology Acceptance Model

In 1989, Davis formed “Technology Acceptance Model”. It is a modest, but an effective model. After its creation, it is cited by many other studies. The main constructs of the model are perceived ease of use and perceived usefulness. They are affecting the attitude. Intention is affected by attitude and intention affects actual system usage. The model can be seen in Figure 6 (Davis, 1989).

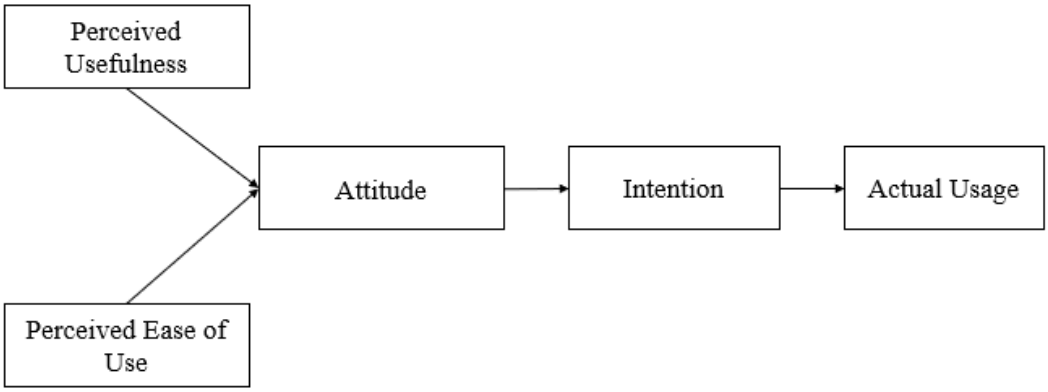

Figure 6 Technology Acceptance Model

New constructs are introduced with this model. Constructs of “Technology Acceptance Model” are defined in Table 4. (Davis, 1989)

Table 4 Constructs of TAM

Constructs	Definition
“Perceived Ease of Use”	"The degree to which a person believes that using a particular system would be free of effort"
“Perceived Usefulness”	"The degree to which a person believes that using a particular system would enhance his or her job performance"

2.1.5 Unified Theory of Acceptance and Use of Technology

This model is developed by Venkatesh, Morris, Davis and Davis in 2003. The motivation was to create model by uniting earlier major models in the literature. Primary factors of the model are performance expectancy, effort expectancy, social influence and facilitating conditions. As an addition to them, additional moderating constructs such as age, gender, experience and voluntariness are also added to the model. It can be seen in Figure 7 (Venkatesh et al, 2003).

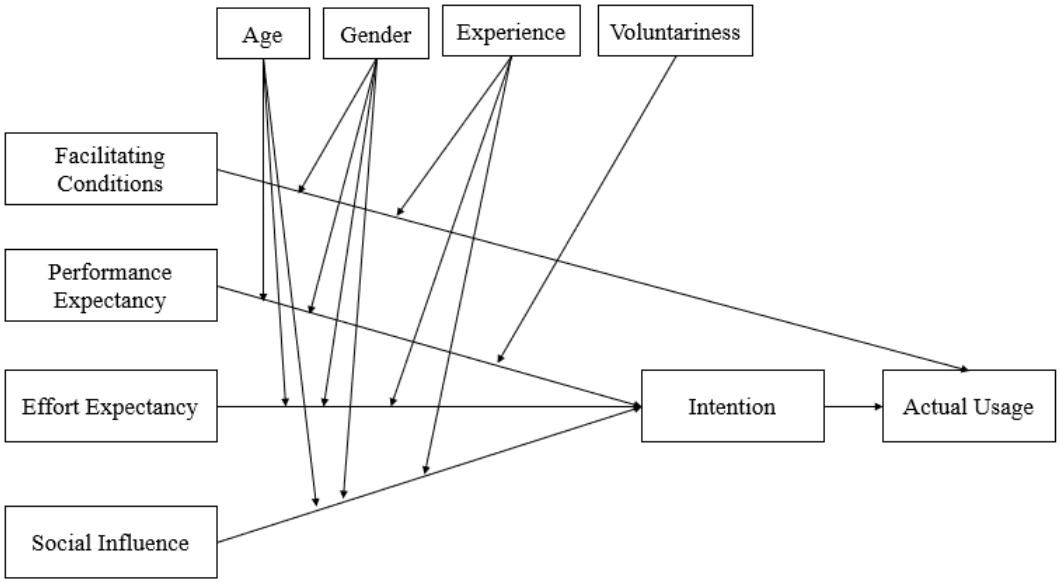

Figure 7 Unified Theory of Acceptance and Use of Technology

There are four main factors in this model. Constructs used in UTAUT Model are given in Table 5. (Venkatesh et al, 2003).

Table 5 Constructs of UTAUT

Constructs	**Definition**
"Performance Expectancy"	"the degree to which an individual believes that using the system will help him or her to attain gains in job performance"
"Effort Expectancy"	"the degree of ease associated with the use of the system"
"Social Influence"	"the degree to which an individual perceives that important others believe he or she should use the new system"
"Facilitating Conditions"	"the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system"

2.2 Systematic Review of "Mobile Payment Adoption" Literature

Technology acceptance models related to mobile payment systems are reviewed from the literature. This section provides information about this review.

2.2.1 Research Criteria

The research question, “What is the state of the technology acceptance of mobile payment systems literature?” is asked earlier. To answer that question, a meta-analysis is conducted. To determine the scope of the study, search of the database is conducted with the following search criteria.

In the literature, mobile payment systems are generally used with two names: “mobile payment” or “m-payment”, therefore; both phrases are included (with OR Boolean operator) in the search. Search is conducted in title, abstract or keywords. Concurrently, the same fields are also searched for “technology acceptance” or “technology adoption” (with OR Boolean operator). Then those keywords are connected with “AND” Boolean operator. As a result, following combinations are used for searching title, abstracts and keywords of the documents.

- “Mobile payment” is combined with “technology acceptance” using the Boolean AND operator
- “Mobile payment” is combined with “technology adoption” using the Boolean AND operator
- “m-payment” is combined with “technology acceptance” using the Boolean AND operator
- “m-payment” is combined with “technology adoption” using the Boolean AND operator

Document type is selected as “article” or “conference paper” and search results are limited to “English” sources. The search results are limited to time window between 2005 - March 2018.

2.2.2 Database Selection

Scopus and METU library databases are chosen to conduct the meta-analysis. The databases are chosen due to their wide range of academic literature sources. First, Scopus database is searched according to research criteria. After that, METU Library database is searched for its peer reviewed sources. Same results are eliminated.

2.2.3 Management of Results

The results coming from queries are noted in spreadsheets using Microsoft Excel software. After all the results are listed in spreadsheet, elimination process took place. First elimination decision is made according to abstract. If the abstract provides promising information about the study, then the full text is examined. After examination of full-texts some studies are eliminated as well.

2.2.4 Evaluation Criteria

After searching the databases; some of the results are eliminated during abstract examination process, and some are eliminated according to their full-texts. Reasons for exclusion are given below:

- Not giving enough information about the research
- Quality concerns
- Being not related to mobile payment systems
- Unfinished conceptual studies
- Full text is not available (within the limits of METU Library memberships)

At the end, 69 studies are decided to be used within the scope of this study. List of papers examined is given in APPENDIX A.

2.3 Evaluation of Results Acquired from Literature Review

This section of the study provides information about the findings of literature review. In the following sections related studies are examined with respect to their distribution across years, location, theoretical background, types of payment, sample properties, research methods, analysis techniques, constructs, and significant relations.

2.3.1 Number of Studies with respect to Years

As it is mentioned in first chapter, mobile payment technology increases its popularity. The rising trend line shown in Figure 8, represents the increasing trend in acceptance of mobile payment studies. However, it should be noted that, the chart is formed with the papers within this study's scope. In total, 69 papers are included for the analysis.

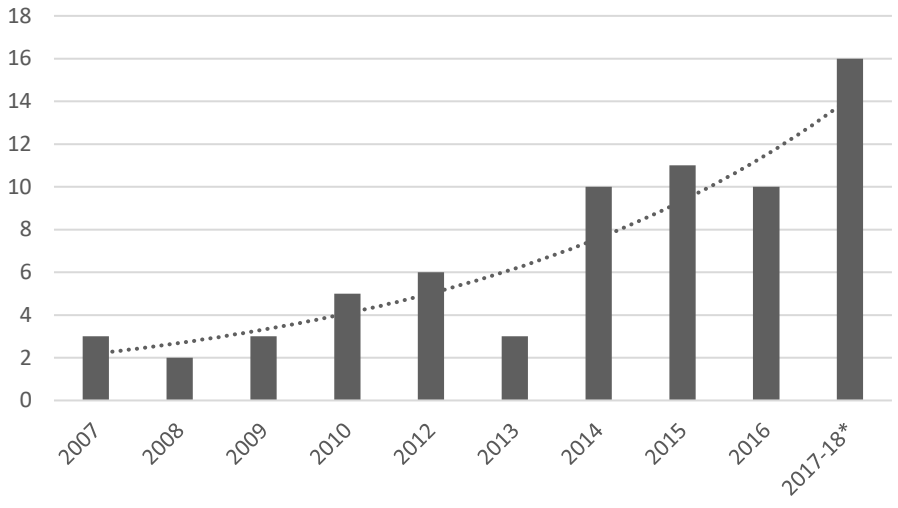

Figure 8 Number of Studies per Year

* Year 2018 consists of only first three months.

2.3.2 Location

Geographical dispersion of the papers is also examined within the scope of this study. In this part of study, one can see that adoption of mobile payment technology is studied in various countries from all around the world. 30 different countries are mentioned in this part of the study. In Figure 9, it can be observed that China has the lead with respect to location of the study. It is followed by Germany, Spain, Malaysia, India and so on. Only the countries having two or more studies are included in the graph. The countries with one study are Bangladesh, Brazil, Cameroon, Canada, France, Indonesia, Iran, Italy, Kuwait, New Zealand, Oman, Pakistan, Portugal, Qatar, Russia, Singapore, Sweden, Tanzania and Thailand.

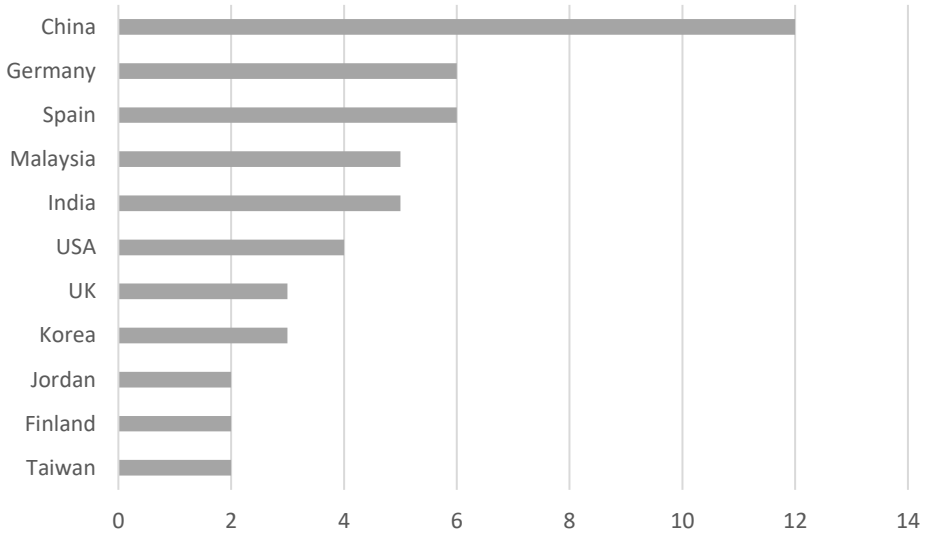

Figure 9 Number of Studies Included (Articles & Conference Papers)

Within the scope of this study, 69 papers are examined. 46 out of 69 papers are articles, and 23 of them are conference papers. The geographical dispersion of 46 articles is given below in Figure 10.

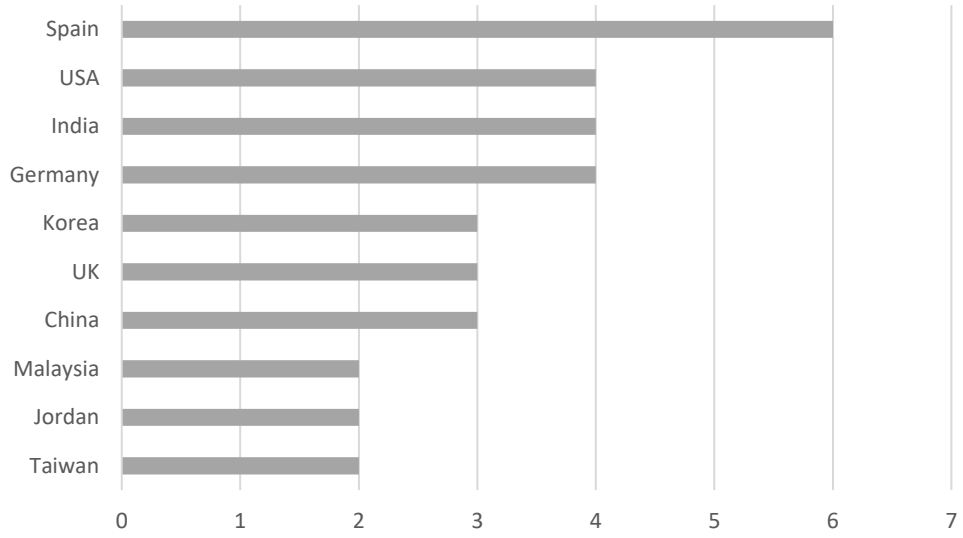

Figure 10 Number of Studies Included (Articles)

When the graph is redrawn for only articles, it is seen that China lost its lead. In this new situation Spain has the lead and it is followed by USA, India and Germany. It should be noted that, Figure 10 shows the countries with two or more studies.

2.3.3 Theoretical Background

Most of the papers examined within the scope of this study, uses one or more theories as a theoretical background. Figure 11 shows that Technology Acceptance Model is employed in most of the studies. It is followed by Diffusion of Innovations and then Unified Theory of Acceptance and Use of Technology. Theory of Reasoned Action and Theory of Planned Behavior are used rarely. “Others” part in the figure is composed of Attribution Theory, Cognitive Style Theory, Hofstede’s Cultural Dimensions, Technology Readiness, Valance Theory and Value-Based Acceptance Model.

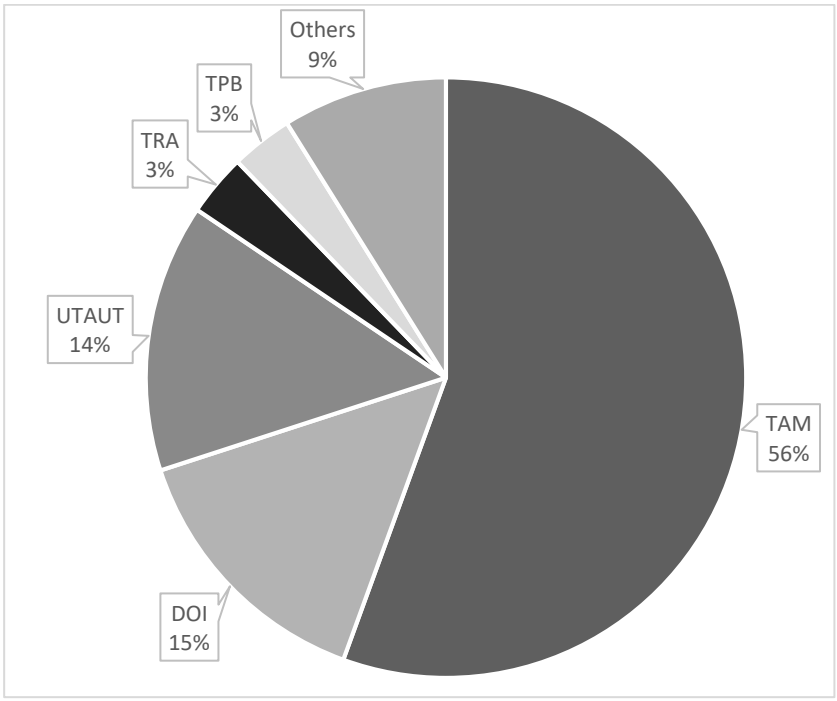

Figure 11 Base Theories Used

2.3.4 Mobile Payment Type with respect to Years

Different types of mobile payment methods are studied in the papers. Some studies worked on more than one payment method. The change in the payment type with respect to years is shown in Table 6.

Table 6 Payment Method & Year

Payment Type	2007	2008	2009	2010	2012	2013	2014	2015	2016	2017-18*	Total
Bluetooth							1				1
General				3	4	2	4	3	4	8	28
Mobile Wallet			1								1
NFC							3	3	4	5	15
Online Wallet									2	1	3
Proximity							3	1		1	5
QR-Code							1	2			3
Remote								1			1
RFID		1									1
SMS	1	1	2			1		1		3	9
WAP	2	2		2	2	1		1			10

*2018, consists of only first three months.

The payment type “General” is used for studies which did not specify a payment method. When Table 6 is examined, it is seen that in the first years of literature review,

SMS Payments and WAP methods were used mainly. However, the studies closer to today handles NFC based (or proximity payments) or "General" mobile payment methods.

Another representation of mobile payment types with respect to number of times studied in papers examined is given in Figure 12. In the figure, the type of mobile payment is given with the number of times it is used in papers. In addition, the number in parentheses represents total number of usage with respect to related upper category.

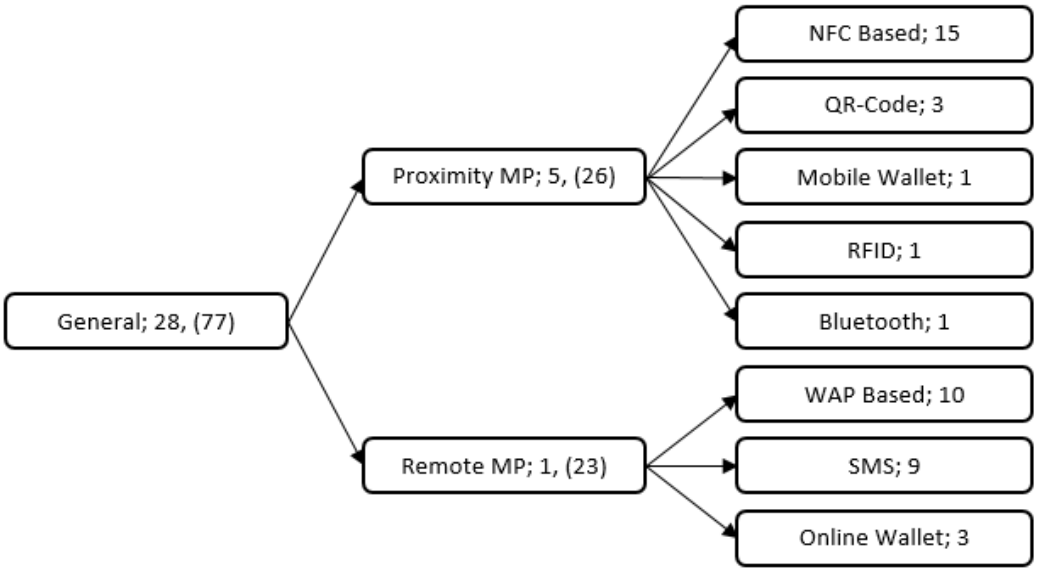

Figure 12 Mobile Payment Types

Studies are also shown in main categories with a pie chart. In Figure 13, the pie chart is provided to better highlight the payment type's share with respect to others.

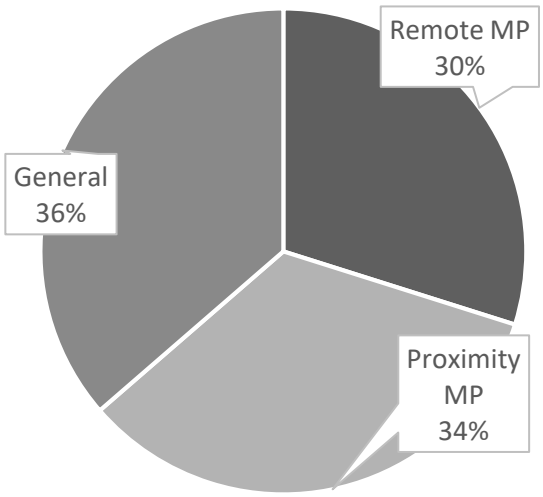

Figure 13 Mobile Payments in Main Categories

2.3.5 Properties of the Samples

Information related to sample size is available in 67 out of 69 studies. The analysis of the papers shows that, mean of selected sample size for analysis is 464,8. The median of the sample size is 292. The smallest sample size used in the analysis is 19 (Mallat & Tuunainen, 2008). The study with the maximum number of sample size (Liébana-Cabanillas et al, 2018) has 2587 data.

In 11 of the studies, it is stated that users are informed about the related technology, before collecting data.

According to (Lee, Kozar, Larsen, 2003) the studies based on technology adoption models are generally tested on university students, since it is easier to reach the sample. However, choosing sample only from university students; could not provide the best resemblance to the population. In this study, our findings show that many of the studies uses a sample including university students as their samples as well. However, only in 11 of those studies, samples are composed of only university students.

2.3.6 Research Method and Analysis

In most of the papers quantitative approach is adopted. 51 papers are written with quantitative method. This method is followed by mixed method and qualitative method with 15 and 3 papers, respectively. The results related to research method is given in Figure 14.

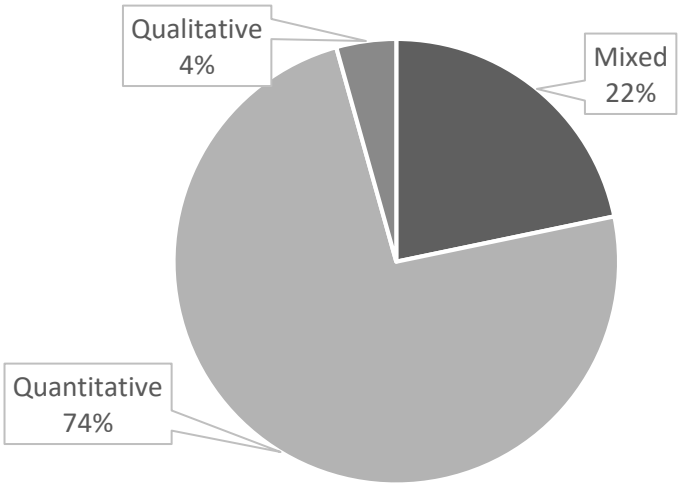

Figure 14 Types of Research Method

After data collection, statistical analyses are conducted in the papers. Some of the methods used to analyze data are very advanced; whereas some of them are just analysis of answers. The methods used for statistical analysis can be seen below in Figure 15. In most of the studies collected data is tested with Structural Equation

Modelling (SEM). It is followed by regression analysis. In some papers collected data is examined without any complex statistical method. They are grouped under "Basic Analysis / Descriptive Statistics" title. Others field are the representative of following methods: multivariate analysis of variance, analysis of variance, elaboration likelihood model, maximum likelihood model.

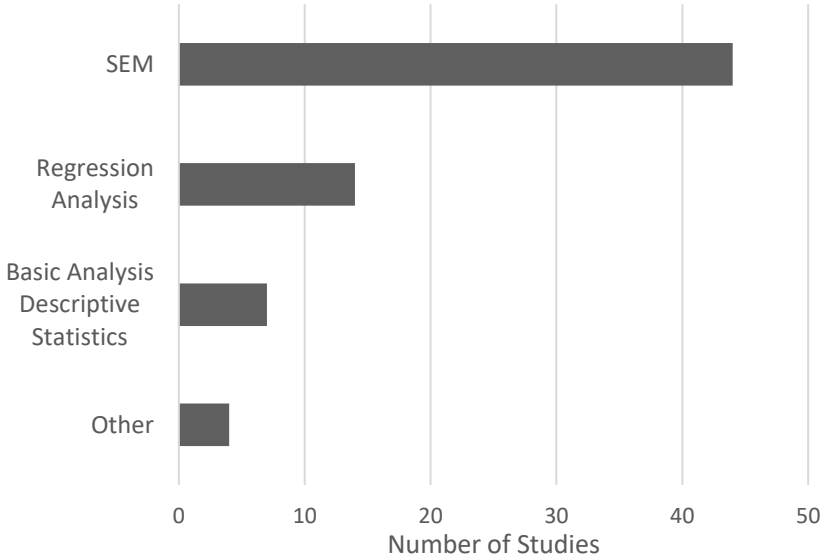

Figure 15 Statistical Methods Used

Analyses mentioned above is generally conducted with the help of statistical software. Their usage percentage is given below in Figure 16. It is important to note that the related information is available for 42 studies. The most used statistical software in related studies is SPSS with 75%. SPSS is generally used with AMOS package. It is followed by SmartPLS software with 11%. Remaining software programs are MPlus, WarpPLS and Microsoft Excel.

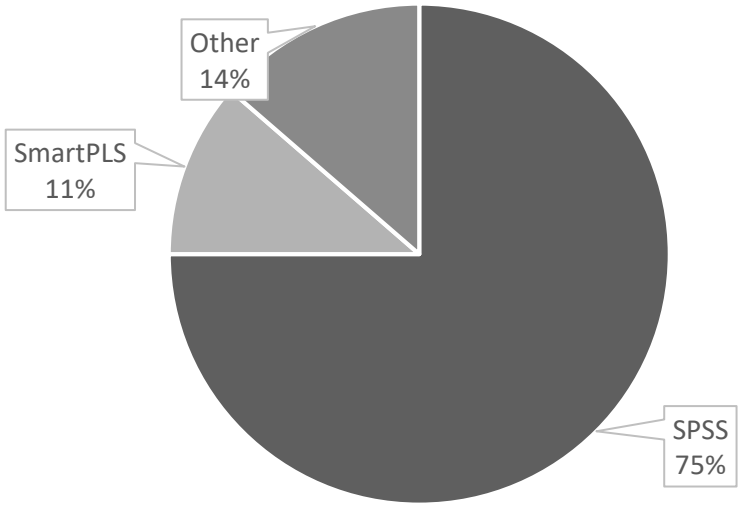

Figure 16 Statistical Software Used

In many of the studies, how much of the variance on use of mobile payments is explained. In 40 studies, variance on the variable is explained with R-squared statistics. The mean of the statistics is 60,78%. The top 10 studies with highest R-squared values are given below in Table 7.

Table 7 Studies with Highest R-squared Values

Research	R-sq.	Reference
"Security-related factors in extended UTAUT model for NFC based mobile payment in the restaurant industry"	0,87	(Khalilzadeh et al, 2017)
"An empirical study on consumer acceptance of mobile payment based on the perceived risk and trust"	0,85	(Mingxing et al, 2014)
"Understanding consumer acceptance of mobile payment services: An empirical analysis"	0,84	(Schierz et al, 2010)
"The effects of product-related, personal-related factors and attractiveness of alternatives on consumer adoption of NFC-based mobile payments"	0,83	(Pham & Ho, 2015)
"Intention to use new mobile payment systems a comparative analysis of SMS and NFC payments"	0,82	(Liébana-Cabanillas et al, 2017)
"A global approach to the analysis of user behavior in mobile payment systems in the new electronic environment"	0,79	(Liébana-Cabanillas et al, 2018)
"Antecedents of the adoption of the new mobile payment systems: The moderating effect of age"	0,76	(Liébana-Cabanillas et al, 2014)
"A Scenario-Based Analysis of Mobile Payment Acceptance"	0,76	(Goeke & Pousttchi, 2010)
"Adoption readiness, personal innovativeness, perceived risk and usage intention across customer groups for mobile payment services in India"	0,76	(Thakur & Srivastava, 2014)
"Mobile payment usage intent in an Indian context: An exploratory study"	0,73	(Chandrasekhar & Nandagopal, 2016)

2.4 Grouping the Factors Used in Literature

In this section, information about the development process of factors is given. Afterwards, the validation of factor grouping is mentioned.

2.4.1 Aggregating Factors

In the scope of this study, 69 papers have been examined. Those papers have 178 different constructs used in their model. Total number of constructs used in the model equals to 422, excluding variables such as use, intention or attitude. The constructs are grouped into 11 categories with respect to their meanings. Categorized constructs and how many times they are used can be examined in Table 8.

Table 8 Grouped Constructs & Frequency

Construct	**Frequency**
"Security"	95
"Ease of Use"	69
"Usefulness"	64
"Social Influence"	46
"Compatibility"	23
"Cost"	23
"Technical aspect"	19
"Innovativeness"	15
"Knowledge"	10
"Enjoyment"	6
"New Technology Anxiety"	2

As it can be seen in Table 8, "Security" related constructs are used mostly. "Usefulness" and "ease of use" are among the most used constructs, as expected, since they are the backbone of Technology Acceptance Model. The list of constructs is given in APPENDIX B.

2.4.2 Validation of Groups

After the factors are divided into groups, expert opinion is needed to confirm grouping process. For this purpose, an expert panel is formed. The expert panel consisted of six members. Four of those members are university professors and two of them are PhD students. All of them are related to technology acceptance topic in Information Systems Field. Factor groups are modified after the feedback of the expert panel members.

2.4.3 Significant Factors Directly Affecting Model

The results of the studies are examined, and significant relations directly affecting use of mobile payments are inspected. The constructs are categorized as given in APPENDIX B. The mentioned constructs and their frequency of affecting latent variable can be seen in Table 9.

Table 9 Constructs Directly Affecting Model & Frequency

Construct	**Frequency**
Usefulness	50
Security	48
Ease of Use	28
Social Influence	27
Compatibility	14
Innovativeness	11
Technical aspect	10
Cost	5
Knowledge	3
Enjoyment	2
New Technology Anxiety	0

According to Table 9 given above, the most frequent effect is coming from the construct groups "Usefulness" and "Security". They are followed by "Ease of Use", "Social Influence", "Compatibility", "Innovativeness" and "Technical aspect" construct groups. The other categories have comparatively less frequent effect.

In Figure 17 given below, effects of constructs are divided into categories according to their payment type given in the related study. The results are only shown for proximity and remote mobile payment main categories, in other words, "general" group is excluded.

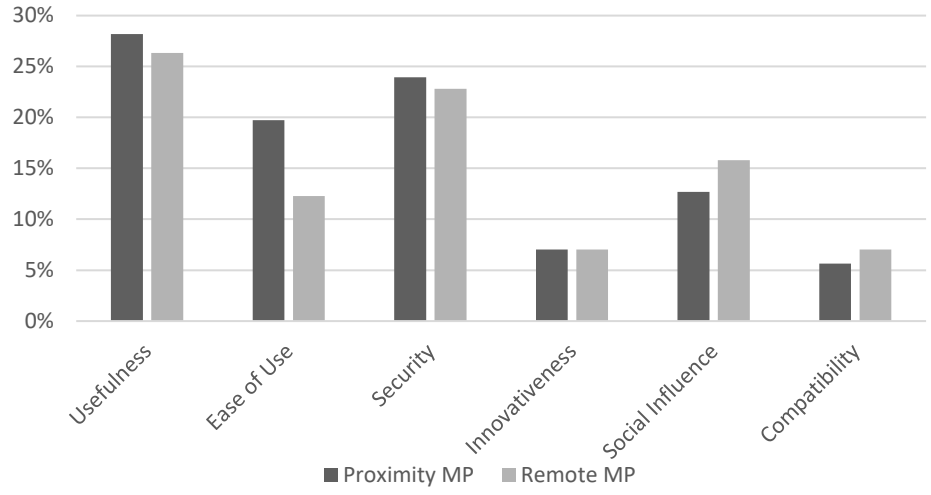

Figure 17 Effects of Constructs on Model with respect to Payment Type

The results show that effects of usefulness, security, innovativeness, and compatibility are almost the same for both types of payment. However, ease of use carries more importance in proximity mobile payment types. Also, social influence has more effect for remote mobile payment.

CHAPTER 3

RESEARCH METHODOLOGY

In this chapter, initially proposed model is introduced. Model constructs are defined separately in detail and related hypotheses are given. In addition, information about measurement instrument is provided. The chapter is concluded with data analysis method used in the research.

3.1 Proposing the Initial Acceptance Model

Considering the observations made in the section 2.4 and its subsections, a model is proposed based on the most frequently used constructs affecting latent variable. The model is given in Figure 18.

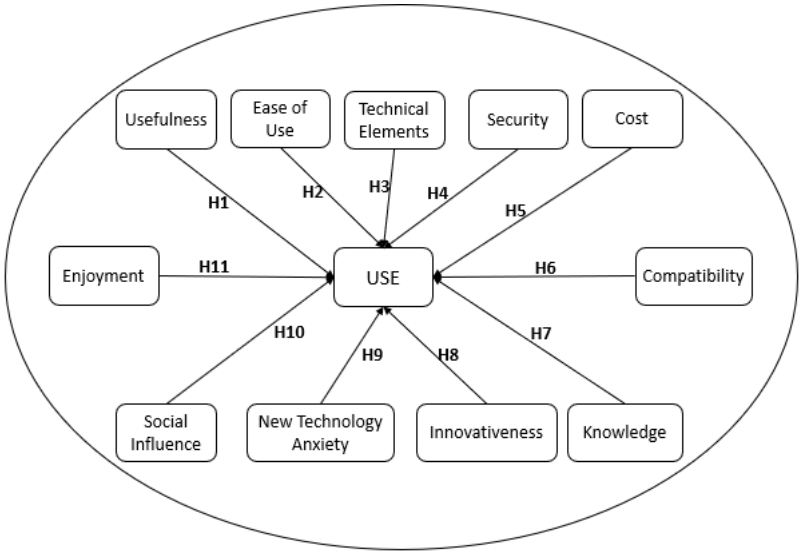

Figure 18 Proposal Based on Literature Review

The model is formed according to the results of the analyses conducted through literature review. The constructs given in Figure 18 are the ones that are used most frequently. Therefore, it is safe to say that an initial model can be proposed as in the figure. However, the proposed model should give the best results after careful

alterations in the model. Therefore, the hypotheses are defined below to be statistically tested in the coming sections.

3.1.1 Usefulness

In the setting of mobile payments literature usefulness can be defined as "the degree to which a mobile payment user believes that using a mobile payment system would enhance his or her performance" (Davis, 1989). Therefore, the hypothesis 1 given below is formed.

H1: Higher level of usefulness has a positive effect on use of mobile payment systems.

3.1.2 Ease of Use

Within the context of mobile payment systems, ease of use can be defined as "the degree to which a mobile payment user believes that using a mobile payment system would be free of effort" (Davis, 1989). Hence, the hypothesis 2 given below is formed.

H2: Higher level of ease of use has a positive effect on use of mobile payment systems.

3.1.3 Technical Elements

In this setting, technical elements refer to availability, speed, smartness, responsiveness and quality of the mobile payment system. Consequently, hypothesis 3 is given as follows.

H3: Better technical elements have a positive effect on use of mobile payment systems.

3.1.4 Security

In the related context, security can be defined as "the degree to which a mobile payment user feels secure by using a mobile payment technology or sending private information over a mobile payment system" (Shin, 2009) (Özkan Yıldırım et al, 2010). Feeling secure or trusting the system are considered as similar issues within the scope of this research. Consequently, the fourth hypothesis is written as follows.

H4: Higher level of security has a positive effect on use of mobile payment systems.

3.1.5 Cost

Within the context of mobile payment technologies, cost could be defined as the amount of money that has to be spent on usage of mobile payment technologies and/or required tools to acquire related technology. Hence, the hypothesis 5 given below is formed.

H5: Higher level of cost has a negative effect on usage of mobile payment systems.

3.1.6 Compatibility

Within the context of mobile payment systems, ease of use can be defined as "the degree to which an innovation is perceived as being consistent with the existing values, needs, and past experiences of users of mobile payments systems" (Rogers, 1995). As a result, the hypothesis 6 given below is formed.

H6: Higher level of compatibility has a positive effect on use of mobile payment systems.

3.1.7 Knowledge

Within the framework of mobile payments, level of knowledge can be explained as the level of obtained information or awareness by experience or education about mobile payment technologies. Hence, hypothesis 7 is provided as follows.

H7: Higher level of knowledge has a positive effect on use of mobile payment systems.

3.1.8 Innovativeness

In the context of mobile payments literature innovativeness could be established as, "the degree that a person's desire or willingness to try a new technology" (Slade et al, 2015).

H8: Higher level of innovativeness has a positive effect on use of mobile payment systems.

3.1.9 New Technology Anxiety

Considering the framework of mobile payment systems, social influence can be elucidated as, "a mobile payment user's apprehension or even fear of, using, or simply considering using mobile payment technology" (Venkatesh, 2000) (Bailey et al, 2017). As a result, the hypothesis 10 given below is shaped.

H9: Higher anxiety related to a new technology has a negative effect on use of mobile payment systems.

3.1.10 Social Influence

Within the boundaries of mobile payments literature, social influence can be defined as "the degree to which a mobile payment user perceives that important others believe he or she should use the mobile payment system" (Venkatesh et al, 2003). Therefore, the hypothesis 10 given below is formed.

H10: Higher level of social Influence has a positive effect on use of mobile payment systems.

3.1.11 Enjoyment

In the mobile payments framework, enjoyment could be mentioned as "the fun or pleasure acquired from using a mobile payment technology" (Venkatesh et al, 2012) (Oliveira et al, 2016).

H11: Higher level of enjoyment positively affects use of mobile payment systems.

3.2 Development of the Measurement Instrument

To measure the effects of constructs mentioned in previous section, a questionnaire is prepared using Google Forms. It consists of two main parts of questions. First part of questionnaire aims to acquire data about: age, level of education, smartphone usage and mobile payments usage. The second part is designed to measure the participants attitude towards mobile payments technology. The questions in the second part are used directly or with minor alterations from literature. The questionnaire is prepared both in English and in Turkish to reach more participants. The questions taken from the literature are translated to Turkish and they are translated backed to English to check the translations. In this process, help of an English teacher (native Turkish) is taken. Related items of factors are given in Table 10 with their references. Before questions, participants agreed to a voluntary participation form. After this form, mobile payment technologies are mentioned to participants briefly.

Table 10 Items of Factors and Related Studies

Number	Items of Constructs	Related Study
Usefulness		
USEF1	"My purchase would be more quickly using mobile payment."	(Pham & Ho, 2015)
USEF2	"My purchasing tasks would be more easily using mobile payment."	
USEF3	"Mobile payment would enhance my effectiveness in purchasing."	
USEF4	"Mobile payment would enhance my efficiency in making a purchase."	
USEF5	"Mobile payment would enable me to make better decisions in making a purchase."	
USEF6	"Overall, I would find mobile payment useful."	
Innovativeness		
INN1	"If I heard about a new information technology, I would look for ways to experiment with it."	(Pham & Ho, 2015)
INN2	"Among my peers, I am usually the first to try out new information technologies."	
INN3	"I like to experiment with new information technologies."	

(Table 10 Continued)

Number	Items of Constructs	Related Study
Ease of Use		
EOU1	"Learning to use mobile payment would be easy for me."	(Pham & Ho, 2015)
EOU2	"Mobile payment would be easy to understand."	
EOU3	"Getting the information I want from mobile payment would be easy."	
EOU4	"It would be easy for me to become skillful at using Mobile payment. (Knowing shortcut keys or advanced options)"	
EOU5	"I would find Mobile payment easy to use."	
EOU6	"My interaction with mobile payment would be clear and understandable."	(Slade et al, 2015)
Compatibility		
COMP1	"Using mobile payment is compatible with all aspects of my life style."	(Oliveira et al, 2016)
COMP2	"Using mobile payment is completely compatible with my current situation."	
COMP3	"I think that using mobile payment fits well with the way I like to buy."	
COMP4	"Using mobile payment fits into my life style."	
Knowledge		
KNOW1	"I can use the mobile payments services without detailed instruction on its use."	(Lwoga & Lwoga, 2017)
KNOW2	"I have the skills/knowledge necessary for purchasing products via mobile devices."	
KNOW3	"I am confident of purchasing products via mobile devices."	
KNOW4	"In general, I am competent in using the m-payments services."	
Technical elements		
TE1	"Mobile payment will offer prompt service to me."	(Shin & Lee, 2014)
TE2	"I find mobile payment systems as smart."	
TE3	"I want to be able to test mobile payment first."	(Pham & Ho, 2015)
TE4	"I want to be able to use it on a trial basis first to see what it can do."	
Enjoyment		
ENJY1	"Using mobile payment is fun."	(Oliveira et al, 2016)
ENJY2	"Using mobile payment is enjoyable."	
ENJY3	"Using mobile payment is very entertaining."	

(Table 10 Continued)

Number	Items of Constructs	Related Study
Security		
SEC1	"I believe mobile payment systems to be secure."	(Slade et al, 2015)
SEC2	"I believe mobile payment systems are trustworthy."	
SEC3	"I would feel secure sending sensitive information across mobile payment."	(Oliveira et al, 2016)
SEC4	"The risk of an unauthorized party intervening in the mobile payment process is low."	(Liébana-Cabanillas et al, 2015)
SEC5	"I would like mobile payment systems to be safe and secure to make payment transactions."	
Cost		
COST1	"It would cost a lot to use mobile payment."	(Pham & Ho, 2015)
COST2	"There are financial barriers (phone prices and internet access charges) to my using mobile payment."	
COST3	"Using mobile payment systems does not create additional cost."	-
COST4	"Mobile payment is reasonably priced."	(Oliveira et al, 2016)
COST5	"Mobile payment is a good value for the money."	
COST6	"At the current price, mobile payment provides a good value."	
New Technology Anxiety		
NTA1	"I feel apprehensive about using new technology."	(Bailey et al, 2017)
NTA2	"The use of new technology can be intimidating."	
NTA3	"I fear that I will do the wrong thing when I use new technology."	
NTA4	"I am not too comfortable using new technology."	
Social Influence		
SI1	"People who are important to me would recommend using the mobile payment system."	(Liébana-Cabanillas et al, 2015)
SI2	"People who are important to me view the mobile payment system as beneficial."	
SI3	"People who are important to me think it is a good idea to use mobile payment systems."	
SI4	"The people in my environment who use mobile payment are more prestigious than those who do not use it."	(Liébana-Cabanillas et al, 2014)
SI5	"The people in my environment who use mobile payment have a superior profile."	
SI6	"Using mobile payment is a status symbol in my environment."	
SI7	"The people whose opinions I value would approve of me using mobile payment systems."	

(Table 10 Continued)

Number	Items of Constructs	Related Study
Use		
USE1	"Given the opportunity, I would use a mobile payment system."	(Liébana-Cabanillas et al, 2015)
USE2	"I am likely to use a mobile payment system in the near future."	
USE3	"I am open to using a mobile payment system in the near future."	
USE4	"I intend to use a mobile payment system when the opportunity arises."	

3.2.1 Study Setting

The (online) questionnaire is distributed using Google Forms. The questionnaire is distributed in both Turkish and English. The questions asked in the Turkish questionnaire is translated from its English source. To check the translation, it is again back to English. The link of questionnaire is mainly distributed using e-mail or WhatsApp message.

Since the data is collected with convenience and snowball sampling methods, the participants are mainly located in Ankara, İstanbul and İzmir. The study is conducted in Ankara, Turkey.

3.2.2 Pilot Study

An online questionnaire is prepared with items given in table above to measure the effects of different factors on acceptance of mobile payment technologies. The answers are collected by convenience sampling within three days. For the pilot study, 32 answers are used.

To measure internal consistency of measuring instrument, Cronbach's alpha values are examined for each of the item given in Table 10. After examination process, some items are eliminated with respect to their Cronbach's Alpha or correlation value. The value for Cronbach's alpha should be between 0,7 and 0,95 for a good level of internal consistency. Very high level of Cronbach's alpha values might indicate a high level of correlation. (Tavakol & Dennick, 2011) Consequently, item eliminations are conducted accordingly.

Minitab 18 software is used to calculate related statistics. In the final version, eliminated items are given in Table 11.

Table 11 Eliminated Factor Items

Factor	Eliminated Item	Reason
Usefulness	USEF3	High correlation
Usefulness	USEF5	Low Cronbach's Alpha
Ease of Use	EOU1	Low Cronbach's Alpha
Ease of Use	EOU4-5	High correlation
Technical Elements	All	Low Cronbach's Alpha
Security	SEC2	High correlation
Security	SEC5	Low Cronbach's Alpha
Cost	COST1-2-3	Low Cronbach's Alpha
Compatibility	COMP1	High correlation
Social Influence	SI3	High correlation
Social Influence	SI5	Low Cronbach's Alpha
Use	USE2-4	High correlation

Elimination process is conducted for increasing Cronbach's alpha statistics or to lower correlation between items of a factor. At the final state; factors of innovativeness, new technology anxiety, enjoyment and knowledge are kept as they are. Items related to technical elements factor are removed, due to low level of Cronbach's alpha. Detailed process information is provided in APPENDIX C. At the final state, with the pilot data the Cronbach's Alpha value for the whole model equals to 0,882.

3.3 Data Analysis Method

To analyze factors and assess the structural model, PLS-SEM (Partial Least Square – Structural Equational Modelling) statistical method is employed with the help of SmartPLS 3.2.7 software. This method is selected due to following reasons.

First, it is one of the most popular method used according to literature review, as it is given in section 2.3.6, Figure 15.

Second, and more importantly, there are two types of SEM models: PLS-SEM and CB-SEM (Covariance based - SEM). CB-SEM is suitable for theory testing or confirmation. However, in this research the purpose is to predict key constructs which is better to be conducted with PLS-SEM method. (Hair et al, 2011) Since, PLS-SEM method is more compatible with the purpose of research, it is used in analyses.

Finally, data restrictions for PLS-SEM is more relaxed compared to CB-SEM. PLS-SEM is able to offer better results for non-normal data with fewer sample size. Also, it is important to keep in mind that in the algorithm observations affecting latent variables are used with their standardized value instead of individual scores. (Hair et al, 2011)

CHAPTER 4

QUANTITATIVE ANALYSES & RESULTS

In this section, quantitative analyses and related results are provided. Sample properties, missing data handling processes, properties of data, assessment of SEM, statistical results of the models are given in this chapter.

For the data analysis various software are used which are Microsoft Excel, SmartPLS 3.2.7 and Minitab 18. Microsoft Excel is used to organize and handle data. Minitab 18 is used for calculating Cronbach's alpha and correlation statistics for pilot study. SmartPLS 3.2.7 is used for remaining statistical calculations including factor and path analysis for structural equational modelling algorithm.

4.1 Data Analyses

After pilot study is conducted, some items are eliminated (given in section 3.2.1, Table 11) and questionnaire is distributed again using Google Forms. During three-week period answers are collected using convenience and snowball sampling methods. Final version of the questionnaire is given in APPENDIX D.

4.1.1 Sample

378 answers are collected from participants. Among collected answers 302 of them were suitable and they are used in the analysis. Answers are eliminated mostly due to the reason of participants have not used any mobile payment system before. Demographic information acquired from the first part of the questionnaire is given in Table 12 for 302 answers.

Table 12 Demographic Information of Sample

Age of Participants		
Range	Count	Percentage
18-30	148	49,01%
31-40	80	26,49%
41-50	44	14,57%
51-60	26	8,61%
More than 60 years	4	1,32%
Level of Education		
Degree	Count	Percentage
Bachelor's degree	181	59,93%
High school	19	6,29%
Master's degree or more	79	26,16%
Two-year degree	23	7,62%
Smartphone Usage		
Range	Count	Percentage
0-1 year	2	0,66%
1-3 years	10	3,31%
3-5 years	61	20,20%
5-10 years	168	55,63%
More than 10 years	61	20,20%
Mobile Payments Usage		
Range	Count	Percentage
0-1 year	39	12,91%
1-3 years	86	28,48%
3-5 years	81	26,82%
5-10 years	70	23,18%
More than 10 years	26	8,61%

4.1.2 Handling of missing values

Among the answers collected from participants, some of them are deleted listwise and some of them are replaced with the missing value's related factor mean. Among 378 answers three of them had too many missing values. Hence, they are deleted listwise. 27 of the answers had one to three missing values. Those missing values are replaced with related factor mean values. At the end 375 of the answers were fit to use in data analysis. After that, the participants who have not used mobile payment before are eliminated. Finally, 302 of them are used in the analyses.

4.1.3 Data Properties

Normality is tested by examining skewness and kurtosis values of data distribution. Related values for normal distribution are 0 and 3 respectively, in ideal case. When the data is examined, it does not show the exact characteristics of normal distribution. However, this is not a problem since PLS-SEM analysis can handle non-normal data even better than CB-PLS (Dijkstra & Henseler, 2015). The skewness and kurtosis data, along with other statistical measures, are given in APPENDIX F.

It is also useful to consider the fact that normality issues are handled well in PLS-SEM method. Unlike CB-SEM, in PLS-SEM normality of data is not a problem. (Hair et al, 2011) Therefore, the normality of the data is fit to use PLS-SEM statistical method.

In APPENDIX F, mean and trimmed mean information can be seen, as well. The difference between two of those statistics are not high. Therefore, the outliers can be considered as the part of the population and they are decided to be kept in analyses.

4.2 Structural Equation Modelling

In this section, first the model is evaluated with various statistical analyses, then the initially proposed model is tested with path analysis. After, model is modified according to results acquired and final model is tested again.

4.2.1 Evaluation of model

In this section initial model is analyzed with PLSc algorithm of SmartPLS 3.2.7. The consistent version is preferred over regular PLS algorithm since the PLSc algorithm provides consistency for inter-factor correlations. Also, with the same algorithm patch coefficients becomes consistent as well as factor loadings (Dijkstra & Henseler, 2015). The PLSc algorithm (path analysis) is used with 1000 iterations and 10^{-7} sensitivity. Initial model is given below in Figure 19.

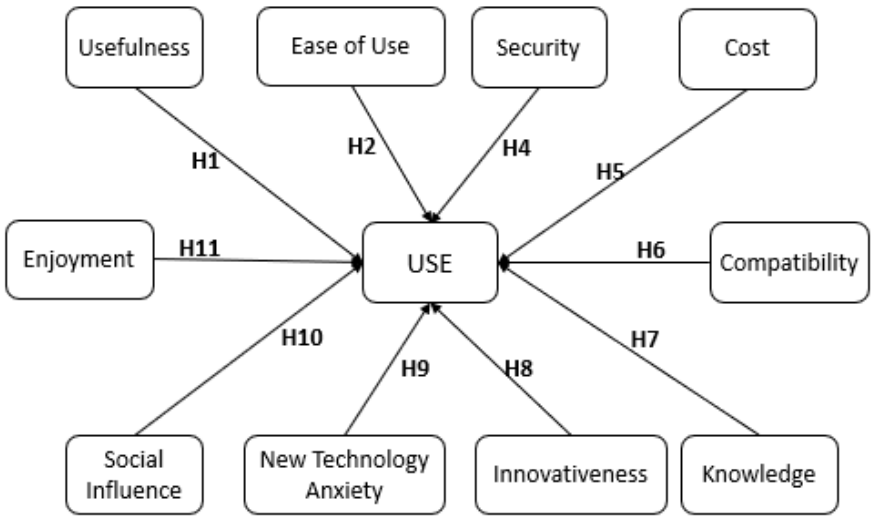

Figure 19 Initially Proposed Model

H3 is removed earlier due to elimination of factor, technical elements, since the factor's alpha value is below the threshold.

To be able to measure construct reliability and validity of the model, the software SmartPLS 3.2.7, is employed. Measures related to construct reliability and validity are given below in Table 13.

Table 13 Construct Reliability and Validity

Factor	Cronbach's Alpha	Composite Reliability	AVE
Compatibility	0,869	0,870	0,693
Cost	0,856	0,860	0,675
Ease of use	0,859	0,861	0,674
Enjoyment	0,914	0,915	0,782
Innovativeness	0,878	0,878	0,706
Knowledge	0,895	0,900	0,696
New Technology Anxiety	0,875	0,872	0,638
Security	0,813	0,816	0,599
Social Influence	0,843	0,839	0,635
Use	0,845	0,845	0,731
Usefulness	0,855	0,855	0,600

Cronbach's alpha value should be between 0,7 and 0,95 for construct reliability (Tavakol & Dennick, 2011). When Table 13 above is examined it is seen that for all constructs have good values of Cronbach's alpha values. However, some researchers suggest that Composite reliability values are "better estimates for true reliability" when weighed the differences between alpha values (Peterson & Kim, 2013). When the table above examined, it is seen that composite reliability measures are also higher than 0,7 for each factor.

Average Variance Extracted (AVE) values are also given in table above. Each factor surpasses the value of 0,5; showing that model validity is established (Henseler et al, 2016).

In order to ensure convergent validity following issues should be examined. First one is factor loadings should be greater than 0,707 and significant. Secondly, composite reliabilities should be higher than 0,7. Finally, AVE values should be larger than 0,5 (Fornell & Larcker, 1981) (Gorla et al, 2010).

The last two criteria are checked above. In the study (Hair et al, 1998), it is stated that the it is enough for factor loadings to pass 0,6. When factor loadings are checked, it is seen that two of the factors (SI4 and SI6) are below that threshold. Therefore, they are eliminated. Final values for the factor loadings are given below in Table 14.

Table 14 Factor loadings

Factor	Load	Factor	Load	Factor	Load	Factor	Load	Factor	Load
COMP2	0,721	ENJY2	0,919	INN3	0,852	NTA1	0,619	SI1	0,749
COMP3	0,874	ENJY3	0,825	USE1	0,857	NTA2	0,708	SI2	0,784
COMP4	0,892	EOU2	0,764	USE3	0,853	NTA3	0,818	SI7	0,854
COST4	0,702	EOU3	0,804	KNOW1	0,669	NTA4	0,999	USEF1	0,848
COST5	0,888	EOU6	0,890	KNOW2	0,867	SEC1	0,835	USEF2	0,680
COST6	0,861	INN1	0,885	KNOW3	0,908	SEC3	0,815	USEF4	0,653
ENJY1	0,905	INN2	0,780	KNOW4	0,871	SEC4	0,661	USEF6	0,889

As it is seen in the table above factor loadings are all higher than 0,6. Therefore, convergent validity is ensured.

Collinearity of factors and factor items are examined below. To examine the collinearity VIF (Variance Inflation Factor) values are used. Variance Inflation Factor values start from 1 to infinity. 1 represents no correlation. If VIF values are very much higher than 1, multicollinearity can be a problematic issue (Henseler et al, 2016). The outer and inner values of VIF are given in Table 15 and Table 16, respectively.

Table 15 Outer Variance Inflation Factor Values

Factor	VIF	Factor	VIF	Factor	VIF	Factor	VIF	Factor	VIF
COMP1	2,20	ENJY2	4,93	INN3	2,67	NTA1	2,24	SI1	3,77
COMP2	3,07	ENJY3	3,06	INT1	2,15	NTA2	2,63	SI2	3,61
COMP3	2,20	EOU1	1,77	INT2	2,15	NTA3	2,54	SI5	1,46
COST1	1,79	EOU2	2,76	KNOW1	1,57	NTA4	2,19	USEF2	2,53
COST2	2,64	EOU3	2,61	KNOW2	3,78	SEC1	1,90	USEF3	1,88
COST3	2,47	INN1	2,17	KNOW3	4,24	SEC2	2,09	USEF4	2,13
ENJY1	3,13	INN2	2,52	KNOW4	3,25	SEC3	1,59	USEF1	2,63

Table 16 Inner Variance Inflation Factor Values

Factor	Use
Compatibility	4,328
Cost	1,791
Ease of use	3,188
Enjoyment	1,702
Innovativeness	1,605
Knowledge	3,683
New Technology Anxiety	1,613
Security	1,654
Social Influence	1,757
Usefulness	2,829

As it is seen in tables above, the VIF values for both outer and inner case are not very different than one, considering a scale going to infinity. Moreover, as a rule of thumb, VIF values should be less than 5. (Hair et al, 2011) Hence, the collinearity of model is fit for the research.

Discriminant validity of the model is checked with HTMT (Hetero Trait - Mono Trait) Ratio. To ensure discriminant validity of the model, SmartPLS offers Fornell-Larcker criterion, cross-loadings and HTMT ratio. In this research, HTMT ratio is selected to check discriminant validity. Since, cross loadings of Fornell-Larcker criterion fails provide better results compared to HTMT ratio. (Henseler et al, 2015) The related statistical information is given in Table 17.

Table 17 HTMT Ratio for Initial Model

#	Factor	1	2	3	4	5	6	7	8	9	10	11
1	Compatibility											
2	Cost	0,60										
3	Ease of use	0,68	0,42									
4	Enjoyment	0,54	0,40	0,49								
5	Innovativeness	0,45	0,23	0,37	0,44							
6	Knowledge	0,78	0,40	0,69	0,49	0,52						
7	Anxiety	0,34	0,18	0,30	0,25	0,43	0,52					
8	Security	0,53	0,52	0,50	0,33	0,29	0,47	0,30				
9	Social Influence	0,55	0,34	0,49	0,49	0,38	0,45	0,07	0,33			
10	Use	0,79	0,44	0,65	0,64	0,53	0,71	0,41	0,43	0,52		
11	Usefulness	0,68	0,48	0,74	0,49	0,28	0,49	0,17	0,43	0,47	0,72	

According to research (Henseler et al, 2015), there are studies suggesting that the HTMT values should be less than 0,9 and 0,85. HTMT ratio helps us to ensure that construct measure is unique and provides the model necessary information that cannot be acquired from other factors. As it can be seen in table above, there is no HTMT value below 0,85 for any factor. Hence, discriminant validity is ensured.

Finally, to ensure avoiding model misspecification Standardized Root Mean Square Residual values (SRMR) are controlled. (Henseler et al, 2014) The value equals to 0,047 for the model. The value ensures the model fitness since the values less than 0,08 is considered as valid for this measure. (Hu & Bentler, 1998)

4.2.2 Results of Path Analysis for Proposed Model

After the model is run with the following results are acquired. Path analysis with consistent PLS algorithm can be seen below in Figure 20.

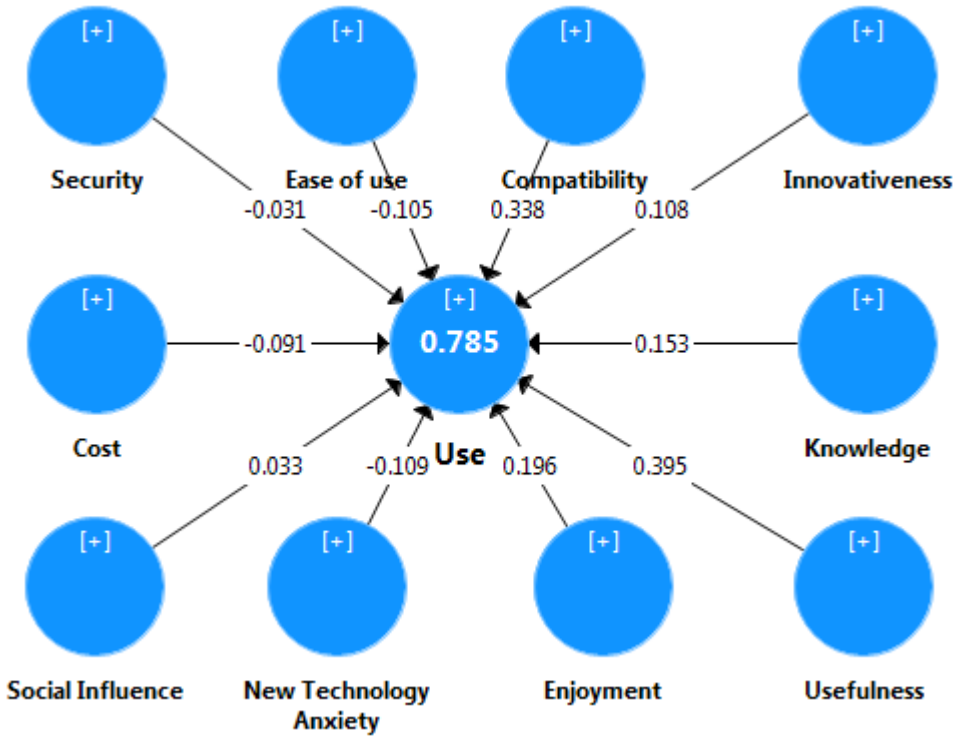

Figure 20 Path Analysis of Initial Model

In the above figure, the numbers on arrows represent path coefficients. R square of the initial model (explained variance) equals 78,5%. Adjusted R square value equals to 77,8%.

Significance of the model above is determined with consistent bootstrapping algorithm. The algorithm is run with 5000 subsamples. The results are given below in Table 18.

Table 18 Path Coefficients for Initial Analysis

Relation	Path Coefficient	P Values	State
Compatibility -> Use	0,338	0,016	Supported
Cost -> Use	-0,091	0,193	Rejected
Ease of use -> Use	-0,105	0,364	Rejected
Enjoyment -> Use	0,196	0,006	Supported
Innovativeness -> Use	0,108	0,071	Supported
Knowledge -> Use	0,153	0,183	Rejected
Anxiety -> Use	-0,109	0,065	Supported
Security -> Use	-0,031	0,632	Rejected
Social Influence -> Use	0,033	0,641	Rejected
Usefulness -> Use	0,395	0,000	Supported

According to table above; factors of new technology anxiety, compatibility, enjoyment, innovativeness, and usefulness are found to significantly affecting use of mobile payment systems. However; factors of cost, ease of use, knowledge, security, and social influence found to be insignificant in affecting use of mobile payment technologies.

4.2.3 Model modification

After results are acquired from initially proposed model, inter-factor relations are also examined. The relations added to the initial model are given in Table 19. Those relations are taken from literature review; since the initially proposed model does not adopt any well-known acceptance model directly.

Table 19 Added Relations

Reference Study	Relation	P Values	State
Liébana-Cabanillas et al, 2017	Ease of use > Usefulness	0,000	Supported
	Social Influence > Usefulness	0,542	Rejected
	Social Influence > Ease of use	0,094	Supported
Khalilzadeh et al, 2017	Security > Ease of use	0,010	Supported
	Security > Usefulness	0,894	Rejected
Martens et al, 2017	Innovativeness > Usefulness	0,117	Rejected
	Innovativeness > Ease of use	0,302	Rejected
Oliveira et al, 2016	Compatibility > Usefulness	0,009	Supported
	Compatibility > Ease of use	0,112	Rejected
	Innovativeness > Compatibility	0,000	Supported
Chandrasekhar & Nandagopal, 2016	Social Influence > Compatibility	0,000	Supported
Liébana-Cabanillas et al, 2014	Social Influence > Security	0,538	Rejected
Peng et al, 2012	Compatibility > Security	0,012	Supported
	Knowledge > Ease of use	0,001	Supported
	Knowledge > Security	0,248	Rejected
Ooi & Tan, 2016	Cost > Usefulness	0,188	Rejected
Koenig-Lewis et al, 2015	Enjoyment > Usefulness	0,315	Rejected
	Enjoyment > Ease of use	0,116	Rejected
	Enjoyment > Security	0,681	Rejected

Those relations are added to the model for testing. After final step, some relations are supported, and some relations are rejected as it can be seen in Table 19.

4.2.4 Final model

After all iterations are made, final version of the model is given in this section. Path coefficients can be found on relation arrows. It can be seen below in Figure 21. The

model only consists of remaining significant relations to prevent unnecessary visual complexity.

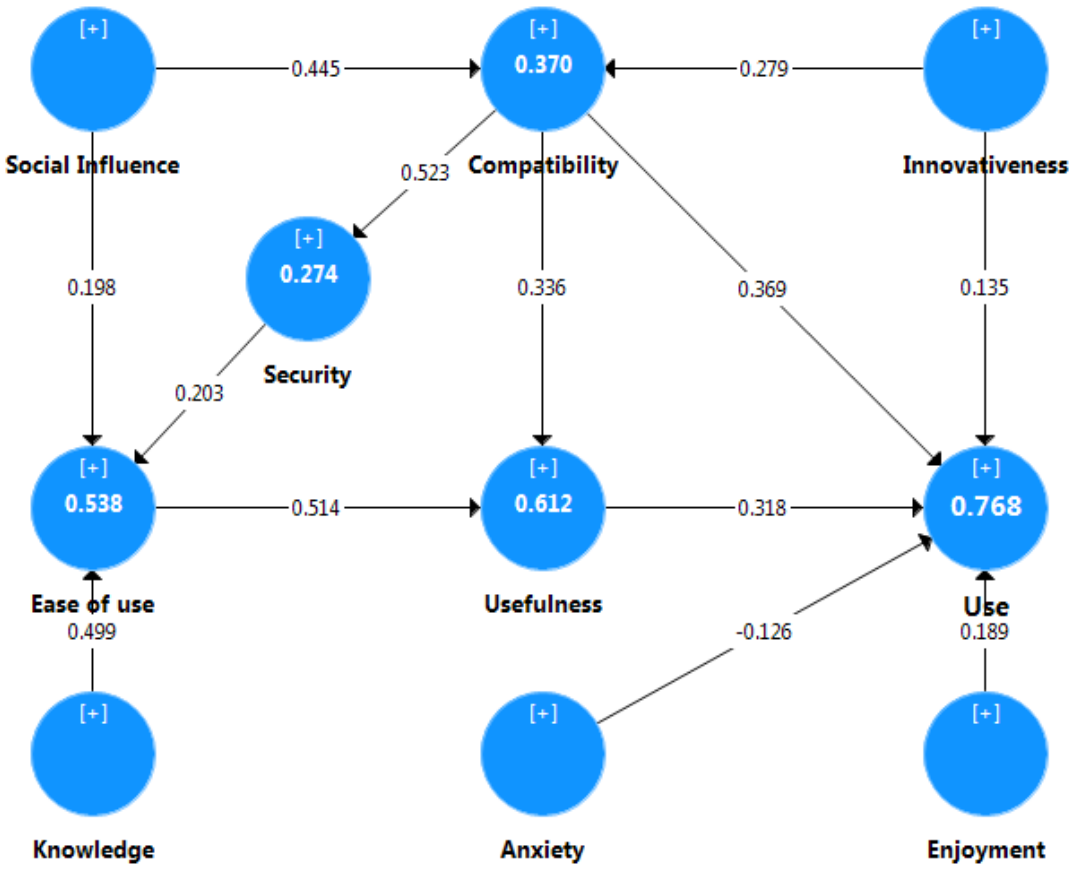

Figure 21 Final Model Proposition

Figure 21 given above, shows only the significant factor relations. All tried relations are given above in Table 19. In the final model, it is seen that compatibility affects security and usefulness. Usefulness is affected by ease of use. Innovativeness and social influence affect compatibility; knowledge, security, and social influence affect ease of use significantly. The remaining relations are eliminated from final model due to higher p-values.

The final model's R square for use of mobile payment technologies is 76,8% and adjusted R square value equals to 76,4%. R square value is slightly less than the value calculated for the initially proposed model which is 78,5%. However, final model is still preferable since it has less number of factors and almost the same amount of explaining power.

In addition, R square value calculated in this section is much higher than the mean R square values calculated related to this literature which is given as 60,78% in section 2.3.6. R square values can be seen below in Table 20.

Table 20 R square Values for Final Model

Factor	R Square	R Square Adjusted
Compatibility	0,370	0,366
Ease of use	0,538	0,533
Security	0,274	0,271
Use	**0,768**	**0,764**
Usefulness	0,612	0,609

CHAPTER 5

DISCUSSIONS & CONCLUSIONS

In this section, results are evaluated for literature review and each factor mentioned in research. Moreover, limitations of the study are given. Section is concluded with suggestions for future study, for others to use in their own research, and conclusions.

5.1 Discussions of the Literature Review Phase of the Research

In this section of the thesis, results of the literature review are summarized. Literature of mobile payment adoption is reviewed systematically. 69 papers are examined from 2005 to March 2018. Following results are acquired from review.

- Mobile payment adoption studies in the literature has an increasing trend. This shows that, the topic carries a good amount of importance, and draws academician's attention.
- An important part of the studies is conducted in China. This can be due to many reasons including China's population in universities.
- Most of the papers use TAM, DOI or UTAUT as the theoretical background. Among them, TAM has the lead. It is not surprising, considering the popularity of TAM. UTAUT can be considered as a more extensive version of TAM. Therefore, academicians are inclined to use those models.
- In the first years of literature review span, it is seen that SMS payments and WAP technology are examined mostly. However, more contemporary studies inspect mostly proximity payment methods or does not specify a method and include them all. This is because, the technology has evolved accordingly. Therefore, the studies examined followed as expected.
- Median of the sample size used in the studies is 292. This can be interpreted as an appropriate number, since the statistical measures related to sample was satisfactory in the papers.
- Most of the studies (74%) adopted a quantitative approach. This is due to the nature of this literature. Opinions of people are generally collected with surveys.
- Majority of the studies are statistically analyzed with Structural Equation Modelling. The statistical method is used with SPSS – AMOS software. The mean variance of the studies equals to 60,78%. This value can be considered

as fitting. Because, the models consist human factor in them, which has the potential of creating a great amount of variance.

- 69 papers used 422 constructs in total. 178 of them were different. They are grouped into 11 categories. Security, ease of use and usefulness are the top three, most frequently used constructs in the papers.
- Significant relations of the models used in the papers are extracted with respect to categories mentioned in previous bullet. The results show that, the mostly used significant factors are usefulness, security, ease of use, and social influence. Usefulness affected usage (or intention to use) more frequently compared to ease of use. It shows that people find mobile payment methods already easy and they are interested in more about its usefulness.

5.2 Discussions Based on the Factors of Research Model

In this part, each factor is evaluated according to results obtained from statistical analyses. In addition, the results of quantitative analyses are compared to results in literature and qualitative analyses.

5.2.1 Usefulness

Usefulness is found as the most powerful factor affecting the usage of mobile payment adoption. In the initial model given in Table 18, it is seen that usefulness affects use of mobile payments with p-value of 0,000. The relations path coefficient is 0,395. Hence, it is safe to state that H1 given earlier is supported. As a conclusion, usefulness affects usage of mobile payment significantly.

Findings above are parallel to results found in literature. In several studies usefulness is proven to be a significantly affecting factor of mobile payment usage (Guo, 2017) (Pham & Ho, 2015) (Zhong et al, 2013).

Results acquired from quantitative analyses are supported with interview results. Many interviewees stated that they would not use something that is not useful, and usefulness of a tool is among the top reasons that affect their decision to use or not.

5.2.2 Ease of Use

In Hypothesis 2, it is stated that use of mobile payments is affected by ease of use. The hypothesis is rejected after the examination of Table 18, due to p value of 0,364. However, ease of use finds itself a place in final version of the model. In final version, ease of use affects usefulness significantly with a path coefficient of 0,514.

The results of initial model are similar to some studies in literature (Qasim & Abu-Shanab, 2016). It is stated that the factor usefulness is significantly affecting the factor ease of use as well, which is similar to findings depicted from this research (Liébana-Cabanillas et al, 2017).

Qualitative analyses provide explanation for the rejection of the hypothesis 2. During the interviews, one of the participants stated that "…During these days, using

technology is mostly easy for its users. Therefore, ease of use is not really a concern for users…". The statement, suggests that ease of use can be ineffective in affecting use of mobile payment technologies.

5.2.3 Technical Elements

This factor is eliminated before the construction of SEM due to its low Cronbach's alpha value. This situation is probably caused by the aggregation process of technical elements. Various attributes are brought together in this factor. Consequently, the instrument becomes incapable of measuring the effect of the related factor in a reliable manner. Therefore, the H3 is not tested and taken out of the scope of this study.

5.2.4 Security

The factor "security" fails to affect use of mobile payments significantly. Earlier, effect of security is positively related with the use of MP technology in hypothesis 4. Results acquired from bootstrapping for the first model shows that, H4 is rejected with a p-value of 0,632 as shown in Table 18. In the final model, security is also tested for affecting both "ease of use" and "usefulness". Former is supported with a path coefficient of 0,203. On the other hand, latter is rejected with a p-value of 0,894.

Results mentioned above are parallel to literature (Trachuk & Linder, 2017). For the effect of security on ease of use results are similar to literature as well (Khalilzadeh et al, 2017). In the related study, the effect of security on ease of use is established as "trust". In this case, the relation can be interpreted as follows: As the users feels secure about their service provider, and the mean of mobile payment; they are likely to feel that the effort to be spent on the process would be less. Therefore, ease of use is positively correlated with feeling secure. In the same study it is stated that security also affects usefulness. This is contradicting with the final model.

Qualitative analysis showed that participants does not worry about sharing their information while using mobile payment processes. One of the interviewee stated that "… I am already sharing my credit card or ID for many transactions. I believe it is same in the case of mobile payments …". This comment helps us to understand results of quantitative analysis.

5.2.5 Cost

In the initial model effect of cost on usage of mobile payments is tested with fifth hypothesis. It is not supported (p=0,193), as shown in Table 18. In the final model cost is tested for its effect on usefulness. The effect was insignificant with a p-value of 0,188. Therefore, in the final model "cost" could not find a place for itself.

The findings depicted from initial model is parallel to literature (Pham & Ho, 2015) (Slade et al, 2015). Cost's effect on usefulness is tested since it was shown as significant in the study (Ooi & Tan, 2016). However, it is rejected in this study.

Matching results are acquired from qualitative analyses. Many participants stated that they already own a mobile phone (smart phones) for their other needs in daily life. Therefore, using a mobile payment functionality does not create additional costs for them. Consequently, cost factor turns out to be insignificant in affecting mobile payment usage.

5.2.6 Compatibility

Compatibility is tested for its effect on use of mobile payment systems in initial model. The hypothesis is supported with a path coefficient of 0,369. The factor also tested for its effect on usefulness, ease of use and security. Hypotheses are supported (path coefficient: 0,336), rejected (p-value: 0,112) and supported (path coefficient: 0,523), respectively.

The results given above can be supported with many other research from literature (Ooi & Tan, 2016) (Ramos-de-Luna, 2016) (Pham & Ho, 2015). In the study, (Oliveira et al, 2016), compatibility has a positive effect on usefulness and ease of use. In this study, former one is found to be matching and latter one is contradicting. However, the p-value for contradicting hypothesis is 0,105. Therefore, it is almost parallel with the findings reference study. In the study, (Peng et al, 2012), findings are similar to ones in this research. In both studies compatibility affects security significantly. The effect on security can be explained as follows: As the users of the technology finds the mobile payment system more matching with his/her lifestyle, needs and experiences, the user starts to feel more secure. In the study, (Peng et al, 2012) the relation is explained as follows. Compatibility is matched with user's experiences and it is expected to decrease user's uncertainty, hence user would feel more secure.

Both quantitative and qualitative analyses point out that compatibility is one of the very important factors affecting use of MP. One of the interviewee stated that "… I would use mobile payments; however, it is not suitable with the way I spend my money. I generally earn in cash form, so I do not bother transferring my money to banks…". This shows that, compatibility is one of the must conditions for use of mobile payments.

5.2.7 Knowledge

Knowledge's effect is tested on factors use of mobile payments, security and ease of use. First two relations are rejected with p-values 0,183 and 0,248 respectively. The last relation is supported with a path coefficient of 0,499.

In the study (Koenig-Lewis et al, 2015) the relation in the initial model is tested as well, and it is supported. This study contradicts with its findings. The relation between knowledge and ease of use is similar to one in literature (Peng et al, 2012). However, the relation with security is accepted in the same research.

The sample used in this study consists of highly educated people. 86% of the participants have a bachelor's degree or above. In this case, this might be the underlying reason for knowledge to not affect use of mobile payments significantly.

5.2.8 Innovativeness

In SEM model the factor “innovativeness” is tested for its effect on use of mobile payments, usefulness, ease of use and compatibility. Effects on usefulness and ease of use are rejected with p-values of 0,117 and 0,302 respectively. In initial model, innovativeness affects usage with a p value of 0,071 a path coefficient of 0,108. Also, innovativeness affects compatibility with a p-value of 0,000 and a path coefficient of 0,279.

Findings of initial model is parallel with several studies from literature (Liébana-Cabanillas et al, 2015) (Slade et al, 2015) (Tan et al, 2014). The results derived from final model become parallel with the study (Oliveira et al, 2016). However, they are conflicting with the research (Martens et al, 2017).

By evaluating the information above it can be said that innovative people are more likely to use new technology such mobile payments. Qualitative analysis produces similar results since people in interviews defined themselves as innovative people for many occasions.

5.2.9 New Technology Anxiety

In Hypothesis 9, it is suggested that use of mobile payments and new technology anxiety have a negative relationship between them. Results of SEM in initial model supports H9 with a p-value of 0,065 and a path coefficient of -0,109. However, it is important to note that p value is close to 0,1. The result would not be supported in a 95% confidence interval. However, it is supported in a 90% confidence interval. It means that this result might be considered as inconclusive.

During the interviews participants mostly stated that they are generally more willing to try a new technology rather than being anxious about it. However, it should be kept in mind that interviews are conducted with a small part of the sample.

5.2.10 Social Influence

Social influence is tested for its effect on usage, usefulness, security, ease of use and compatibility. The relations with usage, usefulness and security are rejected with following p-values: 0,641; 0,542; 0,681 respectively. On the contrary, the effect on ease of use and compatibility is accepted with path coefficients of 0,198; 0,445 respectively. Hypothesis that suggests the effect of social influence on use of mobile payments is rejected in this study, and it is also rejected in several studies as well (Kim et al, 2016) (Tian & Dong, 2013) (Shin, 2009).

Effect on ease of use and compatibility is parallel with results of literature review (Liébana-Cabanillas et al, 2017) (Chandrasekhar & Nandagopal, 2016). However, remaining results about usefulness and security are contradicting with some studies (Liébana-Cabanillas et al, 2017) (Liébana-Cabanillas et al, 2014).

Qualitative analysis explains the relationship between social influence and use of mobile payments. During the interview, one of the participants stated that "… I would not let anyone to influence my thoughts on something like my payment choices…". Consequently, participants do not like to be influenced on this kind of topic.

5.2.11 Enjoyment

With H11 enjoyment is tested with use of mobile payments. The hypothesis is supported with a p-value of 0,006 and a path coefficient of 0,196 (initial model). The effect of enjoyment is also tested on usefulness, ease of use and security. However, they are all rejected with following p-values 0,315, 0,116 and 0,681 (final model).

In the study, (Koenig-Lewis et al, 2015), enjoyment is found to be affecting usefulness, ease of use and security. However, this study conflicts with it. They are all rejected. In the same study effect of enjoyment on intention to use MP fails to be significant, however, this study conflicts with it by suggesting otherwise.

During the interview, one of the participants stated that "… Sometimes, especially, after I use NFC payment with my phone, I feel quite entertained…". This statement suggests that users of mobile payment are enjoying their transactions.

5.3 Further Discussions

In this section, results acquired from both literature review and quantitative analyses are compared with other cultures briefly. Below table groups studies by their region. The regions Africa and South America is eliminated due to having only one studies in their region. At the end studies are grouped into four regions: Asia, Europe, Middle East, and North America. The factors tested in this study is given in the first column. The other columns, given in Table 21, provide information about share of the factors in the related regions.

Table 21 Factors' Shares and Related Regions

Factors	**Asia**	**Europe**	**Middle East**	**North America**
Usefulness	25,0%	26,9%	35,7%	23,5%
Ease of Use	17,0%	13,5%	7,1%	17,6%
Security	25,0%	23,1%	21,4%	41,2%
Innovativeness	7,0%	5,8%	0,0%	0,0%
New Technology Anxiety	0,0%	0,0%	0,0%	0,0%
Social Influence	9,0%	23,1%	28,6%	5,9%
Enjoyment	0,0%	0,0%	7,1%	5,9%
Knowledge	2,0%	1,9%	0,0%	0,0%
Cost	4,0%	1,9%	0,0%	0,0%
Compatibility	11,0%	3,8%	0,0%	5,9%
Total	**100,0%**	**100,0%**	**100,0%**	**100,0%**

As given in earlier sections, in this research factors of usefulness, innovativeness, new technology anxiety, enjoyment and compatibility affect use of mobile payments significantly. When it is compared to other regions (or cultures) following similarities and differences are acquired.

- Usefulness is important for all regions; however, it has the most importance in Middle East.
- Innovativeness is generally less significant or insignificant compared to other factors. It is mostly used significantly in Asia.
- New technology anxiety is not found to be significant in regions above. However, it is significant within 90% confidence interval for this research.
- Enjoyment significantly affects use or intention to use the related technology mostly for studies conducted in Middle East.
- Compatibility is mostly significant for studies in Asia.

5.4 Limitations

In this study, data is collected with convenience and snowball sampling methods. In those methods data is collected from similar demography. Therefore, all attributes of the culture might not be examined thoroughly. Since the sample of this study consists of a bounded surrounding, it would be wrong to generalize the findings for the whole population.

Another limitation to this research is the fact that questionnaire prepared for data collection consisted of both Turkish and English questions. The questions asked are quoted from their English sources and translated into Turkish. This affects the participants' perception about the concept that is asked.

Moreover, the factor "technical elements" is removed from the statistical analyses due to Cronbach's alpha value. However, it was a factor used in other studies of literature. In this study it is not examined.

In addition, moderators such as age, gender or level of education are not taken into account within the scope of this research.

5.5 Directions for Future Study

This study has its limitations due to various reasons. Some alterations can be made to the study for a more extensive scope.

One of those alterations is increasing the selected keywords for search of literature review. Additional concepts related to mobile payment can be added to study. Instead of using "technology acceptance" and "technology adoption" keywords, the search can be conducted with less specific keywords such as "acceptance" and "adoption". In this case queries would provide more detailed results.

Another alteration to study might be including other databases to search. Although, databases of METU and Scopus are very extensive, there might be some studies overlooked in the literature.

The method used in collection of samples can be changed and sample size can be increased for more reliable results.

For future studies, the research can be studied in different time or with a different culture. The results might vary. Additional variables can be added to the model, without aggregating factors used in other studies. In this case, a more detailed SEM model can be created.

Finally, instead of using all types of mobile payments in the scope of the study, the scope can be narrowed down to a specific technology such as “tap and go” (NFC) methods. Then the model could provide more accurate results.

5.6 Conclusions

This thesis study has two phases. In the first phase, a literature review is conducted to better show the current state of mobile payments adoption literature. In this part, literature is examined from following perspectives:

- Number of studies with respect to years
- Location
- Theoretical background
- Mobile payment type
- Properties of the samples
- Research method and analysis
- Significant relations

The results of the literature review showed that, there is an increasing trend in number of studies conducted in this field. Many researchers use TAM as their theoretical base. Various mobile payment types are conducted in this literature and NFC-based payments are one of the most studied type of mobile payments. Significant factors used in literature are grouped together to propose an initial model.

In the second phase of the study, a technology acceptance model for mobile payment technologies is developed and validated. The model is analyzed quantitatively. Results show that usefulness is the most powerful actor in affecting use of mobile payments.

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APPENDICES

APPENDIX A

PAPERS USED IN THE STUDY

Title	Citation
"Testing the Technology Readiness and Acceptance Model for Mobile Payments Across Germany and South Africa"	Martens et al, 2017
"An empirical examination of initial use intention of mobile payment"	Guo, 2017
"Security-related factors in extended UTAUT model for NFC based mobile payment in the restaurant industry"	Khalilzadeh et al, 2017
"Quality in mobile payment service in India"	Singh et al, 2017
"User acceptance of mobile payment: The effects of user-centric security, system characteristics and gender"	Lwoga & Lwoga, 2017
"The adoption of mobile payment services by consumers: An empirical analysis results"	Trachuk & Linder, 2017
"Understanding the mobile payment technology acceptance based on valence theory: A case of restaurant transactions"	Ozturk et al, 2017
"A mixed methods empirical exploration of UK consumer perceptions of trust, risk and usefulness of mobile payments"	Hampshire, 2017
"Intention to use new mobile payment systems: A comparative analysis of SMS and NFC payments"	Liébana-Cabanillas et al, 2017
"An integrated value-risk investigation of contactless mobile payments adoption"	Cocosila & Trabelsi, 2016
"Mobile technology acceptance model: An investigation using mobile users to explore smartphone credit card"	Ooi & Tan, 2016
"Drivers of mobile payment acceptance: The impact of network externalities"	Qasim & Abu-Shanab, 2016
"A comparative study of China and US users' acceptance of online payment"	Hankun et al, 2016
"Mobile payment: Understanding the determinants of customer adoption and intention to recommend the technology"	Oliveira et al, 2016

Title	Citation
“Influence of cognitive style on mobile payment system adoption: An extended technology acceptance model”	Hossain & Mahmud, 2016
“Determinants of the intention to use NFC technology as a payment system: an acceptance model approach”	Ramos-de-Luna et al, 2016
“An investigation of mobile payment (m-payment) services in Thailand”	Phonthanukitithaworn et al, 2016
“The adoption of mobile payment services for “fintech””	Kim et al, 2016
“Mobile payment usage intent in an Indian context: An exploratory study”	Chandrasekhar & Nandagopal, 2016
“The effects of product-related, personal-related factors and attractiveness of alternatives on consumer adoption of NFC-based mobile payments”	Pham & Ho, 2015
“Apple - Pay, towards the acceptance of German customers”	Fiedler, 2015
“Enjoyment and social influence: predicting mobile payment adoption”	Koenig-Lewis et al, 2015
“Social aware mobile payment service popularity analysis: The case of WeChat payment in China”	Qu et al, 2015
“Cognitive trust, emotional trust and the value-based acceptance model in mobile payment adoption”	Zhang et al, 2015
“User intentions to adopt mobile payment services: A study of early adopters in Thailand”	Phonthanukitithaworn et al, 2015
“User behaviour in QR mobile payment system: the QR Payment Acceptance Model”	Liébana-Cabanillas et al, 2015
“The Integrated Model on Mobile Payment Acceptance (IMMPA): An empirical application to public transport”	Di Pietro et al, 2015
“Exploring consumer adoption of proximity mobile payments”	Slade et al, 2015
“Payment systems in new electronic environments: Consumer behavior in payment systems via SMS”	Francisco et al, 2015
“Modeling Consumers' Adoption Intentions of Remote Mobile Payments in the United Kingdom: Extending UTAUT with Innovativeness, Risk, and Trust”	Slade et al, 2015
“NFC mobile credit card: The next frontier of mobile payment?”	Tan et al, 2014
“An empirical study on consumer acceptance of mobile payment based on the perceived risk and trust”	Mingxing et al, 2014
“The moderating effect of espoused cultural dimensions on consumer's intention to use mobile payment devices”	Alshare & Mousa, 2014
“Adoption of near field communication for mobile payment: Evidence from Macau”	Sam et al, 2014
“Understanding the adoption and usage of mobile payment services by using TAM3”	Jaradat & Al-Mashaqba, 2014

Title	Citation
“The effects of technology readiness and technology acceptance on NFC mobile payment services in Korea”	Shin & Lee, 2014
“Adoption readiness, personal innovativeness, perceived risk and usage intention across customer groups for mobile payment services in India”	Thakur & Srivastava, 2014
“Consumer attitudes on mobile payment services - results from a proof of concept test”	Arvidsson, 2014
“Antecedents of the adoption of the new mobile payment systems: The moderating effect of age”	Liébana-Cabanillas et al, 2014
“Online behavior and loyalty program participation-parameters influencing the acceptance of contactless payment devices”	Fiedler & Öztüren, 2014
“Exploring consumer adoption of mobile payments in China”	Zhong et al, 2013
“An analysis of key factors affecting user acceptance of mobile payment”	Tian & Dong, 2013
“Investigating technology acceptance of Mobile payment in Germany and the USA”	Wiegard et al, 2012
“Understanding consumers' intention to use mobile payment services: The perspective of university students in Northern Jiangsu area”	Liu, 2012
“Determinants of user adoption of mobile electronic payment systems for microfinance institutions in developing countries: Case study Cameroon”	Mwafise & Stapleton, 2012
“A combinative model of behavioural and technical factors affecting 'Mobile'-payment services adoption: An empirical study”	Keramat et al, 2012
“Exploring tourist adoption of tourism mobile payment: An empirical analysis”	Peng et al, 2012
“Developing an analytical framework for mobile payments adoption in retailing: A supply-side perspective”	Lai & Chuah, 2010
“Examining the relative influence of risk and control on intention to adopt risky technologies”	Gupta & Xu, 2010
“Understanding consumer acceptance of mobile payment services: An empirical analysis”	Schierz et al, 2010
“Exploring the factors affecting the acceptance of mobile coupons in Malaysia”	Jayasingh & Eze, 2009
“Towards an understanding of the consumer acceptance of mobile wallet”	Shin, 2009
“Factors that affect mobile telephone users to use mobile payment solution”	Yan et al, 2009
“Mobile-phone users' attitudes towards' mobile commerce & services in the Gulf cooperation council countries: Case study”	Manochehri & Alhinai, 2008

Title	Citation
“Acceptance and use of mobile payments”	Viehland & Leong, 2007
“Understanding changes in consumer payment habits - Do mobile payments and electronic invoices attract consumers?”	Dahlberg & Öörni, 2007
“Does mobile payment technology Mnet attract potential consumers? The case of Kuwait”	Rouibah, 2007
“Evaluating the Role of Trust in Consumer Adoption of Mobile Payment Systems: An Empirical Analysis”	Chandra et al, 2010
“Customer Adoption of Mobile Payment Services by Professionals across two Cities in India: An Empirical Study Using Modified Technology Acceptance Model”	Thakur, 2013
“Mobile payments adoption by US consumers: an extended TAM”	Bailey et al, 2017
“Exploring Merchant Adoption of Mobile Payment Systems: An Empirical Study”	Mallat & Tuunainen, 2008
“A Scenario-Based Analysis of Mobile Payment Acceptance”	Goeke & Pousttchi, 2010
“Assurance on the reliability of mobile payment system and its effects on its' use: an empirical examination”	Meharia, 2012
“Analysis of factors that affect NFC mobile payment technology adoption - case study Telkomsel cash”	Fitriani et al, 2017
“Millennials' Perception on Mobile Payment Services in Malaysia”	Mun et al, 2017
“Consumer behavioral intentions towards mobile payment services An empirical analysis in Pakistan”	Aslam et al, 2017
“Intention to use new mobile payment systems a comparative analysis of SMS and NFC payments”	Liébana-Cabanillas et al, 2017
“How users’ Internet experience affects the adoption of mobile payment a mediation model”	Su et al, 2018
“A global approach to the analysis of user behavior in mobile payment systems in the new electronic environment”	Liébana-Cabanillas et al, 2018

APPENDIX B

LIST OF CONSTRUCTS

Constructs	**Group**
“Gain”	“Usefulness”
“Mobile Usefulness”	“Usefulness”
“Performance Expectancy”	“Usefulness”
“Relative Advantage”	“Usefulness”
“Usefulness”	“Usefulness”
“Benefits”	“Usefulness”
“Relative Usefulness”	“Usefulness”
“Personal Usefulness”	“Usefulness”
“Material Reward”	“Usefulness”
“Functional Value”	“Usefulness”
“Comparative Advantage”	“Usefulness”
“Perceived Usefulness”	“Usefulness”
“Utilitarian Value”	“Usefulness”
“Utilitarian Performance Expectancy”	“Usefulness”
“Hedonic Performance Expectancy”	“Usefulness”
“Personal Mobility”	“Technical aspect”
“The Possibility Of Testing”	“Technical aspect”
“Testing Capability”	“Technical aspect”
“Availability”	“Technical aspect”
“Mobility”	“Technical aspect”
“Result Demonstrability	“Technical aspect”
“Responsiveness””	“Technical aspect”
“Individual Mobility”	“Technical aspect”
“Process Integrity”	“Technical aspect”
“Speed”	“Technical aspect”
“Trialability”	“Technical aspect”
“Smartness”	“Technical aspect”
“Interconnection”	“Technical aspect”
“Output Quality”	“Technical aspect”
“Availability of Payment Transaction Information”	“Technical aspect”

Constructs	**Group**
“Quality”	“Technical aspect”
“Control of The Usage Process”	“Technical aspect”
“Payment Transaction Information”	“Technical aspect”
“Expressiveness”	“Social Influence”
“Subjective Norms”	“Social Influence”
“Social Norm”	“Social Influence”
“Perceived Reputation”	“Social Influence”
“Social Interaction”	“Social Influence”
“Social Influence”	“Social Influence”
“Peer Advocacy”	“Social Influence”
“External Influences”	“Social Influence”
“Social Value”	“Social Influence”
“Normative Pressure”	“Social Influence”
“Tourist Susceptibility to Interpersonal Influence”	“Social Influence”
“Peer Influence”	“Social Influence”
“Perceptions of External Control”	“Social Influence”
“Norm”	“Social Influence”
“Culture”	“Social Influence”
“Social Pressure”	“Social Influence”
“Risk”	“Security”
“Perceived Trust”	“Security”
“Privacy Concern”	“Security”
“Trust”	“Security”
“Cognitive Trust””	“Security”
“Perceived Security Concerns”	“Security”
“Perceived Security”	“Security”
“Security”	“Security”
“Perceived Risk”	“Security”
“Privacy Risk”	“Security”
“Emotional Trust”	“Security”
“Technology Risk”	“Security”
“Integrated Value Risk”	“Security”
“Security of Mobile Transactions”	“Security”
“Perceived Security Risk”	“Security”
“Service Credibility”	“Security”
“Mobile Perceived Security Risk”	“Security”
“Trust in System”	“Security”
“Trust in Application Service Providers”	“Security”
“Perceived Credibility”	“Security”

Constructs	**Group**
“Credibility”	“Security”
“Consumer Trust”	“Security”
“Mobile Perceived Trust”	“Security”
“Trust In Financial Organizations”	“Security”
“Security Risk”	“Security”
“Trust In Actors”	“Security”
“Perceived Risks”	“Security”
“Privacy”	“Security”
“Perceived Environmental Risk”	“Security”
“Confidentiality”	“Security”
“Trust in Operators”	“Security”
“Perceived Information Security”	“Security”
“Insecurity”	“Security”
“Perceived Structural Assurance”	“Security”
“Reliability	“Security”
“Information Privacy””	“Security”
“Perceived Security Risks”	“Security”
“Trust in Provider”	“Security”
“Perceived Technology Security”	“Security”
“The Risk of Use”	“Security”
“Additional Values of NFC”	“Other”
“Cognitive Style”	“Other”
“Affinity”	“Other”
“Optimism”	“Other”
“Perceived Opportunism”	“Other”
“Willingness to Pay”	“Other”
“Personal Characteristics”	“Other”
“E-Payment Habits”	“Other”
“Habit”	“Other”
“Attitude Towards New Technologies”	“Other”
“Absorptive Capacity”	“Other”
“Playfulness”	“Other”
“Payment Habits”	“Other”
“Image”	“Other”
“Network Externalities”	“Other”
“Visual Appeal”	“Other”
“Complementary Relationship”	“Other”
“Coercive Pressures”	“Other”
“Organizational Enablers”	“Other”

Constructs	**Group**
“Perceived Regulatory Support”	“Other”
“Market Drivers”	“Other”
“Self-Efficacy”	“Other”
“Perceptibility”	“Other”
“Capability to Implement””	“Other”
“The Possession Of A Smart Phone”	“Other”
“Job Relevance”	“Other”
“Customer Service”	“Other”
“Use Context”	“Other”
“Provider Forces”	“Other”
“Payment Scenario”	“Other”
“Emotional Value”	“Other”
“Membership In A Customer Loyalty Program”	“Other”
“Mimetic Isomorphism””	“Other”
“Consumer Attitudes”	“Other”
“New Technology Anxiety	“New Technology Anxiety”
“Anxiety””	“New Technology Anxiety”
“Destination M-Payment Knowledge”	“Knowledge”
“Safety Awareness	“Knowledge”
“M-Payment Knowledge””	“Knowledge”
“NFC Related Knowledge	“Knowledge”
“Experience with Online Shopping””	“Knowledge”
“Knowledge”	“Knowledge”
“Experience in Use of Social Online Networks”	“Knowledge”
“Level of Education”	“Knowledge”
“Level of Information About Contactless Payment”	“Knowledge”
“Prior Knowledge”	“Knowledge”
“Personal Innovativeness	“Innovativeness”
“Innovativeness”	“Innovativeness”
“Perceived Innovativeness””	“Innovativeness”
“Willingness to Adopt”	“Innovativeness”
“Innovativeness”	“Innovativeness”
“Adoption Readiness”	“Innovativeness”
“Personal Innovativeness”	“Innovativeness”
“Innovativeness In New Technologies”	“Innovativeness”

Constructs	**Group**
“Perceived Enjoyment”	“Enjoyment”
“Enjoyment”	“Enjoyment”
“Hedonic Motivation”	“Enjoyment”
“Enjoyment of Use”	“Enjoyment”
“Effort Expectancy”	“Ease of Use”
“Ease of Use”	“Ease of Use”
“Mobile Ease of Use”	“Ease of Use”
“Convenience”	“Ease of Use”
“Relative Ease of Use”	“Ease of Use”
“Discomfort”	“Ease of Use”
“Complexity”	“Ease of Use”
“Perceived Ease of Use”	“Ease of Use”
“Self-Efficacy”	“Ease of Use”
“Mobile Phone Skills”	“Ease of Use”
“Gender”	“Demographics”
“Age”	“Demographics”
“Age-Income-Use of Card Payments”	“Demographics”
“Demography”	“Demographics”
“Income”	“Demographics”
“Facilitating Conditions”	“Cost”
“Opportunity Cost”	“Cost”
“Attractiveness in Alternatives”	“Cost”
“Cost”	“Cost”
“Price Level”	“Cost”
“Mobile Perceived Financial Resources”	“Cost”
“Perceived Cost”	“Cost”
“Price”	“Cost”
“Price Value”	“Cost”
“Perceived Financial Cost”	“Cost”
“Compatibility”	“Compatibility”
“Perceived Compatibility”	“Compatibility”
“Personal Suitability”	“Compatibility”
“Perceived Compatibility”	“Compatibility”
“Mobile Perceived Compatibility”	“Compatibility”
“Compatibility”	“Compatibility”

APPENDIX C

ITEM ANALYSIS OF PILOT STUDY

Table 22 Item Analysis – Usefulness

Item Analysis - Usefulness					
Initial Version					
Correlation Matrix – Pearson Correlation					
	USEF1	USEF2	USEF3	USEF4	USEF5
USEF2	0,895				
USEF3	0,54	0,566			
USEF4	0,594	0,659	0,904		
USEF5	0,422	0,491	0,47	0,478	
USEF6	0,595	0,719	0,704	0,804	0,491
Cronbach's Alpha	0,8988				
Action:	Items 3 and 5 are omitted.				
Final Version					
Correlation Matrix					
	USEF1	USEF2	USEF4		
USEF2	0,895				
USEF4	0,594	0,659			
USEF6	0,595	0,719	0,804		
Cronbach's Alpha	0,9005				
Omitted Item Statistics					
Item	Mean	Std Dev	Total Cor.	Sq mlt Cor	Cr. Alpha
USEF1	12,029	2,623	0,7562	0,811	0,884
USEF2	12,206	2,484	0,8388	0,8555	0,8513
USEF4	12,529	2,326	0,7626	0,6674	0,8889
USEF6	12,382	2,462	0,8017	0,723	0,8628

Table 23 Item Analysis - Ease of Use

Item Analysis - Ease of Use					
Initial Version					
Correlation Matrix – Pearson Correlation					
	EOU1	EOU2	EOU3	EOU4	EOU5
EOU2	0,845				
EOU3	0,766	0,764			
EOU4	0,692	0,831	0,753		
EOU5	0,714	0,832	0,689	0,886	
EOU6	0,719	0,821	0,765	0,847	0,894
Cronbach's Alpha	0,955				
Action:	Items 1, 4 and 5 is omitted due to high correlation.				
Final Version					
Correlation Matrix					
	EOU2	EOU3			
EOU3	0,764				
EOU6	0,821	0,765			
Cronbach's Alpha	0,9088				
Omitted Item Statistics					
Item	Mean	Std Dev	Total Cor.	Sq mlt Cor	Cr. Alpha
EOU2	7,765	2,075	0,8438	0,7183	0,8667
EOU3	8,265	1,896	0,8008	0,6421	0,8867
EOU6	8,088	1,848	0,84	0,7191	0,8536

Table 24 Item Analysis - Technical Elements

Item Analysis - Technical Elements					
Initial Version					
Correlation Matrix – Pearson Correlation					
	TE1	TE2	TE3		
TE2	0,69				
TE3	0,312	0,146			
TE4	0,019	-0,007	0,564		
Cronbach's Alpha	0,6157				
Omitted Item Statistics					
Item	Mean	Std Dev	Total Cor.	Sq mlt Cor	Cr. Alpha
TE1	11,727	2,254	0,4615	0,5359	0,4938
TE2	11,727	2,414	0,3779	0,4822	0,559
TE3	11,697	2,229	0,5018	0,4151	0,4621
TE4	11,939	2,436	0,2582	0,3461	0,6473
Action:	Eliminated due to low Cronbach's Alpha value.				

Table 25 Item Analysis – Security

Item Analysis - Security					
Initial Version					
Correlation Matrix – Pearson Correlation					
	SEC1	SEC2	SEC3	SEC4	
SEC2	0,941				
SEC3	0,771	0,685			
SEC4	0,616	0,641	0,735		
SEC5	0,181	0,219	0,179	0,171	
Cronbach's Alpha	0,8592				
Action:	Omitted since high correlation and low Cr. alpha.				
Final Version					
Correlation Matrix					
	SEC1	SEC3			
SEC3	0,771				
SEC4	0,616	0,735			
Cronbach's Alpha	0,8782				
Omitted Item Statistics					
Item	Mean	Std Dev	Total Cor.	Sq mlt Cor	Cr. Alpha
SEC1	5,588	2,231	0,7498	0,5991	0,8424
SEC3	6,088	2,137	0,8382	0,7028	0,7586
SEC4	6,029	2,393	0,7183	0,546	0,8704

Table 26 Item Analysis – Cost

Item Analysis - Cost					
Initial Version					
Correlation Matrix – Pearson Correlation					
	COST1	COST2	COST3	COST4	COST5
COST2	0,103				
COST3	0,445	0,093			
COST4	0,056	0,478	0,15		
COST5	-0,057	0,313	0,159	0,712	
COST6	0,034	0,275	-0,021	0,699	0,827
Cronbach's Alpha	0,6942				
Action:	1, 2 and 3 are removed to increase internal consistency.				
Final Version					
Correlation Matrix					
	COST4	COST5			
COST5	0,712				
COST6	0,699	0,827			
Cronbach's Alpha	0,8948				
Omitted Item Statistics					
Item	Mean	Std Dev	Total Cor.	Sq mlt Cor	Cr. Alpha
COST4	6,706	2,097	0,7381	0,5454	0,9051
COST5	7,029	1,817	0,8416	0,719	0,8076
COST6	6,676	1,804	0,8314	0,7081	0,8191

Table 27 Item Analysis – Compatibility

Item Analysis - Compatibility					
Initial Version					
Correlation Matrix – Pearson Correlation					
	COMP1	COMP2	COMP3		
COMP2	0,88				
COMP3	0,696	0,745			
COMP4	0,627	0,774	0,864		
Cronbach's Alpha	0,9277				
Action:	First item is removed due to high correlation.				
Final Version					
Correlation Matrix					
	COMP2	COMP3			
COMP3	0,745				
COMP4	0,774	0,864			
Cronbach's Alpha	0,9183				
Omitted Item Statistics					
Item	Mean	Std Dev	Total Cor.	Sq mlt Cor	Cr. Alpha
COMP2	7,324	1,821	0,7861	0,6222	0,9245
COMP3	7,412	1,794	0,8504	0,7605	0,8693
COMP4	7,265	1,864	0,8759	0,7838	0,854

Table 28 Item Analysis – Knowledge

Item Analysis - Knowledge					
Initial Version					
Correlation Matrix – Pearson Correlation					
	KNOW1	KNOW2	KNOW3		
KNOW2	0,742				
KNOW3	0,703	0,732			
KNOW4	0,769	0,844	0,852		
Cronbach's Alpha	0,9316				
Omitted Item Statistics					
Item	Mean	Std Dev	Total Cor.	Sq mlt Cor	Cr. Alpha
KNOW1	11,882	2,9	0,789	0,628	0,9268
KNOW2	11,412	2,851	0,8378	0,7337	0,9115
KNOW3	11,706	2,78	0,8253	0,7314	0,9164
KNOW4	11,676	2,749	0,9104	0,8404	0,8868
Action:	Used as it is.				

Table 29 Item Analysis – Innovativeness

Item Analysis - Innovativeness					
Initial Version					
Correlation Matrix – Pearson Correlation					
	INN1	INN2			
INN2	0,667				
INN3	0,728	0,796			
Cronbach's Alpha	0,8879				
Omitted Item Statistics					
Item	Mean	Std Dev	Total Cor.	Sq mlt Cor	Cr. Alpha
INN1	5,882	2,071	0,7374	0,5505	0,8836
INN2	6,5	2,178	0,7855	0,6496	0,8419
INN3	5,971	2,037	0,8312	0,703	0,7954
Action:	Used as it is.				

Table 30 Item Analysis - New Technology Anxiety

Item Analysis - New Technology Anxiety					
Initial Version					
Correlation Matrix – Pearson Correlation					
	NTA1	NTA2	NTA3		
NTA2	0,719				
NTA3	0,498	0,636			
NTA4	0,449	0,582	0,795		
Cronbach's Alpha	0,8634				
Omitted Item Statistics					
Item	Mean	Std Dev	Total Cor.	Sq mlt Cor	Cr. Alpha
NTA1	7,353	3,004	0,6317	0,5192	0,8579
NTA2	7,618	2,871	0,7621	0,6253	0,8044
NTA3	7,441	2,862	0,7506	0,678	0,8093
NTA4	7,765	3,006	0,7074	0,6414	0,8284
Action:	Used as it is.				

Table 31 Item Analysis – Enjoyment

Item Analysis - Enjoyment					
Initial Version					
Correlation Matrix – Pearson Correlation					
	ENJY1	ENJY2			
ENJY2	0,896				
ENJY3	0,789	0,874			
Cronbach's Alpha	0,9441				
Omitted Item Statistics					
Item	Mean	Std Dev	Total Cor.	Sq mlt Cor	Cr. Alpha
ENJY1	6,471	2,191	0,8678	0,8035	0,9302
ENJY2	6,706	2,168	0,9353	0,877	0,8809
ENJY3	7	2,118	0,8537	0,7643	0,9452
Action:	Used as it is.				

Table 32 Item Analysis - Social Influence

Item Analysis - Social Influence						
Initial Version						
Correlation Matrix – Pearson Correlation						
	SI1	SI2	SI3	SI4	SI5	SI6
SI2	0,883					
SI3	0,874	0,948				
SI4	0,493	0,465	0,474			
SI5	0,444	0,438	0,431	0,929		
SI6	0,392	0,382	0,441	0,6	0,572	
SI7	0,426	0,393	0,485	0,765	0,721	0,542
Cronbach's Alpha	0,9027					
Action:	Items 3 and 5 are omitted due to high correlation.					
Final Version						
Correlation Matrix						
	SI1	SI2	SI4	SI6		
SI2	0,883					
SI4	0,493	0,465				
SI6	0,392	0,382	0,6			
SI7	0,426	0,393	0,765	0,542		
Cronbach's Alpha	0,8486					
Omitted Item Statistics						
Item	Mean	Std Dev	Total Cor.	Sq mlt Cor	Cr. Alpha	
SI1	11,121	3,612	0,6622	0,7899	0,8183	
SI2	11,091	3,626	0,6343	0,7824	0,8245	
SI4	11,394	3,316	0,7443	0,6541	0,7932	
SI6	12,061	3,499	0,5928	0,3884	0,837	
SI7	11,303	3,495	0,6788	0,598	0,8119	

Table 33 Item Analysis - Use

Item Analysis - Use			
Initial Version			
Correlation Matrix – Pearson Correlation			
	USE1	USE2	USE3
USE2	0,84		
USE3	0,882	0,929	
USE4	0,89	0,93	0,953
Cronbach's Alpha		0,9741	
Action:	Items 2 and 4 are removed due to high correlation.		
Final Version			
Pearson correlation of USE1 and USE3 = 0,882			
Cronbach's Alpha		0,9365	

APPENDIX D

VOLUNTARY PARTICIPATION FORM & QUESTIONNAIRE

Voluntary Participation Form

This research is conducted by Mehmet Erdem Örs METU Informatics Institute, Information System master's student and his advisor Prof. Dr. Sevgi Özkan Yıldırım. This form is prepared to inform you about this research.

What is the purpose?

In this study, the factors affecting acceptance of mobile payment systems are investigated. After investigation of the factors, it is aimed to form a model related to usage of mobile payment systems.

How we would like you to help us?

If you agree to join the research, we would like you to fill out the questionnaire which is composed of multiple choice questions. It is expected to take about 15 minutes.

How are going to use the information that we acquire from you?

Participation is entirely voluntary, and one can stop answering to questions at any time without any consequences. We will not ask you to share any information related to your identity or where you work. Your answers will be confidential, and they will only be evaluated by the researchers. The data acquired will be evaluated as a whole and it will be published scientifically.

What you need to know:

There are not any foreseen risks for the respondents of the questionnaire. Participation is entirely voluntary, and one can stop answering to questions at any time by directly closing the questionnaire.

For more information about research:

We would like to thank you for your participation in advance. For your detailed questions related to research or to reach the results; you can contact Prof. Dr. Sevgi Özkan Yıldırım (e-mail: sevgiozk@metu.edu.tr) or Mehmet Erdem Örs (e-mail: mehmeterdemors@gmail.com).

I have read the information above and I am joining this research voluntarily.

About Mobile Payment Systems

In the context of this research, mobile payments can be defined as any type of payment conducted by using a mobile phone. Payments made with NFC or Bluetooth module of a mobile phone, QR code-based payments, transactions by sending SMS, WAP payments (It includes buying goods or services with a mobile phone from websites or applications such as Google Play Store and Apple Store), or payments conducted by using online wallets (e.g. Google Wallet) are the examples of mobile payments.

Personal Information

1. **How old are you?**

   - 0-18
   - 18-30
   - 31-40
   - 41-50
   - 51-60
   - More than 60 years old

2. **What is your level of education?**

   - Primary school
   - Secondary school
   - High school
   - Two-year degree
   - Bachelor's degree
   - Master's degree or more

3. **How long have you been using a smartphone?**

   - I have not used a smartphone before.
   - 1-3 years
   - 3-5 years
   - 5-10 years
   - More than 10 years.

4. **How long have you been using any of the mobile payment systems?**

   - I have never used mobile payment systems before.
   - 1-3 years
   - 3-5 years
   - 5-10 years
   - More than 10 years

About Mobile Payment Technologies

Questions below are given to understand your opinions about mobile payment technologies under various headings. For all questions; answers are scaled from 1 to 5, and related scale is given below.

1- Strongly disagree

2- Disagree

3- Neutral

4- Agree

5- Strongly agree

Usefulness

1. "My purchase would be more quickly using mobile payment."

   1 – 2 – 3 – 4 – 5

2. "My purchasing tasks would be more easily using mobile payment."

   1 – 2 – 3 – 4 – 5

3. "Mobile payment would enhance my efficiency in making a purchase."

   1 – 2 – 3 – 4 – 5

4. "Overall, I would find mobile payment systems useful."

   1 – 2 – 3 – 4 – 5

Ease of use

5. "Mobile payment would be easy to understand."

   1 – 2 – 3 – 4 – 5

6. "Getting the information I want from mobile payment would be easy."

   1 – 2 – 3 – 4 – 5

7. "My interaction with mobile payment would be clear and understandable."

   1 – 2 – 3 – 4 – 5

Security

8. "I believe mobile payment systems to be secure."

   1 – 2 – 3 – 4 – 5

9. "I would feel secure sending sensitive information across mobile payment."

   1 – 2 – 3 – 4 – 5

10. “The risk of an unauthorized party intervening in the mobile payment process is low.”

1 – 2 – 3 – 4 – 5

Cost

11. “Mobile payment is reasonably priced.”

1 – 2 – 3 – 4 – 5

12. “Mobile payment is a good value for the money.”

1 – 2 – 3 – 4 – 5

13. “At the current price, mobile payment provides a good value.”

1 – 2 – 3 – 4 – 5

Compatibility

14. “Using mobile payment is completely compatible with my current situation.”

1 – 2 – 3 – 4 – 5

15. “I think that using mobile payment fits well with the way I like to buy.”

1 – 2 – 3 – 4 – 5

16. “Using mobile payment fits into my life style.”

1 – 2 – 3 – 4 – 5

Knowledge

17. “I can use the mobile payments services without detailed instruction on its use.”

1 – 2 – 3 – 4 – 5

18. “I have the skills/knowledge necessary for purchasing products via mobile devices.”

1 – 2 – 3 – 4 – 5

19. “I am confident of purchasing products via mobile devices.”

1 – 2 – 3 – 4 – 5

20. “In general, I am competent in using the mobile payments services.”

1 – 2 – 3 – 4 – 5

Innovativeness

21. “If I heard about a new information technology, I would look for ways to experiment with it.”

1 – 2 – 3 – 4 – 5

22. “Among my peers, I am usually the first to try out new information technologies.”

1 – 2 – 3 – 4 – 5

23. “I like to experiment with new information technologies.”

1 – 2 – 3 – 4 – 5

New Technology Anxiety

24. “I feel apprehensive about using new technology.”

1 – 2 – 3 – 4 – 5

25. “The use of new technology can be intimidating.”

1 – 2 – 3 – 4 – 5

26. “I fear that I will do the wrong thing when I use new technology.”

1 – 2 – 3 – 4 – 5

27. “I am not too comfortable using new technology.”

1 – 2 – 3 – 4 – 5

Enjoyment

28. “Using mobile payment is fun.”

1 – 2 – 3 – 4 – 5

29. “Using mobile payment is enjoyable.”

1 – 2 – 3 – 4 – 5

30. “Using mobile payment is very entertaining.”

1 – 2 – 3 – 4 – 5

Social Influence

31. “People who are important to me would recommend using the mobile payment system.”

1 – 2 – 3 – 4 – 5

32. “People who are important to me view the mobile payment system as beneficial.”

1 – 2 – 3 – 4 – 5

33. “The people whose opinions I value would approve of me using mobile payment systems.”

1 – 2 – 3 – 4 – 5

Use

34. “Given the opportunity, I would use a mobile payment system.”

1 – 2 – 3 – 4 – 5

35. “I am open to using a mobile payment system in the near future.”

1 – 2 – 3 – 4 – 5

APPENDIX E

QUESTIONNAIRE ITEMS IN TURKISH

Fayda		
USEF1	Satın alımlarım mobil ödeme ile daha hızlı gerçekleşir.	(Pham & Ho, 2015)
USEF2	Satın alım işlemlerim mobil ödeme ile daha kolay gerçekleşir.	(Pham & Ho, 2015)
USEF3	Mobil ödeme satın alımlarım sırasındaki etkinliğimi arttırır.	(Pham & Ho, 2015)
USEF4	Mobil ödeme satın alımlarım sırasındaki verimliliğimi arttırır.	(Pham & Ho, 2015)
USEF5	Mobil ödeme sistemleri ile satın alımlarım sırasında daha iyi kararlar veririm.	(Pham & Ho, 2015)
USEF6	Genel olarak, mobil ödeme sistemlerini faydalı bulurum.	(Pham & Ho, 2015)
Kullanım kolaylığı		
EOU1	Mobile ödemeyi kullanmayı öğrenmek benim için kolaydır.	(Pham & Ho, 2015)
EOU2	Mobil ödemeyi anlamak benim için kolaydır.	(Pham & Ho, 2015)
EOU3	Mobil ödemelerden istediğim bilgiyi almam kolaydır.	(Pham & Ho, 2015)
EOU4	Benim için mobil ödemeleri yetkin şekilde kullanır hale gelmek (kısa yollara veya gelişmiş seçeneklere hakim olmak) kolaydır.	(Pham & Ho, 2015)
EOU5	Benim için mobil ödemeleri kullanmak kolaydır.	(Pham & Ho, 2015)
EOU6	Mobil ödeme ile etkileşimim açık ve anlaşılırdır.	(Slade et al, 2015)
Uyumluluk		
COMP1	Mobil ödeme kullanımı hayatımın her yönü ile uyumludur.	(Oliveira et al, 2016)
COMP2	Mobil ödeme kullanımı şu anki durumum ile uyumludur.	(Oliveira et al, 2016)
COMP3	Bana göre mobil ödeme kullanımı satın alımlarıma uygundur.	(Oliveira et al, 2016)
COMP4	Mobil ödeme kullanımı yaşam tarzıma uygundur.	(Oliveira et al, 2016)

Bilgi		
KNOW1	Mobil ödeme servislerini ayrıntılı kullanım talimatları olmadan kullanabilirim.	(Lwoga & Lwoga, 2017)
KNOW2	Mobil cihazlar ile ürün satın almak için yeterli bilgi ve beceriye sahibim.	(Lwoga & Lwoga, 2017)
KNOW3	Ürünleri mobil cihazlar kullanarak satın alma konusunda kendime güvenirim.	(Lwoga & Lwoga, 2017)
KNOW4	Genel olarak, mobil ödeme sistemlerinin kullanımında yetkinim.	(Lwoga & Lwoga, 2017)
Teknik Unsurlar		
TE1	Mobil ödeme bana hızlı servis sağlar.	(Shin & Lee, 2014)
TE2	Bana göre mobil ödeme sistemleri akıllıdır.	(Shin & Lee, 2014)
TE3	Mobil ödeme sistemlerini öncelikle test edebilmek isterim.	(Pham & Ho, 2015)
TE4	Neler yapabildiğini görmek için, mobil ödeme sistemlerini öncelikle deneme sürümünde kullanabilmek isterim.	(Pham & Ho, 2015)
Güvenlik		
SEC1	Bana göre mobil ödeme sistemleri emniyetlidir.	(Slade et al, 2015)
SEC2	Bana göre mobil ödeme sistemleri güven verir.	(Slade et al, 2015)
SEC3	Mobil ödeme sırasında hassas bilgileri gönderirken güvende hissederim.	(Oliveira et al, 2016)
SEC4	Mobil ödeme sürecine yetkisiz taraflarca müdahale edilme riski düşüktür.	(Liébana-Cabanillas et al, 2015)
SEC5	Mobil ödeme sistemlerinin ödeme işlemleri sırasında emniyetli olmasını isterim.	(Liébana-Cabanillas et al, 2015)
Maliyet		
COST1	Mobil ödeme yapmak çok maliyetlidir.	(Pham & Ho, 2015)
COST2	Mobil ödemeyi kullanmama engel olan mali engeller (telefon fiyatları ve internet erişim ücretleri) vardır.	(Pham & Ho, 2015)
COST3	Mobil ödeme sistemlerini kullanmak ek maliyet yaratmaz.	-
COST4	Mobil ödeme ücretleri makuldür.	(Oliveira et al, 2016)
COST5	Mobil ödeme için harcanan para yerinde bir harcamadır.	(Oliveira et al, 2016)
COST6	Şu anki maliyetleri ile, mobil ödeme iyi değer sağlamaktadır.	(Oliveira et al, 2016)

Yeni teknolojiye açıklık

INN1	Yeni bir bilişim teknolojisinden haberdar olursam, onu denemek için yollar ararım.	(Pham & Ho, 2015)
INN2	Çevremde, yeni bilişim teknolojilerini genelde ilk deneyenlerdenimdir.	(Pham & Ho, 2015)
INN3	Yeni bilişim teknolojilerini denemeyi severim.	(Pham & Ho, 2015)

Yeni teknoloji endişesi

NTA1	Yeni teknoloji kullanımı konusunda endişeliyimdir.	(Bailey et al, 2017)
NTA2	Yeni teknoloji kullanımı göz korkutucu olabilir.	(Bailey et al, 2017)
NTA3	Yeni teknoloji kullanırken, yanlış bir şey yapacağımdan korkarım.	(Bailey et al, 2017)
NTA4	Yeni teknoloji kullanmak benim için çok rahat değildir.	(Bailey et al, 2017)

Hoşlanma

ENJY1	Mobil ödeme kullanımı zevklidir.	(Oliveira et al, 2016)
ENJY2	Mobil ödeme kullanımı eğlencelidir.	(Oliveira et al, 2016)
ENJY3	Mobil ödeme kullanımı çok eğlencelidir.	(Oliveira et al, 2016)

Dış etkenler

SI1	Benim için önemli insanlar, mobil ödeme sistemlerini kullanmayı tavsiye ederler.	(Liébana-Cabanillas et al, 2015)
SI2	Benim için önemli insanlar, mobil ödeme sistemlerini yararlı görürler.	(Liébana-Cabanillas et al, 2015)
SI3	Benim için önemli insanlar, mobil ödeme sistemlerini kullanmanın iyi fikir olduğunu düşünürler.	(Liébana-Cabanillas et al, 2015)
SI4	Çevremde mobil ödeme kullanan insanlar kullanmayanlara göre daha çok prestij sahibidirler.	(Liébana-Cabanillas et al, 2014)
SI5	Çevremde mobil ödeme kullanan insanlar kullanmayanlara göre daha üst profile sahiptirler.	(Liébana-Cabanillas et al, 2014)
SI6	Mobil ödeme kullanımı çevremde bir statü sembolüdür.	(Liébana-Cabanillas et al, 2014)
SI7	Fikirlerine değer verdiğim insanlar benim mobil ödeme kullanmamı onaylarlar.	(Liébana-Cabanillas et al, 2014)

Kullanım

INT1	Fırsat olması durumunda, mobil ödeme sistemlerini kullanırım.	(Liébana-Cabanillas et al, 2015)
INT2	Yakın gelecekte mobil ödeme sistemlerini kullanmaya meyilliyim.	(Liébana-Cabanillas et al, 2015)
INT3	Yakın gelecekte mobil ödeme sistemlerini kullanmaya açığım.	(Liébana-Cabanillas et al, 2015)
INT4	Fırsat olması durumunda, mobil ödeme sistemlerini kullanmaya niyetliyim.	(Liébana-Cabanillas et al, 2015)

APPENDIX F

DESCRIPTIVE STATISTICS OF SAMPLE DATA

Variable	N	Mean	SE Mean	TrMean	StDev	Variance	Skewness	Kurtosis
USEF1	302	4,3543	0,0506	4,4632	0,88	0,7744	-1,55	2,39
USEF2	302	4,3278	0,0477	4,4118	0,8284	0,6862	-1,28	1,57
USEF4	302	3,9106	0,0579	3,9853	1,0059	1,0119	-0,75	0,17
USEF6	302	4,2086	0,0467	4,2794	0,8108	0,6573	-1,04	1,28
EOU2	302	4,3079	0,0438	4,3824	0,7611	0,5793	-1,18	1,74
EOU3	302	3,9801	0,0522	4,0441	0,9075	0,8235	-0,69	0,12
EOU6	302	4,0563	0,051	4,1287	0,8855	0,7842	-0,86	0,72
SEC1	302	3,2914	0,0567	3,3235	0,9855	0,9713	-0,26	-0,01
SEC3	302	2,9007	0,0603	2,8897	1,0487	1,0997	-0,01	-0,34
SEC4	302	2,9768	0,0614	2,9743	1,0672	1,139	0,05	-0,57
COST4	302	3,5497	0,0562	3,5882	0,9761	0,9527	-0,33	-0,12
COST5	302	3,3841	0,0625	3,4265	1,0867	1,1809	-0,28	-0,57
COST6	302	3,6126	0,0543	3,6581	0,943	0,8893	-0,45	0,21
COMP2	302	3,9305	0,053	4,0037	0,9214	0,849	-0,91	0,97
COMP3	302	3,957	0,0512	4,0257	0,89	0,7922	-0,85	0,87
COMP4	302	4,0132	0,0551	4,0919	0,9575	0,9168	-0,96	0,7
KNOW1	302	3,6126	0,066	3,6801	1,1465	1,3145	-0,7	-0,19
KNOW2	302	4,1192	0,0498	4,1949	0,8659	0,7499	-0,91	0,63
KNOW3	302	4,0695	0,0509	4,1471	0,8846	0,7825	-0,98	1,01
KNOW4	302	4,0464	0,0532	4,136	0,9247	0,855	-1,13	1,55
INN1	302	3,7417	0,0608	3,8015	1,0563	1,1158	-0,59	-0,27
INN2	302	3,1689	0,0669	3,1875	1,1619	1,3501	0,02	-0,89
INN3	302	3,7252	0,064	3,7941	1,112	1,2365	-0,65	-0,34
NTA1	302	2,5861	0,0679	2,5404	1,1802	1,3929	0,34	-0,78
NTA2	302	2,543	0,0667	2,4926	1,1599	1,3453	0,27	-0,78
NTA3	302	2,6954	0,0693	2,6618	1,2035	1,4484	0,26	-0,82
NTA4	302	2,4238	0,0668	2,364	1,161	1,348	0,42	-0,74
ENJY1	302	3,8344	0,0551	3,8971	0,9571	0,916	-0,72	0,34
ENJY2	302	3,6788	0,0565	3,7243	0,9813	0,9629	-0,51	-0,13
ENJY3	302	3,351	0,0623	3,3897	1,0826	1,1721	-0,29	-0,39
SI1	302	3,3974	0,058	3,4338	1,0088	1,0177	-0,31	-0,23
SI2	302	3,4868	0,0562	3,5294	0,9772	0,955	-0,5	0,05
SI7	302	3,2881	0,0622	3,3199	1,0813	1,1692	-0,36	-0,34
USE1	302	4,043	0,0506	4,125	0,8788	0,7722	-1,15	1,78
USE3	302	4,1954	0,0489	4,2868	0,85	0,7225	-1,3	2,15

TEZ FOTOKOPİ İZİN FORMU

ENSTİTÜ

Fen Bilimleri Enstitüsü ☐
Sosyal Bilimler Enstitüsü ☐
Uygulamalı Matematik Enstitüsü ☐
Enformatik Enstitüsü ☐
Deniz Bilimleri Enstitüsü ☐

YAZARIN

Soyadı : .....
Adı : .....
Bölümü : .....

TEZİN ADI (İngilizce) : .....
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TEZİN TÜRÜ : Yüksek Lisans ☐ Doktora ☐

1. Tezimin tamamı dünya çapında erişime açılsın ve kaynak gösterilmek şartıyla tezimin bir kısmı veya tamamının fotokopisi alınsın. ☐

2. Tezimin tamamı yalnızca Orta Doğu Teknik Üniversitesi kullanıcılarının erişimine açılsın. (Bu seçenekle tezinizin fotokopisi ya da elektronik kopyası Kütüphane aracılığı ile ODTÜ dışına dağıtılmayacaktır.) ☐

3. Tezim bir (1) yıl süreyle erişime kapalı olsun. (Bu seçenekle tezinizin fotokopisi ya da elektronik kopyası Kütüphane aracılığı ile ODTÜ dışına dağıtılmayacaktır.) ☐

Yazarın imzası ..... Tarih .....