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An Empirical Analysis towards the Adoption of NFC Mobile Payment System by the End User

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Abstract

With the introduction of new technologies like the Near Field Communication (NFC), payment today can be done very easily and conveniently using any NFC enabled mobile phone. Although the potential of NFC mobile payment system is tremendous, yet its use is still not widespread and popular. In general, the mobile payment system allows the users to pay for the goods and services purchased using their own mobile phones anytime and anywhere. In this paper, we provide relevant literature reviews related to the mobile payment ecosystem in general with a special emphasis on cutting edge technologies like the NFC mobile payment system. We try to analyze the adoption behavior of the users towards such a new technology, and suggest a proper path for the future that can make this technology a success. To analyze the adoption effect we propose a research model that includes two user-oriented factors and four system oriented factors in general. The proposed model is evaluated empirically by collecting relevant data through proper surveys. We also try to segment the users into two groups viz. early adopters and late adopters and try to find out the factors that can affect the user's intention towards using such a system. The results indicate that perceived ease of use and perceived usefulness are the two strongest predictors for user adoption of NFC mobile payment system. The early adopters view the perceived ease of use to be an extremely important factor towards the success of the system, whereas for the late adopters perceived usefulness is the single most important factor. The research provides useful insights that can not only help the business managers to choose an appropriate business model but also enable the mobile phone manufacturers, bankers, software developers and government agencies device their own marketing, administrative and financial strategies for the future.

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Keywords:NFC mobile payment system; mobile commerce; TAM; Early and late adopters

1. Introduction

Mobile commerce involves the sale of goods, services and contents via wireless devices without any time or space limitations [1]. Mobile commerce in general is very popular these days. In this study, Apple Pay and Samsung Pay are defined as a propitiatory NFC mobile payment system found in only Apple and Samsung mobile

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devices respectively (IOS 8 and Android 4.4 onwards) that can be used to initiate, authorize and confirm a commercial transaction. Both Apple Pay and Samsung Pay are a natural evolution of the NFC payment system in general that enables hassle free mobile transactions without the need of any wireless data network or credit/debit cards. Payments through NFC can be done for a variety of purpose like making payments at the point of sale (POS) counters of any business organization or even at the banks to credit/debit money from users own account or maybe to even pay for any utility bills of the user. According to Juniper Research, 2013 the gross transaction value of payments made through mobiles will exceed $3000 billion globally by 2015 [2]. The report predicts that the global annual gross transaction value will grow over 8 times and ticketing segment will represent over 40% of global transaction value by 2016. Due to the rapid growth of mobile payment system, issues associated with it are of critical importance [3]. In particular, mobile user's intention to use systems like Apple pay or Samsung Pay is of considerable interest to researchers because financial institutions, trusted third parties, payment service providers and other stakeholders can benefit greatly from enhanced understanding of the key factors underlying the user intention to use such a system [4]. Over the past decade there has been a great variety of options within the mobile payment eco-system in general ranging from various payment methods based upon the Wireless Access Protocol (WAP) to the most recent NFC technology. Although mobile payment systems provide flexibility and convenience, still they cannot compete with the traditional payment services [5]. Thus, considering the current limitations of any mobile payment system, this paper focuses mainly on using NFC technology as a means for mobile payment. In this case, no physical connection is required between the consumer payment and the POS, which can simply be done with a simple touch or wave of the hand.

Till date the use of NFC payment service has been very poor [6]. The article suggests that although the technology is available in the market since late 2010, yet it is not widely accepted either by the end users or by the merchant establishments. Due to this low adoption rate, very little research has been done on this aspect of mobile payment system. As per paper [7] this is particularly true for the developing countries of Asia. In light of the current state of research, the main objective of this study is to empirically assess the factors affecting the user's intention to use services like Apple Pay or Samsung Pay. In order to achieve the desired goal we have proposed a research model that is a modified version of Technology Acceptance Model (TAM), taking into account four user-oriented factors and two system-oriented factors.

We have used TAM because it is a well-recognized model [8] to explain Information Technology adoption behaviour. Another major benefit of using TAM is that it provides a general framework, within which the effect of external factors influencing the system can be studied. In order to have a better understanding of the user's intention to use the system, we have also segregated the users into two categories viz. early adopters and late adopters.

The next section provides the appropriate literature review pertaining to this research. Section III presents our research model along with the hypothesis. Section IV provides a discussion of the research method that we use. Section V provides with the analysis of the data collected, while Section VI discusses the results. Finally, Section VII provides the conclusion, contribution, implication and drawbacks of our proposed research model.

2. Literature Survey

The usual payment method for mobiles was either through VISA or MasterCard program [9]. Ruijun and Yao suggested [10] that with the help of NFC we can transfer data either in active or passive modes over a short range using a very high frequency. Thus, using this technology we can make transactions by holding a NFC enabled mobile phone within the range of a NFC reader. This technology is somewhat popular in USA, Canada, Korea and Japan although to a limited extent [11]. For developing countries the situation is far worse with very little to no penetration at all. Thus, although the technology has been there for a short while, yet it is relatively not used, thus opening up the opportunity to work in this particular area.

Over the years a number of research models have been proposed to explain the human-computer usage behaviour. Theory of Reasoned Action (TRA) [12] depicts the user behaviour from a social psychologists point of view. TRA is very general in nature and not particularly useful while explaining IT related services. TAM [13], which was derived from TRA, is one of the first models to explain users IT adoption behaviour. Currently it

is the most widely applied model among researchers to study the user behaviour towards new Information Service systems. TAM proposes two belief variables, namely Perceived Ease of Use (PEOU) and Perceived Usefulness (PU). It also has three other constructs namely Attitude towards Using (ATU), Behavioural Intention (BI) and Actual system Use (AU). However the model does not take into account users individual characteristics [14]. Similarly, paper [15] proposes the Diffusion of Innovation (DOI), which provides an insight as to how innovation flows among consumers from early adoption to mass adoption.

Since, each of the models have their own advantages and disadvantages, we have selected TAM (with some modifications) as we feel that it can provide a suitable explanation to all the research questions that has been raised in this paper. In order to remove the drawback of TAM that has been previously mentioned, we introduce two additional constructs viz. Personal Innovativeness (PI) and NFC Payment Knowledge (NPK) for each individual user. These two constructs take into account the users individual characteristics. Apart from this we also have four system-oriented constructs viz. User Mobility (UM), Reachability (R), Compatibility (C) and User Convenience (UC). We discuss all the constructs in detail and propose the research model in the next section.

3. Research Model and Hypothesis

The research model that has been proposed is shown in Figure 1 below.

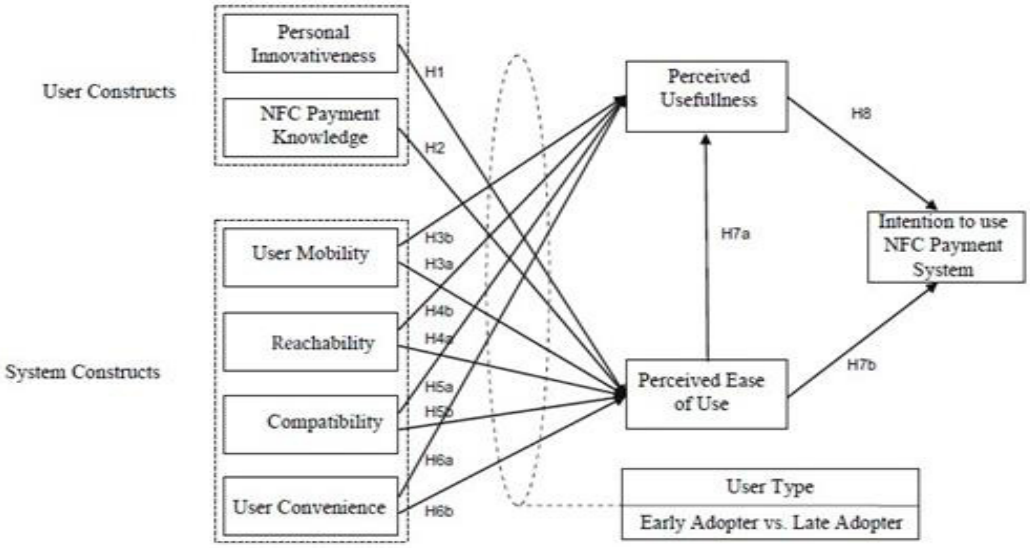

Fig. 1. Research Model

As mentioned previously, the model includes two variables that take care of the user-centric constructs and four variables that take care of the system-centric constructs. Paper [16] suggests that individual user characteristics play an extremely important role towards the successful integration of any Information System and its interaction with the end users. Personal Innovativeness (PI) and NFC Payment Knowledge (NPK) are two factors that are chosen to be the user-centric constructs.

a. Personal Innovativeness (PI):

PI can be defined as the inclination of an individual to try out any new IS. It has a positive effect on various online shopping scenarios [17]. Various studies show that innovative individuals are curious, dynamic and

communicative. Individuals with a high degree of innovation are active information seekers with respect to any new ideas [18]. Generally, for any new technology very few individuals may have familiarity or expertise with the new system, but they should be dynamic enough and have a positive intention towards using such a new system. From the above findings we can conclude that generally a person having a higher degree of PI should have a positive effect on the Perceived Ease of Use (PEOU) of any new system, which in turn should lead to a positive system usage intention. This is hypothesized as follows:

H1: PI has a positive impact on PEOU for the NFC payment system under consideration

b. NFC Payment Knowledge (NPK):

The numbers of people who use mobile phones have already exceeded the number of people using fixed line telephony [19]. Due to the popularity of the mobile devices, it is extremely important to know whether people using such phones would like to expose themselves to the other various applications that the service can bring. It is expected that people already having some sort of background knowledge about NFC, would find it easier and more encouraging to use it for payment purpose, rather than those who do not have any idea regarding it. This observation is hypothesized as follows:

H2: NPK will have a positive impact on PEOU of the NFC payment system under consideration

Next, we consider the system-oriented constructs. As per paper [20], these constructs have got the capacity to affect both the PEOU as well as the PU. Due to the rapid surge in mobile technology specially the use of smartphones in the past decade, it is extremely important to identify those system factors that can affect the PEOU and PU of any IS. As the domain of mobile technology is quiet broad, hence we need to judiciously choose only those factors that are related to the use of the NFC system in general for making mobile payments. Four carefully selected parameters are mentioned below.

a. User Mobility (UM):

Mobility refers to "Anywhere and Anytime" computing. The temporal and spatial dimension of mobility allows access to information and services anytime and anywhere. This is in sharp contrast to the tradition mode of e commerce, wherein transactions of various types are generally carried out using wired internet services. Thus, it is quite obvious that a mobile scenario provides the user with much more freedom, ease of use and flexibility. The probability of success of such an omnipresent, on-demand service is quiet high. We hypothesize these facts as follows:

H3a: UM has a positive impact on PEOU on the NFC payment system under consideration

H3b: UM has a positive impact on PU on the NFC payment system under consideration

b. Reachability (R):

Use of mobile systems enables the service providers to remain in active touch with the consumers at all times. This will prompt users to use such systems more often as they are assured of continuous support round the clock as and when required. It is especially true for payment services via mobile phones because in case of any issue the user is assured of a prompt service either by the service provider or the financial institution as the case may be. In most of the developing nations of the world generally in the rural areas there is a significant problem of mobile coverage especially with reference to data transmissions. This is where NFC technology can prove to be helpful as it does not rely on any mobile data network. Although, the initial investment cost for such a system can be quiet high, yet it can provide a greater degree of reliability and hence its reachability to the end users must increase. These facts lead us to propose the following hypotheses:

H4a: R has a positive impact on PEOU of the NFC payment system under consideration

H4b: R has a positive impact on PU of the NFC payment system under consideration

c. Compatibility (C):

As per paper [21] mobile services compatibility to users need and lifestyle, and possibility of trying out a new service has a positive effect towards its adoption. The NFC payment system might not be acceptable/compatible for all users. In fact some people might find the technology to be more compatible to their lifestyle as

compared to others. Thus, compatibility has an indirect effect on the intention to use any particular system. This can be hypothesized as follows:

H5a: C has a positive impact on PEOU of the NFC payment system under consideration

H5b: C has a positive impact on PU of the NFC payment system under consideration

d. User Convenience (UC):

People believe in technology only when it makes their life easier [22]. User convenience is one of the most important factors in the success of mobile commerce [23]. Convenience is actually a combination of time utility and place utility that can have an impact on the user's decision to use a particular system. In general, a more convenient a system will attract more number of users. Thus, we hypothesize as follows:

H6a: UC has a positive impact on PEOU of the NFC payment system under consideration

H6b: UC has a positive impact on PU of the NFC payment system under consideration

The remaining two constructs viz. PEOU and PU are a part of the original TAM specification and described as follows:

a. Perceived ease of Use (PEOU):

As stated above this factor has its original meaning as found in the TAM specification. In order to popularize the NFC payment system, it should be easy to use as well as easy to learn. Thus, we hypothesize as follows:

H7a: PEOU has a positive impact on PU of the NFC payment system under consideration

H7b: PEOU has a positive impact on the actual behavioural intention (BI) to use the NFC payment system under consideration

b. Perceived Usefulness (PU):

The meaning of this construct is also as per the original TAM specification. Intention to use the payment system will increase if users find it useful. Thus, the following hypothesis:

H8: PU has a positive impact on the actual behavioural intention (BI) to use the NFC payment system under consideration.

Apart from the factors that have already been discussed we also try to include the effect of some moderators. In particular, we propose the concept of early adopters and late adopters. Innovation is accepted at a different pace by different people. Some people tend to adopt a technology when it is at a very nascent stage, while others may want the technology to mature first before they take any decision to adopt it. Thus, early adopters have a very short adoption decision plan as compared to the late adopters. Thus, we can conclude that the user-centric factors, system-centric factors and the belief factors that we have just discussed have different effects on these two moderating groups (factors). Therefore, we test our model separately for the two groups and try to find out the differences between them.

4. Research Methodology

4.1 Sampling and data collection:

Since this study is about NFC mobile payment system, hence our target population must use a smart phone. Prior knowledge of using credit/debit cards is also desirable, though not mandatory. We use a self-administered questionnaire in which each item is measured on a 5 point Likert scale. Some of the items in the survey instrument are developed from existing set of questionnaires but modified to suite our need. The survey questionnaire for collecting the system-centric factors is shown in figure 2. In particular the factors Reachability (R) and Compatibility (C) have been adopted from the paper by Yang, et.al [24].

System centric factors	
User Mobility	
UM1	I believe NFC payment is independent of time
UM2	I believe NFC payment is independent of place
UM3	I can use NFC payment anytime while traveling
Reachability	
R1	In general, I would be always reachable by others through phone call
R2	NFC payment can be done regardless of the location
R3	It is always possible for my bank to contact me when it is needed
Compatibility	
C1	I believe NFC payment is compatible with existing technology
C2	I believe NFC payment is compatible with other mobile services
C3	I believe NFC payment is compatible with my daily routine tasks
User Convenience	
UC1	NFC payment is convenient because the phone is usually with me
UC2	NFC payment is convenient because I can use it anytime
UC3	NFC payment is convenient because I can use it in any situation
UC4	NFC payment is convenient because it is not complex

Fig. 2. Questionnaire for system-centric factors

Figure 3 shows the questionnaire for collecting data for user-centric factors. The questionnaires found in the paper by Goldsmith and Hofacker [25] have been modified to suit our needs. Figure 4 shows the questionnaire for data collection about the rest of the factors (belief factors).

The survey was conducted for a period of three weeks. Samples were collected by visiting shopping malls as well as e-mail surveys and personal interviews. For shopping malls, systematic sampling method was used, wherein every 4th customer entering the mall was interviewed. For email survey and personal interviews the subjects were chosen carefully so as to have a proper mix of age, gender and other miscellaneous factors. Out of the 300 questionnaires initially distributed, 30 were rejected due to incomplete response, therefore giving a final count of 270 questionnaires. Finally, these 270 questionnaires were used for empirical analysis.

User Centric Factors	
Personal innovativeness	
PI1	I know more about new products before other people do
PI2	I am usually among the first to try new products
PI3	New products excite me
NFC payment knowledge	
NPK1	I enjoy purchasing products via mobile devices
NPK2	I use Internet banking, credit cards, or NFC payment to make purchases
NPK3	I mostly use NFC payment when purchasing goods or services at retail outlets
NPK4	I would be confident to use m-banking for financial transactions

Fig. 3. Questionnaire for user-centric factors

Belief Factors	
Perceived ease of use	
PEOU1	Learning to use the NFC payment is easy for me
PEOU2	My interaction with NFC payment procedure would be clear and understandable
PEOU3	It would be easy for me to become skillful at using the NFC payment
PEOU4	I find the NFC payment easy to use
PEOU5	I find the NFC payment procedure to be flexible to interact with
Perceived usefulness	
PU1	Using NFC payment would enable me to pay more quickly
PU2	Using NFC payment makes it easier for me to conduct transactions
PU3	I find NFC payment a useful possibility for paying
Behavior intention	
BI1	Now I pay for purchases with a mobile phone
BI2	Assuming that I have access to NFC payment, I intend to use it
BI3	During the next six (6) months I intend to pay for purchases with a mobile phone
BI4	Five (5) years from now I intend to pay for purchases with a mobile phone

Fig. 4. Questionnaire for belief factors

5. Empirical Analysis

Reliability and validity for the collected data has been checked using Cronbach's alpha for measuring the internal consistency. For demographic analysis of the samples we use descriptive statistics. The function of hypothesis testing was carried out using SPSS software.

5.1 Demographic Analysis:

Total 270 responses were used for this analysis. Figure 5 shows the detailed breakup of the demographic profile of the respondents.

The respondents had more number of males than females. With regards to education respondents with a post graduate degree dominated the scene. Majority of the people belonged to the earning category 30000-50000. Also, about 55% of the respondents belonged to the late adopter category.

Item		Frequency	Percentage
Age	Under 19	9	3.3
	20 -25	65	24.2
	26-30	79	29.4
	31-40	84	31.2
	41 or Older	33	11.9
	Total	270	100.0
Education	Under High School	7	2.6
	High School Graduate	5	1.9
	University Student	81	30.1
	University Graduate	121	45.0
	Postgraduate	54	20.1
	Others	2	0.8
	Total	270	100.0
Earnings	Less than 10,000	79	29.4
	10,000-30,000	67	24.9
	30,000-50,000	83	30.8
	50,000 or More	41	15.0
	Total	270	100.0
Gender	Male	162	60.0
	Female	108	40.0
	Total	270	100.0
Respondents Industry	Banking	58	32.8
	IT	60	20.2
	Manufacturing	70	30.9
	Marketing	82	16.1
	Total	270	100.0
NFC Payment Users	Early Adopters	120	44.4
	Late Adopters	150	55.5
	Total	270	100.0

Fig. 5. Demographic Profile of the respondents

5.2 Reliability and Validity Analysis:

Before going for the actual data analysis, we have to verify that the collected data is consistent and reliable. Thus, we must have an idea that to what extent the variables under investigation are error free.

Constructs	Reliability of individual constructs		Reliability
	Total Corelation Value	Cronbach's Alpha when item removed	
PEOU1	.739	.851	.907
PEOU2	.777	.836	
PEOU3	.747	.848	
PEOU4	.714	.860	
PEOU5	.727	.864	
BI1	.794	.836	
BI2	.814	.823	.868
BI3	.752	.83	
BI4	.802	.86	
UM1	.689	.669	
UM2	.638	.729	.842
UM3	.601	.766	
UC1	.653	.707	
UC2	.587	.737	
UC3	.605	.728	.898
UC4	.539	.764	
C1	.614	.861	
C2	.746	.829	.874
C3	.639	.854	
NPK1	.631	.787	
NPK2	.658	.778	.826
NPK3	.631	.739	
NPK4	.692	.799	
PI1	.675	.787	.817
PI2	.699	.758	
PI3	.704	.756	
R1	.794	.836	
R2	.738	.823	.747
R3	.702	.814	
PU1	.603	.697	
PU2	.514	.744	.806
PU3	.761	.702	

Fig. 6. Reliability analysis

For reliability analysis we use the well-established Cronbach's Alpha test. Cronbach's Alpha for every item should be at least 0.6, for the item to be included. Else, the item has to be removed from the list and the process repeated. The detailed results have been shown in figure 6.

From the figure it is evident that the Cronbach's Alpha varies from 0.514-0.861. We discard all those factors for which the Cronbach's Alpha is less than 0.6. Thus, PU2, UC4 and UC2 are discarded from the final analysis.

5.3 Evaluation of Research Model:

We use SPSS package to test our hypothesis. Figure 7 shows the overall goodness-of-fit for our model.

Absolute fit measures can help us in determining whether our proposed model is suitable overall. The absolute fit measures are quantified in term of the Chi-square value, RMR (Root Mean Square Residual) value and the RMSEA (Root Mean Square Error of Approximation) value. In our case corresponding to Chi-square value of 438.00, we obtain the p- value to be 0.00. Although, the obtained p-value is not within the specified range, yet we do not take into account this factor since the p value is very sensitive to the sample size and also the complexity of the model under consideration. Thus, we give more importance to the RMR and the RMSEA values for determining the overall fit, both of which lie well within the specified limits in our case. After finding out the overall suitability of our model we now go for testing the hypothesis that has been proposed earlier.

Chi-square	DF	p-Value	RMR	RMSEA
438.300	301	.000	.042	.043

Fig. 7. Overall goodness-of-fit

5.4 Hypothesis Testing:

The results of the hypothesis testing that we carry out has been presented in figures 8 and 9.

Path	Estimate	Corelation Type	p-value	Hypothesis status	
Personal Innovativeness -> Perceived ease of use	0.138	+ve	0.008	H1	Yes
NPK -> Perceived ease of use	0.129	+ve	0.002	H2	Yes
User Mobility -> Perceived ease of use	0.046	+ve	0.647	H3a	No
User Mobility -> Perceived usefulness	0.179	+ve	0.044	H3b	Yes
Reachability -> Perceived ease of use	0.40	+ve	0.003	H4a	Yes
Reachability -> Perceived usefulness	0.273	-ve	0.030	H4b	Yes
Compatibility -> Perceived ease of use	0.040	-ve	0.583	H5a	No
Compatibility -> Perceived usefulness	0.039	-ve	0.534	H5b	No
User Convenience -> Perceived ease of use	0.215	+ve	0.026	H6a	Yes
User Convenience -> Perceived usefulness	0.170	+ve	0.004	H6b	Yes
Perceived ease of use -> Perceived usefulness	0.748	+ve	0.023	H7a	Yes
Perceived ease of use -> Intention to use NFC payment	0.321	+ve	0.002	H7b	Yes
Perceived usefulness -> Intention to use NFC payment	0.357	+ve	0.003	H8	Yes

Fig. 8. Table for hypothesis testing

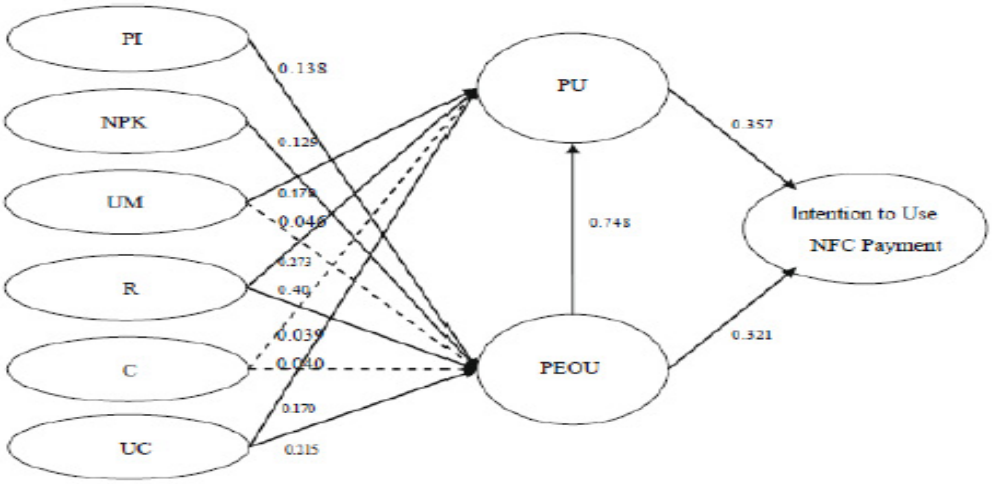

Fig. 9. General model for hypothesis testing

From the result it is clear that hypothesis **H3a**, **H5a** and **H5b** are not supported. Remaining of the hypotheses are all supported. A detailed explanation of the results is provided in the next section.

As already mentioned beforehand, we have classified the users into two different groups' i.e. early adopters and late adopters in order to investigate their behavioural intention to use the NFC payment system. Figure 10 below shows the questions that each respondent had to answer so that we could determine the appropriate group for every user.

I am willing to take risk	Early adopter
I am interested in new technology	
I tend to be first in buying new products	
I am kind-of cosmopolitan	
If someone else did it first, I should also do it	
Adopting may be an economic necessity	
Adopting may be a result of peer pressure	Late adopter
I feel uncertain about new technology	
I am suspicious of changes	

Fig. 10. Early adopters vs. late adopters

Based upon the answers provided, we find that about 44.4% of the users belong to the category of early adopters, whereas the remaining 55.6% of the people belong to the category of late adopters. The same method of hypothesis testing is now carried out separately on these two different groups, the results of which have been shown in figures 11 and 12.

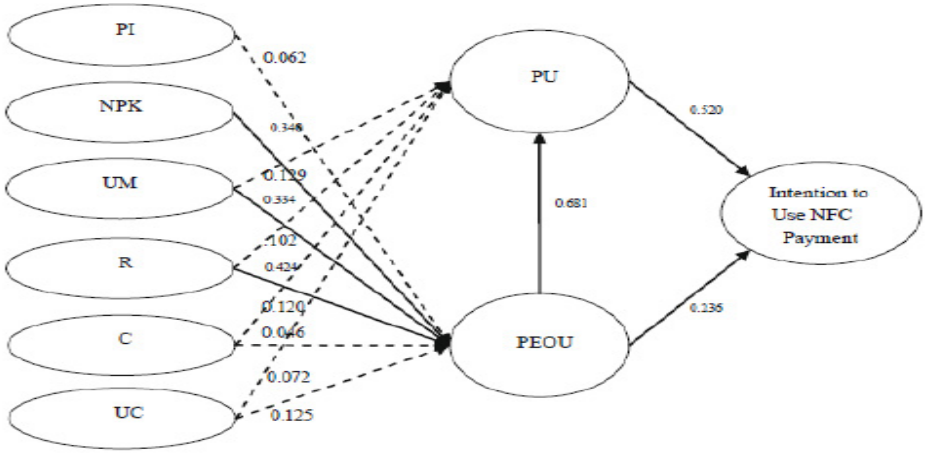

Fig. 11. Hypothesis testing for early adopters

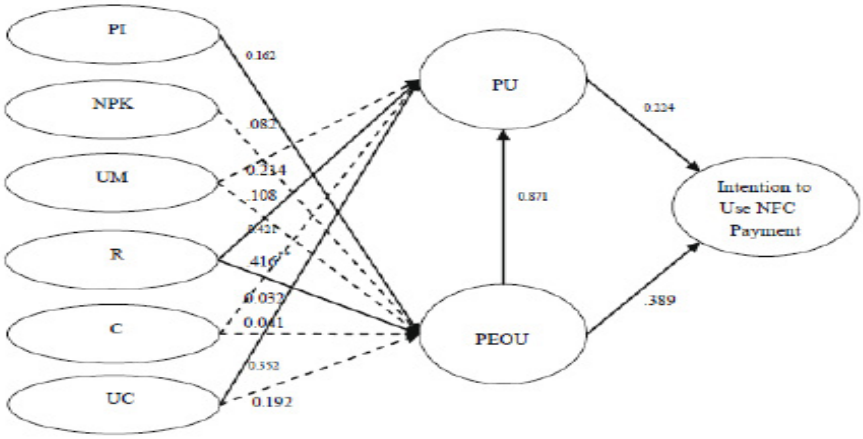

Fig. 12. Hypothesis testing for late adopters

For early adopters hypotheses **H1**, **H3b**, **H4b**, **H5a**, **H5b**, **H6a** and **H6b** are not supported. While for late adopters hypotheses **H2**, **H3a**, **H3b**, **H5a**, **H5b** and **H6a** are not supported. From the result it is clear that there is a significant difference between the two groups regarding the various factors that ultimately can affect the adoption of NFC payment system. A detailed analysis of the results in provided in the next section.

6. Discussion of Results

In this empirical study we tried to find out the users acceptance of NFC payment system. In order to make TAM suitable for our purpose, we introduced two user-centric variables and four system-centric variables, apart from the

normal constructs that are already a part of TAM. We further segregated the users into two different groups and tried to find out the adoption scenario for both the cases.

The results show that people having a higher degree of personal innovation find the NFC payment system easy to use. Also, individuals having some prior background knowledge about NFC payment system can easily adapt themselves to the new technology. User mobility has a negative effect on the perceived ease of use. This is because we had to reject the hypothesis **H3a**. It can be attributed to the fact that NFC being a very new technology, there are not sufficient NFC payment channels/counters either in various merchant establishments or other places of interest. Due to this reason although a user may have a NFC enabled phone, yet they cannot make the payment due to the non-availability of such specialized payment gateways. Compatibility (hypothesis **H5a** and **H5b** rejected) does not have any effect either on the perceived ease of use or perceived usefulness. Thus, we can safely eliminate this factor while considering the adoption of NFC payment system. Out of the four system-centric factors, reachability (R) has the most pronounced effect on both PEOU and PU. Hence, it is quite obvious that once this payment system starts off it is bound to succeed as compared to the traditional modes of payment either through credit/debit cards or internet banking. Both PU and PEOU play their part towards the adoption of NFC payment system by the users. However, the effect of PU on the actual BI is somewhat more as compared to PEOU. With respect to the current system it is a clear indication that people are willing to use this new technology if they find it useful in their life even though it may be a bit more complex to use. Of all the factors under consideration, PEOU is the greatest predictor for PU.

For early adopters, previous knowledge about NFC technology plays a vital role towards the PEOU. This might be because, these people believe that if they have an idea about a technology from beforehand, it will be easier for them to use it irrespective of how complex the new technology may be. User mobility and reachability has also its effect on PEOU. Surprisingly, there are no factors that affect PU. This essentially means that the early adopters are quiet doubtful about the potential usefulness of the system. Since, the NFC payment system is at its very early stage, hence this group of people do not expect much out of it.

For late adopters personal innovativeness and reachability have an effect on PEOU. This means that this group of people prefer less changes. They want a technology to mature enough and will only adopt it, if there has been a mass adoption of that technology before. In other words this group of people likes to play it safe and adopts any new technology only after it has been popular. Also, those people having a lower degree of innovativeness may need some extra training for using the system. For the late adopter's user convenience is also an important factor that affects the perceived usefulness, which is in sharp contrast to that of the early adopters.

7. Conclusion and Scope of Future Work

The main objective of this study is to identify the factors that are responsible for the adoption of NFC mobile payment system by end users. For doing so, we proposed two user- centric variables, four system-centric variable, two belief variables and one dependent variable. We also introduced the concept of different user groups and found out the adoption scenario for both the cases.

A lot of time and money has to be invested into this technology by its promoters. Thus, it is extremely important to be sure that this new payment system will be used by the users on a large scale. Thus, from a business perspective proper advertising campaigns should be carried out by the promoters of this new payment system so that people get to know about the advantages of using such a system. These advantages can be in terms of saving time, less cash handling, convenience or even flexibility in terms of making a payment. Banks and similar other financial institutions can also campaign about the benefits of using such a system. Also, for those regions where such a system is already in place, they must ensure that proper user support is provided both online as well as offline. Personal innovativeness affects the PEOU as it is evident from the results. So, the device manufacturers can segregate the market for these innovative and non-innovative customers and cater to the specific needs of this niche market by providing appropriate services.

However, there are certain limitations to this study also. Since, this type of payment system is quiet new; hence we could not include the actual system usage by the end users. Also, there can be other factors that may affect the adoption rate of the NFC mobile payment system apart from the ones we discussed. For example gender and financial status of a particular person may determine their attitude towards using such a system. Since, this

type of payment system is very new, hence the cost of the technology will be more. But, we have not taken into account such financial considerations. Other factors like perceived trust towards this new payment system, security issues and government support have also not been taken into account, which can be investigated upon in future. In this study for all the samples that we have taken people use either a credit or debit card. But, this can prove to be a bias factor as it is not known how people not using such cards will react to this new system. Thus, for future studies we must include both the groups and do a comparative analysis between the two. Although there are shortcomings in this paper as we have already mentioned, we expect that the findings will provide valuable information to the mobile phone manufacturers, banks, companies owning payment gateways, merchants and the government in general while formulating their business or administrative strategy towards the adoption of NFC mobile payment system.

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