

Examining the Influencing Factors of NFC (Near Field Communication) - Payment Adoption in China : The Moderating Role of Personal Innovativeness

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중국 근거리 무선통신(NFC) 간편결제 채택의 결정요인: 개인 혁신성의 조절효과를 중심으로

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요약 근거리 무선통신 (Near Field Communication: NFC) 기술을 이용한 서비스가 많이 소개되고 있다. 본 연구의 목적은 NFC 간편결제 채택의도에 영향을 미치는 요인을 찾기 위한 것이다. 이를 위해, 본 연구는 기술수용모델 (Technology Acceptance Model: TAM)을 기반으로 한 연구모형을 제안하고자 한다. 인터넷 설문조사를 통해 NFC 간편결제 서비스를 사용하는 사용자 353명의 자료가 수집되었다. 분석결과 상대적 이점, 사회적 영향 및 기술 가용성이 인지된 유용성에 중요한 영향을 미친다는 것을 확인할 수 있었다. 그러나 사용 용이성에는 상대적인 이점과 사회적 영향만이 영향을 미치는 것으로 확인되었다. 인지된 사용 편의성은 인지된 유용성에 큰 영향을 미치며, 이들 모두 NFC 간편결제 채택의도에 큰 영향을 미치는 것으로 나타났다. 또한 분석결과, 개인 혁신성이 조절효과는 가지는 것으로 밝혀졌다.

키워드 : NFC 간편결제, 상대적 이점, 사회적 영향, 기술 가용성, 개인 혁신성, 사용의도

Abstract Near Field Communication has been emerged as a spectacular phenomenon. The aim of this study is to determine the factors influencing the adoption of NFC-enabled mobile payment. In order to analyze, this study proposes a research framework based on Technology Acceptance Model. 353 valid data were collected through the Internet who has used NFC technology. Results show that relative advantage, social influence, and technology availability have a significant effect on perceived usefulness (0.190***, 0.211***, 0.227***respectively). However, for perceived ease of use, only relative advantage and social influence were verified to have significant influence. Perceived ease of use significantly influence perceived usefulness (0.348***), and both of them significantly affect the NFC-payment adoption intention (0.199**, 0.361***). The results also verified the moderator variable of personal innovativeness (0.20*** and 0.297***respectively).

Key Words : NFC-Payment, Relative Advantage, Social Influence, Technology Availability, Personal Innovativeness, Intention to Use

1. Introduction

With the evolution of short-range wireless

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technologies such as Near Field Communication (NFC), Bluetooth and Radio Frequency Identification (RFID), consumers can be able to conduct payment "anytime" and "anywhere". A new form of payment has emerged through the integration of these technologies into the mobile phone where consumers just need to make payments via their own mobile phones. One form of m-payment is NFC-enabled mobile phones is now gaining popularity. In this study, Apple Pay was adopted as the target NFC-enabled mobile phones. Devices respectively IOS 8 wards that can be used to initiate, authorize and confirm a commercial transaction. China has cash-centric payment culture that are different from U.S.A., France, and Korea. Substantial evidence from the market indicates that payment habit is difficult to change when a customer moves from traditional toward e-commerce or m-commerce settings. It may be expected that they will also affect the acceptance of NFC mobile payment service in China. Thus, this study aims to determine the factors influencing the adoption of NFC-enabled mobile payment.

2. Literature Review

NFC is defined as a new technology which can makes a transfer over distances of up to 10cm by integrating RFID technology and contact-less smart cards. NFC-based mobile payment have a lot of advantages such as quick purchasing, transferring information securely by just touching the facility. Such a new payment method has not only decrease the carrying of cash, but also at the same time, improve a fast speed transaction process. Even though NFC-enabled mobile payments are created by integrating mobile network operators with banks, there are still poor understandings about consumers' motivation for using NFC-enabled mobile payment. In addition, only few researchers provided guideline to

interpret NFC-based mobile payments adoption [1]. Thus, we conduct this research.

2.1 Technology Acceptance Model

Technology Acceptance Model (TAM) is one of the widely used model for studying technology acceptance or intention to use. TAM was developed by [2], and include two determinants, namely perceived ease of use and perceived usefulness. Perceived ease of use (PEU) refers to a person perceived that using a specific information technology will be free of effort [2]. While perceived usefulness (PU) means user believes that using a particular information technology will enhance his own performance [2]. [3] developed TAM2, in which they removed the attitude and added the subjective norm as well as other concepts such as image, job relevance or experience. [4] proposed TAM3 under the e-commerce context with the inclusion of trust and perceive risk on system use. TAM was widely used in previous studies to examine the adoption intention of new technology, thus this study also adopted perceived ease of use and perceived usefulness as two main antecedents of intention to use.

2.2 Relative Advantage

Relative advantage refers to the extent to which an innovative technology is perceived to be superior to ideas it replaces. If a current users sees relative advantage of using innovative product over existing one, he will perceive its usefulness. This assumption underlies the rationale used by previous research on innovation products, which proposed the positive effects of relative advantage on adoption of the innovation products [5].

2.3 Social Influence

Social influence refers to members of a reference group influence one another behavior and experience social pressure to perform particular behavior [6]. In a

meta-analysis of the relationship between innovation characteristics and adoption. If the innovation is compatible with potential users, they will have a great intention to adopt the innovation. Similarly, social influence can be useful in explaining the adoption and use of new media. [7] indicated that an individual's opinions or behaviors are affected by others.

2.4 Technology Availability

Technology availability refers to the degree to which an individual thinks that technical infrastructure exists to support the use for the system [8]. [9] suggested that the more the technological infrastructures become easily and readily available, the more accessible and usable will be the Internet commerce applications.

2.5 Personal Innovativeness in Information Technology (PIIT)

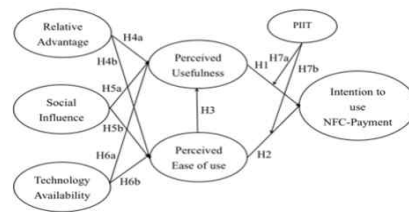
PIIT is defined by [10] as the intention of an individual to adopt or consider to use any new information technology. [10] theorized the new construct of PIIT domain and included it into TAM's model [2]. They found that individual with higher levels of PIIT can lead to more positive perceptions about adopting new innovations in terms of relative advantage, ease of use, compatibility. [11] tested the relationship between PIIT and the adoption intention of wireless mobile services, and they also found a direct positive impact of PIIT. In this study, we adopt PIIT as a moderator variable.

3. Research Model and Hypotheses

According to the literature review, a research model was presented based on the TAM model, which is shown in ([Fig. 1]).

3.1 PEU, PU, and Intention to Use

As presented earlier, TAM is widely used in IS



[Fig. 1] Research Model

research [12]. PEU and PU are among the top five most utilized IS research constructs. Thus, TAM posits a high predictive power in the IS research area [3]. For consistency and comparison with other studies, the following hypotheses are stated:

H1: PU positively influence on the intention to use NFC-payment.

H2: : PEU positively influence on the intention to use NFC-payment.

H3: PEU has a positive influence on the PU of NFC-payment.

3.2 Relative Advantage

If a current user perceived relative advantage when using innovative product over existing one, he will perceived its usefulness. This assumption underlies the rationale used by previous research on innovation products, which proposed the positive effects of relative advantage on adoption of innovation products [5, 13]. Research consistently found that relative advantage positively affected the user's intention to use the system across different participants [14]. When users perceive higher relative advantage, they will perceive a higher usefulness of new technology. Accordingly:

H4a: Relative advantage has a positive effect on PU of the NFC-payment use intention.

H4b: Relative advantage has a positive effect on PEU of the NFC-payment use intention.

3.3 Social Influence

The acceptance and usage of new IT is affected by social influence [8]. Social influence is a key role

played by other people’s opinion, superior influence, and peer influence. [2] also noted that sometimes other people’s commands scored over the user’s feelings and beliefs. It is expected that social influence will positively influence behavioral intention in adopting the NFC systems in China. Thus:

H5a: Social influence has a positive influence on PU of the NFC-payment.

H5b: Social influence has a positive influence on PEU of the NFC-payment.

3.4 Technology Availability

As [9] suggested, the more the technological infrastructures become easily and readily available, the more accessible and usable will be the Internet commerce applications. For [9] research, technical resources refer to the ease access of technological resources and infrastructure. In this research, we consider technology availability as the extent to which users can have access to NFC technologies, or in other words, how easily they can use or get in touch with NFC technologies. Therefore:

H6a: Technology availability has a positive effect on PU of NFC-payment.

H6b: Technology availability has a positive effect on PEU of NFC-payment.

3.5 Personal Innovativeness in Information Technology

Following the definition of PIIT [10], they suggest that PIIT serves as a key moderator in technology acceptance behavior. As a moderator of the antecedent of perceptions, PIIT moderates the development of perceptions, a person with higher levels of PIIT is expected to develop more positive perception about new IT. As a consequence, moderator of PIIT epitomizes the risk-taking trait, an individual with higher level of PIIT is expected to have more positive intention to use the new IT [10]. Therefore:

H7a: PIIT effect the relationship between PU and

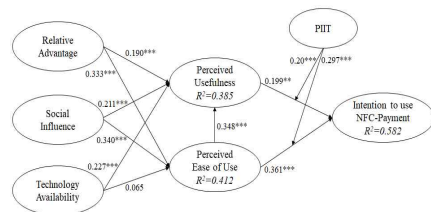
NFC-payment use intention.

H7b: PIIT effect the relationship between PEU and NFC-payment use intention.

4. Research Design and Results

The questionnaire design is based on the previous research. This paper adopts a five-point Likert scale and participants were required to indicate their level of agreement. This new model was validated on surveys of 353 Chinese who have the experience using NFC before. The validated data were analyzed using AMOS 20.0 and SPSS 20.0. <Table 1> present the operational definition along with measurements of each construct.

As shown in <Table 2>, each construct of the alpha value exceeds 0.7, which represents good reliability. All the C.R. results exceed 0.7 supporting good reliability. The AVE values exceed 0.5 indicates the discriminant validity. <Table 3> represents the fit indices of the model exceeds the acceptance level indicating a good fit with the data collected. <Table 4> shows the final result of hypotheses test. All of the hypotheses were accepted except H6b. In addition, moderating factor of personal innovativeness has significant influence on both of the PU and PEU. Finally, [Fig. 2] shows the path coefficients and R² of variables. Relative advantage, social influence, technology availability as well as PEU all together explained 38.5% of the variance in PU. Independent variables explained 41.2% of the variance in PEU. While PEU and PU together explained 58.2% of the variance in intention to use NFC-payment.



[Fig.2] Research Model Results

<Table 1> Operational Definition and Measurements

Variable	Operational Definition	Measurements	References
Perceived Usefulness	Means user believes that using a particular information technology will enhance his own performance.	Using NFC technology can make one productive.	[2, 15]
		Using NFC technology can make things easier.	
		I consider that NFC technology will allow new features for electronic devices.	
Perceived Ease of Use	Refers to a person perceived that using a specific information technology will be free of effort.	Learning to use NFC technology is easy.	[2, 15]
		Using NFC technology is clear and understandable.	
		It is easy to become skillful at using NFC technology.	
		Overall, NFC technology is easy to use.	
Relative Advantage	Refers to the extent to which innovative technology is perceived to be superior to ideas it replaces.	NFC payment is convenient because I can use it in any situation.	[16]
		I believe NFC payment is compatible with other mobile services.	
		I believe NFC payment is compatible with my routine tasks.	
		NFC payment allows me to manage my finances more effectively.	
Social Influence	Degree to which an individual perceives that how important others believe he or she should use the new system.	People who influence my behavior would think that I should use NFC technology.	[3, 15]
		People who are important to me would think that I should use NFC payment.	
		I will use NFC payment if the service is widely used by people in my community.	
Technology Availability	An individual believes that technical infrastructure exists to support the use of the system.	I consider that actual mobile phone are not equipped with NFC technology.	[8]
		I consider that few shops or stores are equipped with NFC technology.	
		I consider that there are enough opportunities for NFC technology.	
		I consider that the use of NFC technology is mainly based on the availability of the technology everywhere.	
Personal Innovativeness	The intention of an individual to adopt or consider to use any new information technology.	If I heard about a new technology, I would look for ways to experiment with it.	[3, 10, 17]
		I like to take a chance.	
		I like to experiment with new ways of doing things.	
Intention to Use	A person's subjective probability that he or she will perform some m-services	I am likely to use NFC payment in the near future.	[2, 17]
		I am willing to use NFC payment in the near future.	
		I will think about using a NFC payment.	

<Table 2> Convergent Validity and Reliability Test

Factors	Item	Standardized Estimate	Cronbach's α	P	AVE
Relative Advantage	RA1	0.751	0.844		0.582
	RA2	0.711		***	
	RA3	0.775		***	
	RA4	0.811		***	
Social Influence	SI1	0.847	0.857		0.668
	SI2	0.782		***	
	SI3	0.822		***	
Technology Availability	TA1	0.700	0.820		0.534
	TA2	0.745		***	
	TA3	0.776		***	
	TA4	0.700		***	
Perceived Usefulness	PU1	0.717	0.840		0.573
	PU2	0.736		***	
	PU3	0.730		***	
	PU4	0.839		***	
Perceived Ease of use	PEOU1	0.795	0.848		0.654
	PEOU2	0.836		***	
	PEOU3	0.794		***	
Personal Innovativeness	PI1	0.832	0.873		0.697
	PI2	0.851		***	
	PI3	0.822		***	
Intention to Use	ITUN1	0.724	0.802		0.580
	ITUN2	0.788		***	
	ITUN3	0.772		***	

<Table 3> Fit Indices

Fit Indices		Model Indices	Recommended Value
Absolute Fit Indices	X ² /DF	1.050	≤ 3.000
	GFI	0.954	≥ 0.900
	AGFI	0.939	≥ 0.800
	PGFI	0.731	≥ 0.600
	CFI	0.997	≥ 0.900
	NFI	0.947	≥ 0.900
	RMR	0.040	≤ 0.05
	RMSEA	0.012	≤ 0.08

<Table 4> Hypotheses Test Results

Hypothesis		Standardized Estimate	S.E.	C.R.	P-Value	Result
H1	PU→ITUN	0.199	0.078	2.473	0.013**	Accepted
H2	PEOU→ITUN	0.361	0.086	4.457	***	Accepted
H3	PEOU→PU	0.348	0.072	5.305	***	Accepted
H4a	RA→PU	0.190	0.056	3.158	***	Accepted
H4b	RA→PEOU	0.333	0.054	5.149	***	Accepted
H5a	SI→PU	0.211	0.062	3.513	***	Accepted
H5b	SI→PEOU	0.340	0.059	5.350	***	Accepted
H6a	TA→PU	0.227	0.065	3.894	***	Accepted
H6b	TA→PEOU	0.065	0.063	1.033	0.302	Rejected
H7a	Moderator 1(PUxPI)	0.200	0.059	2.975	***	Accepted
H7b	Moderator 2(PEOUxPI)	0.297	0.070	3.442	***	Accepted

*p<0.05, **p<0.01, ***p<0.001

5. Conclusions

5.1 Implications

According to the results, relative advantage, social influence and technology availability are proved to have positive influence on customer's perception about PU, PEU. And PU, PEU positively influence intention to use NFC-payment. These results are in accordance with previous studies. This study has contributed to an overall conceptual understanding of NFC adoption by using components of intention factors. In addition, this study adopted PIIT as a moderator variable, and it has proved that PIIT significantly influence the relationship between perception of PU, PEU and behavior intention. In China, there are few studies focus on NFC-payment, thus this study has a special contribution to Chinese academic area.

According to the results, NFC-payment operators should pay more attention to develop multi-function that traditional payment cannot do based on NFC. Operators should also find some ways to introduce what is NFC-payment, what are the differences, and make more and more people know it and attract more customers to use it since social influence is a significant factor. In addition, PIIT can influence adoption behavior, with high innovative, the use intention will also increase. Operators should think about what can influence PIIT Apps or try to find high innovativeness group to advertise NFC-payment.

5.2 Limitations and Future Research

This study exists some limitations. First, most of the respondents are young and highly educated, this may make the result exist bias. Second, there were only 353 data and it cannot reflect all Chinese perceptions. In addition, some potential factors affect consumer's use intention may not be exposed to the research platform.

Therefore, it will not good for the future study. Thus, future study can consider other variables to explain consumer's behavior intention. Researchers

can also try to examine more by considering the characteristics of NFC-payment service and individual.

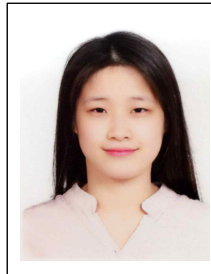
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