

THE FACTORS THAT AFFECT CONSUMERS INTENTION TO ADOPT NEAR  
FIELD COMMUNICATION MOBILE PAYMENT IN SUPERMARKETS

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A dissertation submitted in partial fulfillment of the  
requirements for the award of the degree of  
Master of Information Technology

Faculty of Computing  
Universiti Teknologi Malaysia

JANUARY 2017

To my beloved Family, for their patience, support and love during the completion of  
this thesis.

## ACKNOWLEDGEMENT

I wish to express my most profound gratefulness to each one of individuals who helped me, in one way or another, to make this dissertation possible. First and foremost, I thank God who provided me with strength, direction and purpose throughout the dissertation. Special thanks to my supervisor, Associate Professor Dr. Mohd Zaidi bin Abd Rozan for his patience, guidance and advices during the completion of this dissertation. Without his continued support and interest, this thesis would not have been the same as presented here.

Besides that, I would also like to thank all my colleagues and others who have provided assistance at various occasions. Their support was greatly appreciated. Unfortunately, it is not possible to list them in this limited space.

Last but not least, my heartfelt gratitude goes out to my family for supporting me spiritually throughout my life. Without their encouragement and support, it would have been impossible for me to finish my study.

## ABSTRACT

The emergence of mobile technologies has changed the consumer's life in many ways, especially the way they perform payment. This thesis examines the core drivers of using Near Field Communication (NFC) mobile payment in the supermarket industry from the consumer's perspective. Based on the Technology Acceptance Model (TAM) and Innovation Diffusion Theory (IDT), the author developed a seven-factor model to reveal the determinants of consumers' intention to use Near Field Communication (NFC) mobile payment. Relative advantage, speed of transaction, compatibility with consumers' lifestyles, security and awareness were added to the two-factor TAM model (usefulness and ease of use). Author evaluated the proposed model empirically, applying survey data gathered from supermarket consumers respect to their perceptions on Near Field Communication (NFC) mobile payment. Six significant factors found in this research can serve as guideline to encourage consumer adoption of Near Field Communication (NFC) mobile payment in supermarkets. Among which most of the respondents reported that relative advantage was not their primary reason in their decision to adopt the system. More over ease of use was significantly influenced by awareness of consumers and perceived usefulness influenced by speed of transaction which can be best explained by the fact that consumers would find the system useful if it provides them means to avoid long checkout lanes. Based on the findings of this research, marketing of new technologies must focus on creating awareness and gaining consumers trust to enable consumers to be easily familiarized with the Near Field Communication (NFC) mobile payment system.

## ABSTRAK

Kemunculan teknologi mudah alih telah mengubah hidup pengguna dalam pelbagai cara, terutama dalam melaksanakan pembayaran. Tesis ini mengkaji faktor teras penggunaan bayaran mudah alih Near Field Communication (NFC) dalam industri pasar raya dari perspektif pengguna. Berdasarkan Technology Acceptance Model (TAM) dan Innovation Diffusion Theory (IDT), penulis membangunkan model tujuh faktor bagi mendedahkan penentu kepada niat pengguna untuk menggunakan bayaran mudah alih Near Field Communication (NFC). Kelebihan relatif, kepantasan urusanniaga, kesesuaian dengan gaya hidup pengguna, keselamatan dan kesedaran telah ditambah kepada TAM model dua faktor iaitu kebergunaan dan mudah guna. Penyelidik menilai model yang dicadangkan secara empirikal, menggunakan data kajian yang dikumpul daripada pengguna pasaraya dan menghormati persepsi mereka terhadap bayaran mudah alih Near Field Communication (NFC). Enam faktor yang signifikan di dalam kajian ini boleh dijadikan sebagai garis panduan untuk menggalakkan penggunaan bayaran mudah alih Near Field Communication (NFC) di pasar raya. Antara yang paling utama ialah responden melaporkan bahawa kelebihan relatif bukan alasan utama mereka untuk menerima pakai sistem. Manakala faktor mudah guna telah dipengaruhi dengan ketara oleh kesedaran pengguna dan anggapan berguna dipengaruhi oleh kepantasan urusanniaga yang boleh dijelaskan oleh fakta bahawa pengguna akan mencari sistem berguna jika ia memberikan kelebihan kepada mereka untuk mengelakkan barisan panjang semasa membuat pembayaran. Berdasarkan dapatan kajian ini, pemasaran teknologi baru perlu memberi tumpuan kepada mewujudkan kesedaran dan menjana kepercayaan untuk membolehkan pengguna untuk mudah berjinak dengan bayaran mudah alih Near Field Communication (NFC).

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**LIST OF ABBREVIATIONS**

A	-	Awareness
CA	-	Compatibility
IA	-	Intention to Adopt
IDT	-	Innovation Diffusion Theory
M-Payment	-	Mobile payment
NFC	-	Near Field Communication
PEOU	-	Perceived Ease of Use
POS	-	Point of Sale
PSOT	-	Perceived Speed of Transaction
PU	-	Perceived usefulness
RA	-	Relative Advantage
RFID	-	Radio frequency identification
TAM	-	Technology Acceptance Model

## **CHAPTER 1**

### **INTRODUCTION**

#### **1.1 Introduction**

Payment methods has kept evolving since the early stages where services and goods were exchanged as form of transaction, then the introduction of coins started changing people's form of economic transactions from the age-old barter system to coin based payment. There was a steady stream of innovation till the year 1960s the only two main form of payment options that existed where cheque and cash. Later the introduction of credit and debit cards gained huge popularity. However, the trend started changing with the development of mobile network, it bought new payment opportunities along with it, which started the mobile payment era. Nowadays, consumers are less interested in making transaction with physical money. Instead cashless transaction are used as a preferred form of payment (Shin, 2010).

In today's modern society every person carries three essential items around in their purses or pockets; set of keys, wallet and a mobile phone. Throughout the years, these artifacts have kept increasing, there seemed to be no end to this trend, but not anymore mobile phones have evolved during the last decade, it offers more services apart from its basic call and SMS services, they are now capable to provide services such as GPS, digital wallet, music player, smart keys etc. which has made it a truly all in one device. Following the trend, the recent service addition from the 2nd Gen smart phones is the NFC (Near Field Communication) which was implemented in late 2006.

Popularization of smartphones and evolution in its technologies have brought experimental space for innovative companies, which has led to the birth of NFC enabled mobile payment where consumers make transaction by tapping or waving their smartphone at the NFC reader placed at the point of sales location. This enabled for a fast, simple and convenient form of mobile payment to the customers (Longoni & Gâza, 2013).

Why the need to be aware of NFC technology?

With day to day technology adapting into smart technology, there's a need for communication method between smart devices that needs to be both cost effective and power efficient. One of the communication mode that is considered to have these benefits are Near Field Communication. NFC have been paired with different technologies and among that m-payment. There are virtually limitless applications and utilizations that could be produced for it, some of them are unlocking doors (used in hotels and cars), medical device, mobile smart tickets, smart printers, check-ins etc. Other key advantages of NFC technology are as follows (NFC Forum, 2012)

- Intuitive: Interaction between devices is possible just by simple touch
- Interoperable: NFC works with existing contactless cards
- Security ready: NFC has built in capabilities to bolster secure applications
- Open and standard based: NFC is compatible with different POS systems, cards or mobile devices due to its universally implemented ECMA, ETSI and ISO standards.

Need of NFC payment technology in mobile commerce?

Businesses and Banks are constantly innovating new ideas to keep up with today's space world, they are finding ways to optimize consumer's everyday routines. At the same time consumers, too are looking ways to minimize activities that do not present much value to their lives which in-turn saves time for activities that really

matters to them for example, everyone has experienced standing in a long queue at the counter just to pay for a few items.

These are the moments we would like to get done with it as fast as possible. Secondly, with the growing number of consumers who are eco-conscious, businesses want alternatives that are environment friendly alternate which will not only cut down production cost but also give added value to their product.

How will these needs be addressed by NFC payment technology?

With current innovation in the mobile payment sector what is happening is that it optimizes payment process for businesses which leads to faster consumer payment transaction which in-turn leads to consumers spending less time waiting to pay for services or goods at counter. A research done on time efficiency on different payment methods by Polasik (2012) shows us that in term of time efficiency there is not much difference between cash and card payments but when comparing it with mobile payment there are improvements. Secondly, through the innovation of NFC technologies, it can help businesses addresses the environmental issues by slowly decreasing the production of plastic credit/debit cards from the market which thereby will decrease its effect on the environment.

Apart from this NFC m-payment also addresses to other needs such as having more than one authentication variables such as password – fingerprint authentication where customer will be asked to either enter the password or use the fingerprint to approve the transaction and Secure element it's a chip that relays authorization back to the NFC device this chip makes this method tamper proof by providing a unique signature during each transaction.

The other advantage of secure element is that retailers just store the unique number and don't store payment information (Card number, account info) from transaction, so for all intents and purposes they are futile to hackers. NFC m-payment

also can present consumers with timely, targeted offers for products and services relevant to their purchase from a cost to a revenue opportunity for agencies.

In a world where consumers are given the alternative to use their smartphones to make transactions, what will make them inclined to use NFC m-payment? Which constructs would determine the consumer's intention to adopt? What are the constructs managers should focus on when developing strategies? This thesis assesses the NFC m-payment environment and reviews the constructs that influence NFC m-payment adoption. A few hypotheses on how the constructs interact with each other and methodology to verify these relations are shown in Chapter 4.

## **1.2 Background**

With continuous advancement in mobile technology, industries are presented with opportunities to offer innovative services and are making progress toward attaining the right balance between consumer acceptance and market force. As future of money heading to crypto currency, smartphones will be playing a major role in the transaction process. So, with these advances mobile payment is going to continue to happen at a faster pace. In Malaysia, with population of 30 million the mobile penetration is about 140% (WorldPay, 2015) from which about 60% of the population own a smartphone. With such high penetration rate banking industries are concentrating in providing more mobile based banking services to its customer.

Apart from the banking industry, retailers have also stepped in to provide mobile based shopping experience. In spite of the accessibility of mobile payment service in Malaysia, there is a possibility for the technology or service to remain unnoticed or be an under-employed bank resource. According to WorldPay (2015) only about 2% of smartphone users use NFC m- payment method for their purchases. Due to the fact that most of the consumers are either not aware of the technology or believe that it is not widely implemented to adopt the technology.

According to Kasavana (2011) with revenue and infrastructure growth forecasted for retail industry, its assumed that industry will face growth in NFC m-payment technologies in the coming years due to the issues faced by these retailers. Looking into supermarket industry it has recently been targeted by hackers due to its low security (Incorporated, 2014).

About 40 percent of security threats come from retail POS systems. In case of vulnerability retailers don't only lose money that comes with fixing the breach but also face damage to customer loyalty and reputation which could result in huge losses, according to Applebaum (2000).

Supermarkets and hypermarkets are also in constant need of finding new opportunities in making customer experience more convenient and time efficient, in addition also provide better security characteristics which benefits the merchants and the consumers (Customer experience in this study are indicated by constructs such as perceived ease of use, perceived usefulness and compatibility).

NFC m-payment can provide solution to reduce fraudulent POS transaction since clients would no longer need to give their payment information or credit card, so the POS system does not store any of the consumers' personal information (Hayashi, 2012). Kasavana (2011) explores use of proximity payment method in retail stores which remains in the forefront for embracing cashless payment technologies. Kasavana claims that this form of payment method benefits all entities of the payment process, the consumers feels the transaction is faster and more secure, the establishment gains customer satisfaction and the banks develop stronger relationship with their clients (merchants).

However, there is still need for further research in consumer behavior with respect to NFC m-payment in the retail channel particularly in the supermarket industry, as earlier research is very limited and has not considered all the major constructs for understanding the core drivers in consumer adoption of NFC m-payment technology in the industry.



Before addressing an issue, we must first understand the problem and see if the problem still exists. As this study focuses on supermarkets, the shopping process of customers must be looked at in order to find the problems faced by consumers. The following is a field observation done by the researcher to identify the problem in the process and to see if NFC enabled shopping process would solve the existing problem faced by consumers.

Customer shopping process can be compressed as follows: The customer enters the market, gets a shopping cart and heads in to search for the items he/she intends to buy or walks through the store. At the point when the item is found, he/she acquires the item that satisfies his/her requirements and settles on a choice on whether to buy it. Alternatively, the customer may ask the store staff for assistance in order to find an item or to receive more information on an item he/she is uncertain of. This part of the shopping process is rehased until the customer settles not to look for any more items. He/she then moves on to check-out aisles, where he or she might have to wait in long line before placing the shopped products on the counter. A cashier then scans the items and informs him/her about the total bill that is to be paid. Alternatively, the customer can hand over coupons in order to claim discounts or his/her loyalty card in order to collect reward points. The shopping process comes to an end when the customer pays for his/her purchases by card or cash.

This shopping process does not include numerous technological resources that offer assistance for customer or enhance their shopping experience (Shopping experience in this study are indicated through constructs such as speed of transaction and relative advantage). The only exceptions to this are the barcode scanner which enhances the checkout process by eliminating the need to capture items manually and transaction terminals which empowers customers to pay for their purchases without the need to convey large amount of cash. But, about 95% of retailers consider checkout waiting lines as their most significant issue to tackle in order to better service their customers (Morrison, 2007). NFC innovation could add to the mitigation of such issues. The download of information and procurement of product information can be triggered by NFC tags attached to shelves holding the product which reduces their need for assistance. In terms of payment, coupons and loyalty cards can all be managed

through a single interface along with consumer's payment cards this replaces them having to get several cards or coupons from their wallet or purse giving means to accelerate the checkout process.

Some consumers were interviewed on the process amid the interviews, different clarifications were given concerning some issue: Shoppers for the most part don't go to supermarkets for delight or to treat themselves, but to satisfy essential needs of getting sustenance and other household necessities. Likewise, numerous clients don't go to stores on their day off, but fit the task or chore of shopping between leaving work and going home. In this way, most of the customer wish to spend as minimum time as could be allowed in a store.

The implementation of NFC m-payment, could give retailers means to accelerate parts of checkout process by customer holding the device up to a contactless reader which reads the payment card, discount coupons and loyalty card all saved under one application which could replace having to get several cards or coupons out a wallet or purse. As these depictions appear, the NFC based application would not generally change the shopping process, but merely support it on the checkout area and in the store floor.

During the observation, the researcher also notices that most of the consumers are not aware of the technology. So, the researcher wants to look into whether awareness plays a role in influencing consumers to adopt m-payment apart from other influencing constructs such as speed, compatibility, security and relative advantage.

Thus, this research would put forward the following problem statement for this study. Consumers still find checkout process exasperating in supermarkets. So, in order for players to adopt NFC m-payment technology, it is important to understand the viewpoint of users. Hence, this research explores the important factors that are relevant in the NFC m-payment context in supermarkets.

### **1.3 Purpose of The Study**

Currently, consumer's adoption of NFC m-payment in Malaysia are in its early stages but marketers are eager to see widespread adoption of this technology (Choong & Hedrick-Wong, 2014). The growing number of companies that are offering M-payment technology is in increase (Schierz et al. 2010). Hence, it is critical to recognize the reasons behind NFC m-payment paradox, since the providers and participants of NFC m-payment services could significantly benefit from understanding the perspective of users. Albeit much research has studied the reasons behind the consumers' hesitancy to adopt m-payment and the effects of constructs such as trust, reliability, security on adoption in general, research concentrating on consumer behavior to adopt NFC m-payment in supermarket and hypermarkets are limited. The goal of this study is to add to the emerging research on m-payment in Malaysia by investigating the constructs effecting a consumer's adoption of this technology in supermarkets.

### **1.4 Research Question**

The following are the research questions of this study

- What are the factors that affect acceptance and usage of NFC m-Payment in Supermarkets?
- What is the adoption model for NFC m-payment in supermarkets?
- How valid is the Adoption model for NFC m-payment in supermarkets?

## **1.5 Research Objectives**

The following objectives are the guidelines this study wishes to fulfill:

- To identify the key factors for the adoption model that are likely to influence consumer acceptance and usage of NFC m-payment in supermarkets.
- To develop an Adoption model for NFC m-payment in supermarkets
- Test and Validate the adoption model for NFC m-payment in supermarkets

## **1.6 Contribution and Significance**

The result of this study will provide proof points to industry players who are looking to build public demand and usage of NFC m-payment in supermarkets (not suited for department checkout operation). The significance of this research is for the supermarket and hypermarket industry. A meager understanding of consumer desire for using NFC m-payment point to the loss of opportunities in making customer's lives more convenient and saving their time.

## **1.7 Scope of Research**

The research presented in this thesis is concerned with consumer acceptance of NFC m- payments. NFC m-payment is a new domain in Malaysian information systems research, but given the extensive research in e-commerce during the last decades, it is clearly important to start investigating the usage and impact of NFC m-payments at an early stage.

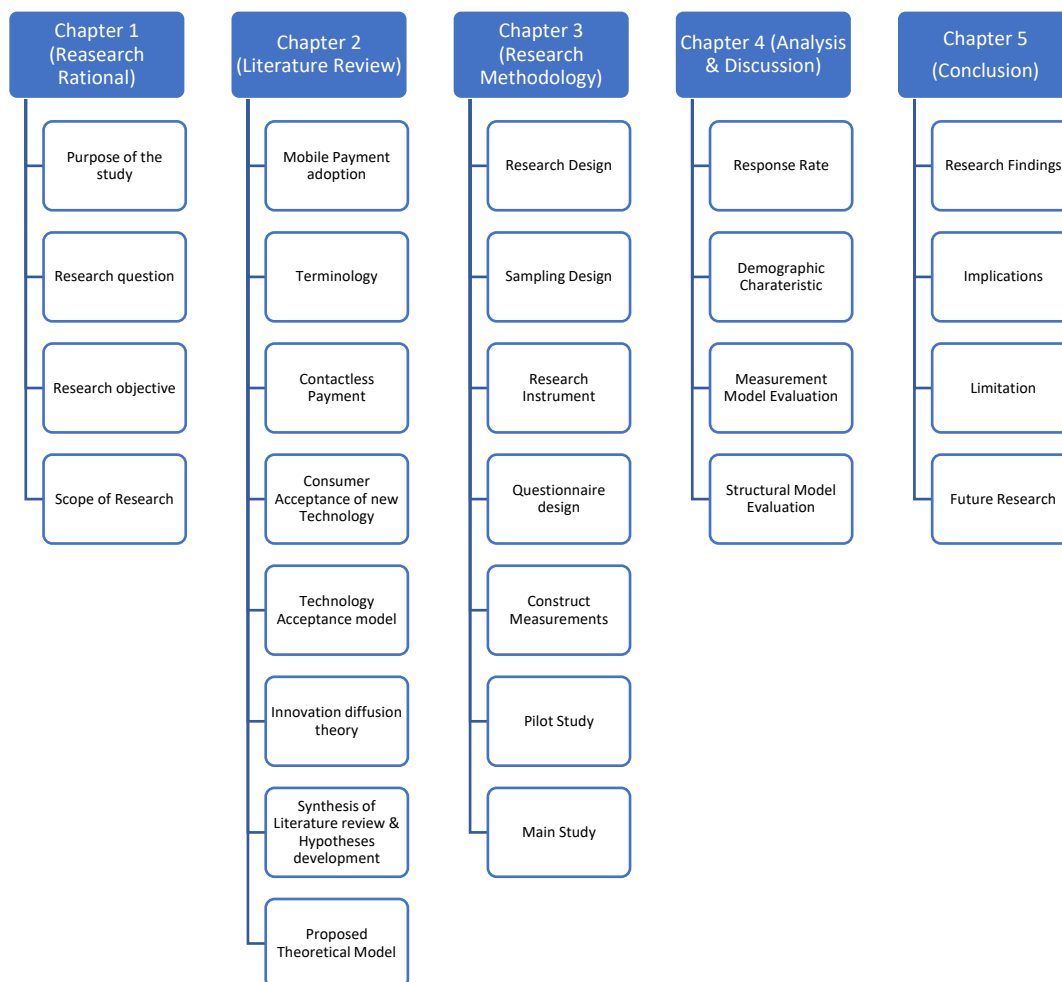
This research aims to identify and explore key factors that affect consumers' decisions of whether to accept NFC m-payment systems in supermarkets. NFC

m-payment refers to the use of mobile devices to conduct payment transactions. The advantages of using mobile devices for business activities and personal communications are clear, as they offer convenient, fast, location free services for users. Moreover, mobile devices offer potential opportunities and new channels for new business applications.

The NFC m-payment service is one of the exciting new applications to emerge. The application has the potential to be widely utilized to establish a new payment market as well as a next-generation payment solution by financial institutions, telecommunication operators, device manufactures and independent payment service providers. It is difficult to access and obtain results or information from NFC m-payment service providers, as a result of business confidentiality. More importantly, the majority of services did not highlight some aspects of consumer resistance to NFC m-payments (Schierz *et al.*, 2010).

In order to make NFC m-payments a must-have, offering unique services, mobile payment service providers have to improve their services substantially. For instance, interoperability is a key issue for implementing the service. In the long term, NFC m-payments will undergo convergence. However, some consumers are unwilling even to try these systems. There is an urgent need to address this problem at the introductory stage of this service. That is why the present research has been proposed. The study will focus on supermarket industry in Malaysia. Supermarket consumers are the one who are apt for this study as they are the one who frequently involved in the payment process.

## 1.8 Thesis Structure



**Figure 1.1** Thesis outline

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