NEAR EAST UNIVERSITY
INSTITUTE OF GRADUATE STUDIES
INNOVATION AND KNOWLEDGE MANAGEMENT PROGRAM

THE STUDY ON IMPLEMENTATION AND OPTIMIZATION OF E-WALLET SYSTEM FOR INTERNATIONAL STUDENTS IN NORTH CYPRUS: A CASE STUDY ON MOBILE PAYMENT

PHAGEL MWEMA KAMFWA

MASTER'S THESIS

NICOSIA
2021

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MASTER'S THESIS

THESIS SUPERVISOR

ASSOC.PROF. DR. BEHIYE CAVUSOGLU

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ACCEPTANCE/APPROVAL

We as the jury members certify the 'THE STUDY ON IMPLEMENTATION AND OPTIMIZATION OF E-WALLET SYSTEM FOR INTERNATIONAL STUDENTS IN NORTH CYPRUS: A CASE STUDY ON MOBILE PAYMENT' prepared by the PHAGEL MWEMA KAMFWA defended on 25/06/2021 has been found satisfactory for the award of degree of Master.

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DECLARATION

I, PHAGEL MWEMA KAMFWA, hereby declare that this dissertation entitled '(**The implementation and optimization of e-wallet system for international students in north Cyprus (a case study on mobile payment)**' has been prepared myself under the guidance and supervision of 'Social Science' in partial fulfilment of the Near East University, Graduate School of Social Sciences regulations and does not to the best of my knowledge breach and Law of Copyrights and has been tested for plagiarism and a copy of the result can be found in the Thesis.

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DEDICATION

To my parents…

ABSTRACT

THE STUDY ON IMPLEMENTATION AND OPTIMIZATION OF E-WALLET SYSTEM FOR INTERNATIONAL STUDENTS IN NORTH CYPRUS: A CASE STUDY ON MOBILE PAYMENT

Evolution of technology has made people's lives easy through various user-friendly features. The mobile payment has many main features, such as simple and fast money transactions, payments receipt, subscription renewal, shopping etc. However, numerous studies demonstrate that there are several variables that can affect the adoption and acceptance of mobile payments.

E-wallet is a software application that is used to pay or make transfers without the use of cash or bank cards. Uduji, J.I., Okolo-Obasi, E.N., & Asongu, S.A. (2019) defined E-wallet as a software application that uses electronic devices such as computers or mobile devices for online transactions. The E-wallet can be linked with the bank account credit or debit, but in some countries, they are linked with the telephone number, In Africa, for instance, the mobile wallet application is managed by the telecommunication companies, so the application or system works offline, you don’t need the bank account to make the money transfer or whatever you want to do at anytime and anywhere. For instance, Mpesa and airtl money.

Mobile payment services are NFC-based payment systems that include contactless payment methods and are supported by close interactions between the Internet and mobile devices and banks. This method saves a lot of time and does not necessitate long queues for the user to pay. In providing a payment services to the consumer, all these organizations play a major role.

The expected result of this study based on the implementation and optimization of the electronic wallet application for international students is to demonstrate the importance and impact of the application that will be used both offline and online. in terms of optimized application, we are referring to the combination of system. Although some tabs will only work with internet or WIFI connection, but money transfer, payment will work on both sides. This implementation will allow foreign students in North Cyprus to have electronic money through the mobile app, but it can also be used by everyone,

as the app will contain important tabs which will be useful for everyone. The application should be user-friendly, easy to use and understand.

Keywords**:** mobile payment, mobile wallet, telecommunication, e-wallet, innovation, technology adoption

ÖZ

THE STUDY ON IMPLEMENTATION AND OPTIMIZATION OF E-WALLET SYSTEM FOR INTERNATIONAL STUDENTS IN NORTH CYPRUS: A CASE STUDY ON MOBILE PAYMENT

Teknolojinin gelişimi, çeşitli kullanıcı dostu özelliklerle insanların hayatlarını kolaylaştırdı. Mobil ödeme, basit ve hızlı para işlemleri, ödeme makbuzu, abonelik yenileme, alışveriş vb. gibi birçok temel özelliğe sahiptir. Ancak çok sayıda çalışma, mobil ödemelerin benimsenmesini ve kabul edilmesini etkileyebilecek çeşitli değişkenler olduğunu göstermektedir.

E-cüzdan, nakit veya banka kartı kullanmadan ödeme yapmak veya transfer yapmak için kullanılan bir yazılım uygulamasıdır. Uduji, J.I., Okolo-Obasi, E.N. ve Asongu, S.A. (2019) e-cüzdanı, çevrimiçi işlemler için bilgisayar veya mobil cihazlar gibi elektronik cihazları kullanan bir yazılım uygulaması olarak tanımlamıştır. E-cüzdan banka hesabı kredisi veya borç ile bağlantılı olabilir, ancak bazı ülkelerde telefon numarasıyla bağlantılıdır, örneğin Afrika'da mobil cüzdan uygulaması telekomünikasyon şirketleri tarafından yönetilir, bu nedenle uygulama veya sistem çevrimdışı çalışıyor, para transferi yapmak için banka hesabına veya her zaman ve her yerde yapmak istediğiniz herhangi bir şeye ihtiyacınız yok. Örneğin, Mpesa ve airtl para.

Mobil ödeme hizmetleri, temassız ödeme yöntemlerini içeren ve internet ile mobil cihazlar ve bankalar arasındaki yakın etkileşimlerle desteklenen NFC tabanlı ödeme sistemleridir. Bu yöntem çok zaman kazandırır ve kullanıcının ödeme yapması için uzun kuyruklar gerektirmez. Tüketiciye bir ödeme hizmeti sunmada, tüm bu kuruluşlar önemli bir rol oynamaktadır.

Uluslararası öğrenciler için elektronik cüzdan uygulamasının uygulanması ve optimizasyonuna dayalı bu çalışmanın beklenen sonucu, hem çevrimdışı hem de çevrimiçi olarak kullanılacak uygulamanın önemini ve etkisini ortaya koymaktır. Optimize edilmiş uygulama açısından, sistem kombinasyonundan bahsediyoruz. Bazı sekmeler sadece internet veya WIFI bağlantısı ile çalışsa da, para transferi, ödeme her iki tarafta da çalışacaktır. Bu uygulama, Kuzey Kıbrıs'taki yabancı öğrencilerin mobil uygulama üzerinden elektronik paraya sahip olmalarını sağlayacak, ancak

uygulamada herkesin işine yarayacak önemli sekmeler içereceğinden herkes tarafından kullanılabilecek. Uygulama kullanıcı dostu, kullanımı kolay ve anlaşılır olmalıdır.

Anahtar Kelimeler: mobil ödeme, mobil cüzdan, telekomünikasyon, e-cüzdan, inovasyon, teknoloji benimseme.

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LIST OF ABBREVIATIONS

TAM: Technology Acceptance Model

MPA: Mobile Payment Application

PU: Perceived Usefulness

PEOU: Perceived Ease of Use

NFC: Near Field Communication

POS: Point of Sale

ICT: Information and Communication Technology

QR CODE: Quick Response code

WAP: Wireless Application Protocol

SMS: Short Message Services

GPRS: General Packet Radio Service

WML: Wireless Markup Language

HTML: Hypertext Markup Language

XML: Extensible Markup Language

SRCN: Short Range Communication Network

OTA: Over-The-Air

OTC: Over-The-counter

PKI: Public Key Infrastructure

SAFE Safe Applications for Financial Environment

PS: Perceived Security

PI: Personal Innovation

SI: Social Influence

PEOU: Perceived ease of use

CHAPTER 1

INTRODUCTION

Smartphones and electronic wallets are gaining popularity across the world. Most e-wallets come from mobile Apps in which users may store funds for future online transactions. However, mobile payments include all transactions conducted through a mobile phone and debited to a bank card, the operator's bill, or an electronic wallet stocked with cash from an agency or a merchant. For many years, the electronification of cash flows in the context of high-value payments has been a driving force behind technical advancement. Electronic money is used to power new payment instruments designed to automate the payment process via the use of electronic values. People have depended on various payment systems to buy services and products, and they favor easy and transactional payment methods. These choices influenced the early twentieth century and the rest of the globe. According to John Rampton (2016), people use mobile devices that store data to accomplish a transaction. However, the mobile wallet is considered to be a replacement for the existing physical wallet in order to recover all payment information.

Because of its capacity to provide transactions anytime, anywhere, with a high acceptance rate and growth potential, mobile payments have become one of the world's fastest growing systems in recent years and presently it encompasses a broad range of applications, allowing users to perform different types of operations, such as booking tickets, shopping, transferring money, and so on by using mobile payment apps. Pousttchi (2008) defines the mobile payment as the approving or completing payment by means of mobile communication techniques and devices. Mobile phones and other forms of communication technology have significant economic and social

implications, it Increased Ability to Communicate and Collaborate Significantly and has revolutionized the way people and businesses work.

Today, a variety of methods have been created to enable customers to pay easily by phone. Cell phones play an essential role, particularly in economics, where monetary transactions and mobile business have sparked a lot of interest. A mobile payment is a transaction of money in which mobile device authorise and confirm the transfer in return of goods or services. Users do not need to carry cash with them all the time since they may save all of their money in their E-wallet.

It can be the same as one-click payment in that the card information does not need to be entered each time. This study tries to solve the payment issues for foreign students, by creating a mobile payment application in which users will not need to have a bank account, but only their student ID and phone number. This research is aimed at unbanked individuals, in particular all foreign students in Northern Cyprus. Previous research on mobile payment adoption has shown a variety of models that influence mobile payment acceptance and use, but this study work highlights, in chapter 3, these five models "perceive ease of use and usefulness in technology acceptance, innovativeness, security, and social influences have the impact in MP adoption ". Mobile wallets are electronic version of conventional wallets that are carried in pockets. Prof.Gajanan Tikhe (2020) defined electronic wallet as a virtual or a cashless service used as a substitute for physical cash. According to Jinimol the International Journal, E-wallet is an online money account which does not require the use of a physical card for undertaking transaction remittance.

The implementation of mobile payment system in Northern Cyprus would be of tremendous benefit to all students because it will allow those who do not have the bank account to make their purchases and transfers though their phone.

This study thesis is divided into 4 main parts, the introduction chapter sets the basis of the study by providing an overview of the mobile payment system. The chap 2 is based on the literature review which gives a survey of scholarly sources on the topic as a foundation and support for the insight that the study contributes. The chapter 3 will provide the theoretical models and hypothesis, Chapter 4 is going to focus on the

conceptual framework, whereas Chapter 5 will define the sampling and data analysis, and Chapter 6 will be the conclusion.

1.1 Statement of The Problem

Northern Cyprus is a developing island that has become one of the countries that welcomes a large number of international students. Despite the fast development of technology and the mobile payment application relevance in the world, we have realized international students in north Cyprus are not enjoying it. Based on the implementation of mobile payment, Credit west bank has one mobile payment application (**Local pay)** that enables Cypriot citizens to make purchases from their mobile phone through the app but unfortunately foreign students cannot use it because the bank does not allow them to open a bank account. Bank account, Money transfers, e-shopping, ATM location etc are the main issue that many students faced to. Many foreign students do not have a bank account not because they do not want to, but rather it is difficult for them to get it. Some bank, that accept them such as Turkiye bankasi and near east bank ask for commission fees to open a bank account and this may be difficulty or expensive, and as result foreign student prefer to keep their cash in their pocket. For those who have the possibility to open it, they cannot fully enjoy because of the restrictions from some services. It is important to note that the banks have the mobile banking application that is fully different to MPA that is used by a telecom company or by an organization. Issue regarding the ATMs location, is Another challenge faced by international students. Students are living where they feel comfortable, and it is sometimes far from the ATM, therefore, they cannot do transfer or make a deposit.

The only way for international students to make payment is by cash money, and for those who have bank account, is their debit or credit plastic card so the implementation of a mainly mobile payment application will solve many of the small problem students face in their daily life.

1.2 Purpose and Objective of Study

This study examines how to set up an optimized mobile payment application that will allow students and many others smartphone users to make purchases, transfers etc; while paying their bills electronically and to receive money on their phone. This mobile payment application will allow international students to have an electronic wallet in which the money will be store in order to avoid losing and walking around with the cash.

Considering the constant technological improvement, the multiplication of the mobile phone functionalities has become an essential instrument for user. The objective of this study is to demonstrate the importance of the implementation of the m-payment application in order to solve the problem of payment that international students faced, by turning the mobile phone into an electronic wallet that international students can easily use routine payment transactions.

1.3 Limitation of The Study

This thesis deals with the implementation of an optimized m-payment application with wallet that will allow international students to use online services and pay easily. As this study is a theoretical approach, the technical limitation is that the solution cannot be implemented now because it required software engineers and designers but we will provide general analysis of mobile payment systems.

This study will focus only on NEU in which international students are representative.

Due to the covid-19 outbreak and its restrictions, it has posed an unprecedented challenge to humanity and scientific research. As result of lock-down, most institutions have witnessed a long pause in basic science research. For my concern, it was difficult to reach all respondents within the time frame that we had set, therefore it took 5 weeks to collect information from 250 respondent out of 300, which would be quick and easy if we could also physically distribute the questionnaires. Our initial plan was to distribute the surveys both physically and by using online Google Forms; however, we were compelled to utilize just the online method. It has also prevented me from discussing physically the research with colleagues and my professors. So, the Covid-19 pandemic has been affecting a variety of students, researchers and academics as

institutions have limited in-person research activities as this pandemic disease has imposed many social and systemic barriers that affect individuals and prevented them from moving around regardless of breaking covid-19 policies. I planned to collect data requiring in-person sessions and involving eye-tracking, but unfortunately, I used more web-based survey. It was a serious challenge.

1.4 Significance of Study

Looking at the previous study, researchers have shown that to use the mobile payment application, users must link the APP with their bank information but this study argues that users (international students) can use their phone number, student ID as well as their passport to register to the mobile payment application.

Apart from tourism, which is a resource of the country, this study is economically significant because by implementing the payment system many students will use the application for online services dealing with transactions in which Northern Cyprus will benefit from a percentage (tax) for each transaction.

The implementation of mobile payment system will contribute to their social development, they will be able to make their transaction easily, manage their money and others will even be able to save for their project's future.

1.5 Research Questions

This study seeks to answer the following research questions:

- Q1. How international students can conduct easily and quickly the financial transactions in North Cyprus?
- Q2. Does mobile wallet provide security in savings and financial transactions?
- Q3. Can innovation influence international student to the adoption of payment system?

1.6 Research Methodology

This research is a case study of mobile payment application for international students in Northern Cyprus. As a case study, the design will be made up using qualitative tools to enable data from key respondents using online questionnaires on the implementation and optimization of mobile payment system.

This online questionnaire will be made with **GOOGLE FORMS** and shared through WhatsApp and Instagram to the samples. The questionnaires will consist of multiple choices in order to get better understanding and obtain useful information from key respondents for data sourcing and will be share through WhatsApp and Instagram to the samples. the questionnaires will consist of multiple choices in order to allow a better comprehension and obtain useful information for the study related to the implementation of an optimized application in the north of Cyprus. This questionnaire is an open access questionnaire and was designed by Aditya Shukla And published in 2017.

The questionnaires will be sent to a total of 300 respondent students from NEU via Google form, a survey administration tool, which is part of the Google Docs, Google Sheets, and Google Slides software. For the sample size to be representative, the sampling strategy was based on a purposive and snowball sampling method to identify them. The study degree of sample participants' ranges from undergraduate to the PHD degree and they will be men and women, from eighteen to above.
Through personal connections, snowball sampling will be employed to reach more people.

The validity and reliability of this study is established by using the subjective approach. The validity is limited to the content validity based on the literature review. The questionnaires were made, developed and presented to the NEU Scientific Research Ethics Committee to be evaluated whether the questionnaires would be able to capture concern on the implementation and optimization of mobile payment App for international students in Northern Cyprus. The questionnaires were refined by the Ethics Committee, and thus the content validity was established.

CHAPTER 2

LITERATURE REVIEW

The literature on e-wallet is abundant. But the contemporary researches underpin the understanding of the analysis based on mobile payment systems. This is quickly becoming an important mode of payment in today's businesses (Dahlberg, et al., 2008), and present numerous advantages over other technologies, such as the ability to transfer money from anywhere, at any time, to be used independently, to personalize information and services, and to obtain quick responses (Dastan, 2016) and this payment system is cheaper than opening bank account.

New innovations and the digitization of life influence the way businesses are conducted as well as customer behaviour. Mobile devices have been one of the most significant electronic goods ever introduced in the modern digital era. In developing countries, the number of mobile phone users far exceeds the number of bank account holders (Nurhussen, 2016).

Although they are fitted to local traditions and intellectualities, rapid ICTs may change payment habits more quickly in developing nations than locals. According to Allen et al. (2012) and Dupas et al. (2011), using a mobile phone to make transactions has become more appealing than using cash, a bank transfer, or a debit card. When banks are inaccessible to a portion of the population, they are no longer regarded as effective institutions. In this perspective, cash becomes the only way to pay and be paid. Aside

from the cultural aspect, there is also the economic aspect of financial exclusion, such as inaccessibility or a lack of distribution networks (Lyons and Scherpf, 2004).

In some African countries, such as Democratic Republic of Congo, mobile payment services are mostly provided by telephone operators not only because of internet issue but also bank account holders is low and the majority banks do not offer online banking systems but in countries like Northern Cyprus, where bank use and internet access are considerable, the services are provided by bank such as credit west (local pay) offer these various of mobile payment services. In recent years, telephone operators have collaborated with banks to improve customer service, for instance Mpesa, a mobile payment service used in some African countries like Kenya. The first service is "**frugal innovation**", it is a design philosophy that suggests doing better with less, in a context of limited resources and means, implements an innovative system at the same time user-friendly, efficient and inexpensive to meet clearly identified needs. In frugal innovation, the operator does not introduce new technology but instead adapts existing technology to new use and aims to develop efficient solutions, devoid of sophistication and superfluity, with the least possible means but without make concessions on the quality of the service provided. This mobile payment service has the advantage of quickly fitting into the existing habits of users and this innovation is often successfully practiced in low-resource countries. The second service (**sophisticated**) allows users already accustomed to the frugal innovation to evolve towards a more functional, this system is more secure, more advanced and is fully compatible with frugal innovation but unfortunately it is not immediately suitable for unbanked people because it requires users to have a bank account. These two offers may be permanent in an atmosphere where offering a single advanced service is not judged acceptable.

Following the emergence of COVID-19 in China in December 2019, the Payment & Clearing Association of China launched a campaign on 28 February 2020 to promote and urge people to utilize mobile payment, online payment, and pay by barcode to prevent contamination. This would significantly boost mobile payment transactions in China, where the volume of such transactions is expected to reach RMB777.5 trillion in 2020, an increase of 31.8 percent year on year (Global and China Mobile Payment Industry Report, 2020-2026).

China’ m-payments are based on the Quick Response code and NFC. According to the implementation plan "FinTech" (2019-2021) issued by the bank of china, payments by QR code will be interconnected with a universal code before the end of 2021. Dahlberg et al. (2007) state that several companies and mobile payment initiatives in EU have failed and many have been abandoned. Mobile payment system, on the other hand, have been quite successful in some Asian countries, particularly in India, China, and other Asian countries. The success of Asian mobile payment system is primarily due to specific consumers' payment culture.

Marina Pasquali on May 21, 2019 presented a report conducted by Statista Global Consumer before to the Covid19 issue. According to Statista’s survey, more than 500 million Chinese consumers prefer mobile payment at point-of-sale terminals. The Statista's Digital Market Outlook, the penetration rate of digital payments in China will exceed 35% in 2019, this will make China the world leader in mobile payments. When it comes to transaction value, however, US users are at the top of the list. According to Statista, by the end of 2019, each mobile payment user in the United States will have spent an average of US $ 3,018.5 per transaction, while this value will be US $ 1,172.2 in China. Statista conducts research and surveys each year before making predictions. Another research conducted between February and June 2020 by Statista and published by Stéphanie Chevalier Naranjo on November 6, 2020. Since the coronavirus epidemic, electronic commerce and payment are growing rapidly in 2020. As more companies go digital, more people are flocking to payment options that provide a quick, reliable and contactless experience. Despite the hurdles that remain in banking and the acceptance of new technologies in south America and the Caribbean, several countries in the region have slowly but steadily started to adopt the use of electronic payment systems. In the twelve months before the survey, almost five out of ten Mexican and Brazilian customers had used online payment systems such as PayPal or Samsung Pay.

The 2 figures give more explanation about the Statista research. Figure is about the mobile payment penetration and the figure 2 about the adoption of electronic payment in the world.

Figure 1: Mobile Payment Penetration (Survey On 2021)

Source:*https://es.statista.com/grafico/18018/uso-del-pago-movil-en-el-punto-de-venta/ Accessed on 13 may 2021*

The proliferation of mobile technology and the digitalization of financial services have marked the birth of electronic money as alternative mode of payment that is considered as part of a new and modern lifestyle**.** Many nations have developed the mobile payment system with more recognizable brands stepping into the industry to advance technology and offer what users want in terms of Apps and services allowing them to pay with their mobile phones. However, despite the increase in users, payment with mobile phone is still unknown or not fully applicable in some countries. The case of Northern Cyprus captures the attention of this study, where the number of international students is increasing, and where they do not all have easy access to bank account or not have a bank account at all. This study is meant to fill this gap.

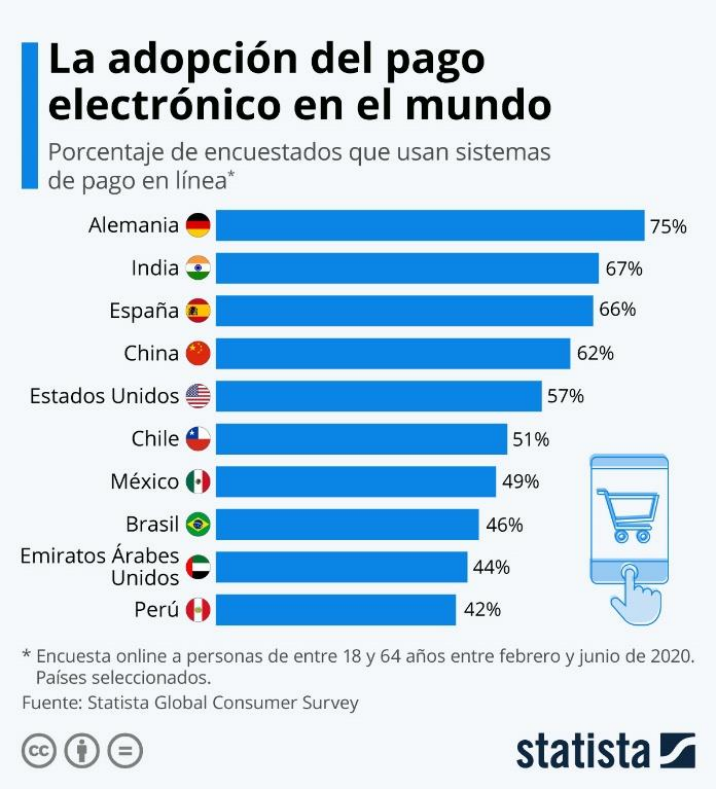


Figure 2: The adoption of electronic payment in the world (survey on 2020)

Source:*https://es.statista.com/grafico/23411/porcentaje-encuestados-usuarios-sistemas-pago-online/ Accessed on 13may2021*

2.1 Mobile Wallet

It's an electronic wallet which holds payment card details on a mobile application is known as a mobile wallet. Mobile wallet is a convenient way to make payments and stores money, it can also be used at merchants listed with the mobile wallet service provider and allow user to make transfer or receive money (Investopedia). with the evolution of electronic commerce and digital everyone wants to have and keep money in an electronic wallet.

2.1.1 Types of Wallet

The ongoing literature presents three types of wallet:

- ***Open wallets***: refers to the wallets issued by the banks. These types of wallets allow users to buy goods and services, withdraw money from the

Automated Teller Machine or in banks, and transfer to others. Example: Turkiye Bankasi

- ***semi closed wallets***: means wallets issued by telecommunications providers. These types of wallets allow consumers to buy and make transaction safety.

Ex: Example orange money

- ***Closed wallets***: Wallet issued by independently operating wallet companies. These types of wallets don't allow users to withdrawal or transfer money. The money on the wallet can only be used to the specific merchant. This feature prevents users from trading with others merchant. For instance, Apple pay, google, amazon pay etc.

2.1.2 Benefits of Using Mobile Wallet

Mobile Wallet Payments can help by:

- **In business, to increase customer and cash flow**: Due to the numerous benefits, people nowadays prefer mobile wallet transactions. As a result, merchant or supply must upgrade their payment system in order to accept all forms of payments. The increased use of mobile wallet technology by customers has advantages for all businesses sizes. With digital wallet in the pocket, you don't need to carry any additional thing, you can do everything directly from your mobile and when the customers are satisfied with the services provided, you will keep them and win their loyalty as the result.

- **Security**: In the case of wallet transactions, the security level remains high. The fraudsters will be unable to decrypt the encrypted data. Furthermore, in order to access the wallet and complete the transaction, users must enter a PIN, use finger or face. Mobile wallets are more difficult to steal or duplicate than cards or cash.

- **Flexible, Fast and Easy**: mobile wallet plays a very important role nowadays. Nobody has time to wait in line (queue) to pay their bills in the twenty-first century. We want everything to be faster and easier. You can, however, make online payments in a matter of seconds with the help of a mobile wallet.

2.1.3 The Important of Mobile Wallet

mobile wallet is the application allowing people to keep their money in the devices. Today everybody wants to use the mobile payment system. Many studies shown the importance of mobile wallet application. This figure explains the important things with the mobile wallet.

Figure 3: The Important of Mobile Wallet

Source:*https://www.xpressmoney.com/blog/industry/what-is-a-mobile-wallet-and-how-does-it-work/ Accessed on 15may2021*

2.1.4 How Does Mobile Wallet Work?

Users must first download the app from the App Store, then open it and sign up by entering information and authorizing the usage of a PIN number, password, or a fingerprint scanner as a supplementary option and Then choose the card or banking account that you will link with the app to complete the transactions. The app is now ready for use. To utilize the app, mobile applications employ NFC technology to communicate payment information. As a result, company owners need a POS system (Point of Sale) that includes NFC chips in order to accept payments through their phone or users can use the QR code. Many customers often choose to pay using new technologies (QR code). Some apps will immediately remove money from the app or

bank based on what you chose initially, while other apps need users to confirm this action by inputting a password.

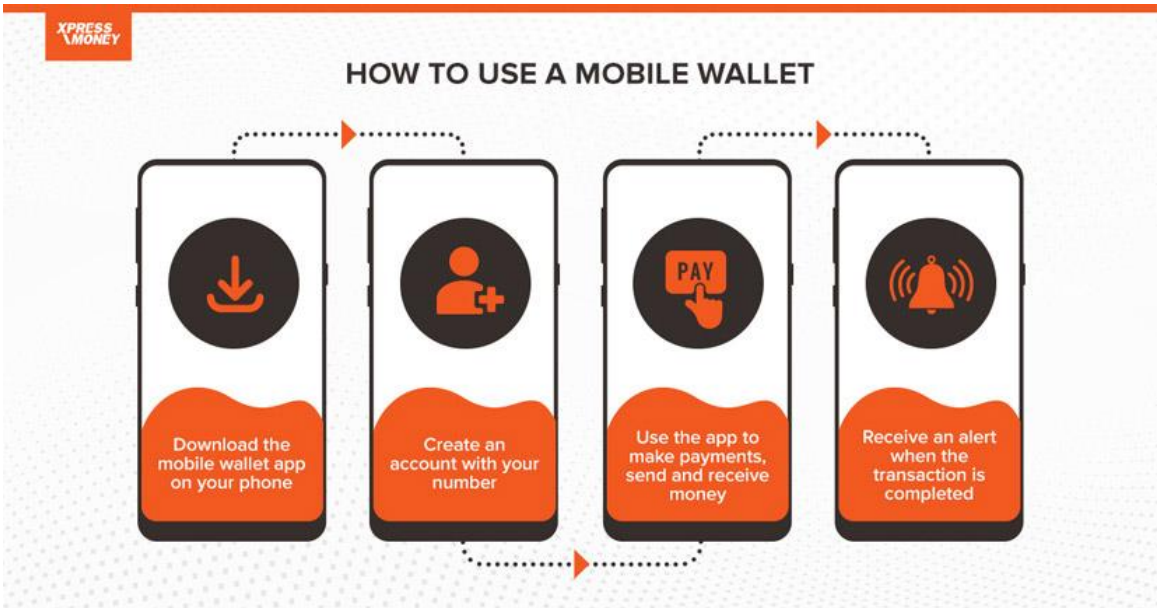


Figure 4: This image illustrates how the mobile wallet work

Source:https://www.xpressmoney.com/blog/industry/how-to-send-money-to-someone-without-a-bank-account/ Accessed on 15may2021

2.1.5 Mobile Money

Mobile money is the service used to transmit and receive money electronically using a mobile telephone as a mobile wallet. One of the primary benefits of electronic money is that users do not need a bank account and can conduct everyday financial transactions without carrying cash.

A user with a mobile money account may often conduct the following functions:

Cash in: the conversion of physical cash into electronic cash.

Transfer: The movement of e-value from the Mobile wallet account to another mobile wallet.

Cash out: this refers to the exchange of electronic value for cash.

Pay bills: use electronic money to pay for regular services and products.

e.g., Cable TV, power bills, travel tickets, and other.

According to the GSMA research on The State of Mobile Money in Sub-Saharan Africa (2016), more than 40% of the adult population in seven sub-Saharan African nations (Gabon, Ghana, Kenya, Namibia, Zimbabwe, Tanzania, and Uganda) actively utilizes

mobile money. GSMA report also, the value of cash in doubled between 2013 and 2016, unfortunately cash remains the main means of payment.

2.2 Mobile Payment

Since individual authentication codes are enforced on any transaction, the mobile payment system is much more reliable than using a standard credit or debit card. The most positive aspect of mobile payments is the eradication of physical wallets. To compensate for the lack of formal banking transaction channels, mobile phone was transformed into a vector of financial flows through mobile payment (Chaia, et al, 2010; Bounie, et al, 2013). Mobile payments are any payments where mobile devices are used to initiate, approve and confirm a currency exchange for goods and services (Tobbin & Kuwornu 2011; Shin 2010). According to Investopedia, mobile payment as the money payment made for a product or service through a portable electronic device such as a tablet or cell phone. Mobile payment technology can also be used to send money to friends or family members. From this definition, mobile payment looks to be significant compared to cash and credit cards. Mobile payment systems are expected to be key instruments in different transactions due to the rising prevalence of mobile devices and the rapid growth of mobile trading activities (Ondrus and Pigneur, 2006).

Mobile payments save time because there is no need to travel, users can manage their money at any time and from any location, and transaction costs are generally lower when compared to bank transactions. Banks have time-consuming and restrictive procedures. According to Grimes (2010), bank transaction costs are higher than mobile transaction costs. Mobile payment methods are simple to learn and apply, even for illiterates. Because of the low cost of mobile phones and the wide network coverage provided by operators, cell phone use is a cost-effective innovation that allows unbanked people to access m-payment services, before other financial services (Aggarwal and Klapper, 2013). The mobile payment can not only save the time but, no one can read, steal or duplicate your wallet or purse contents. Since the virus outbreak at the end of 2019, payment by mobile application is becoming more popular, and everyone prefers this payment method to prevent infection.

2.2.1 Payments System History

From history, humans have relied on some kind of payment system to get goods or services. For a long time, payment was done via the trading goods (cattle, grain, shells), and this approach is still used in certain nations, notably in villages. From trading to metal coins in 700 BC, paper money in 960, gold, bank cards in 1887, and, most recently, electronic payments, we've come a long way.

Edward Bellamy suggested payment by bank card in 1887, but it did not become a reality until 1921, when a payment card was issued to Western Union customers. Soon after, department stores, gas stations, and hotels began to provide charge cards to customers.

Bank Americard was the first contemporary credit card issued by a third-party bank, and it was renamed Visa in 1977. In 1994, online banking and bill payment were established, followed by mobile web payment (WAP) in 1997 and the current generation of mobile payment applications.

- In 1983: David Chaum, an American cryptographer, starts work on the development of digital money by creating "the blinding formula, which is an extension of the RSA method, which is still used in Web encryption."
- In 1998: PayPal is designed.
- In 1999: Cell phones may now be used to purchase
- In 2003: 95 million of mobile phone users made a purchase using their mobile device.
- In 2007: IOS and Android systems are released.
- In 2008: The invention of Bitcoin.
- In 2011: Google Wallet is launched.
- In 2014 Apple Pay is introduced, a year later Android and Samsung Pay was also introduced.
- In 2020, 90% of smartphone owners will use a mobile payment system.

Payment product innovation

Even while payment product innovation is mostly focused on electronic payments, it has the potential to disrupt cash use as more and more options become accessible to the general population.

Examples: Internet payments, mobile payments and usage of near-field communication.

Banknote and coins production: banknotes are printed on a number of materials, including paper, cotton, polymer, or a combination of these.

Improvement of security to avoid falsification: such as cylinder moulding watermarks, security threads, security films, secure windows, printed and concealed security features, 3D imaging, holograms, and fluorescent ink.

Withdrawals from ATMs through mobile banking apps: Mobile banks function through a mobile application that allows customers to withdraw money from a variety of ATMs at no extra cost. Mobile banking is a relatively recent thing. on NFC and QR (Quick Response) code technology, virtual currencies, and rapid payments.

2.2.2 Mobile Payment provider

- ***The Operator-Centric Model***: in this model a telephone operator serves as the model's central mode, managing transactions and distributing property rights to partners as needed. Let's look at Mpesa as an example of this model. Mpesa is a mobile payment based on USSD money transfer and microfinance service developed by Vodafone Group plc and Safaricom in 2007. This mobile payment service is aimed at all unbanked people. Users can deposit and withdraw money, transfer money to other users, pay bills, purchase airtime, and save money on a virtual account. There are also offices that convert cash and place it in electronic wallets to the users' request and he/she must pay a fee to the operator based on the amount of the transfer when he makes any transaction. This mobile payment method is more popular in African countries, and anyone can open a Mpesa account by registering with their Vodafone number and an ID. The benefit of Mpesa system is that users don't need to be connect to the internet or to the mobile data to use it.
- ***Collaborative Technology Model***: in this model, mobile operators and banks combine their skills by working in partnership, in order to offer special service to the customers. This model is more widely used in some countries. For a better understanding of the model, let talk about 2 organizations, one is the bank and the other the telecom company. Safaricom the telecom company in Kenya has worked in partnership with one private bank named Equity bank, these 2

organizations decided to create a mobile payment that will allow users to use ATM instead of offices without opening the bank account. So, people can withdrawal and make deposit easily from there. M-Kesho launched in 2010, is the result of partnership between equity bank and Safaricom. Another example of partnership, Mpesa which is the result of the partnership between Safaricom and Vodafone, is very popular in many Africa countries. Vodafone works in collaboration with some banks in D.R Congo such as Equity bank, Ecobank and trust merchant bank. This collaboration enables users to withdraw and deposit money from ATMs without the need off a bank account.

The adoption of mobile payment services allows banks to attract new customers and experiment with complementary ways to increase demand for banking products in all cases observed (Mbiti, Weil, 2014). The model provided and researched in the following sections tries to explain how mobile payment services contribute to higher financial inclusion, as well as the kind of collaboration that this requires between operators and financial intermediaries.

2.2.3 Mobile payment Model and technologies architecture

The mobile technology architecture provides a variety of options for implementing mobile payments.

1. Mobile payment based on Short message services (SMS): SMS is the communication method that allows users to make transactions or pay for services (Ozcan & Santos, 2015). A common format is utilized to convey messages such as random number, the amount of money, currency, and destination phone number. The payer's validation is based on their phone number and passcode. Any problem regarded to the security issue with the PIN code, a one-time password is a more secure alternative. The mobile payment based on SMS is cheap and simple to use. Customers use these services primarily to make mobile payments and check their fundamental account data. As a result, users are effectively paying through their phone network provider. For instance, Orange money.

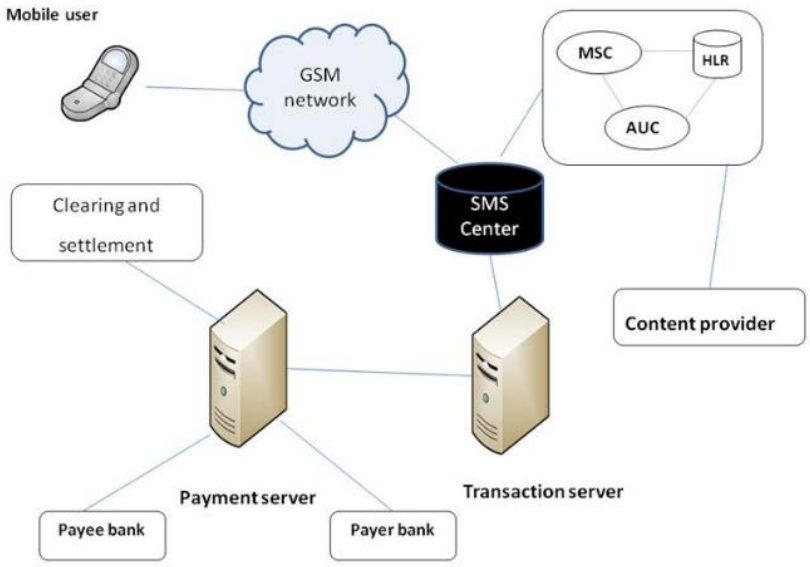


Figure 5: The mobile payment based on SMS (*Hamid R. Rabiee 2010)*

Source:https://www.researchgate.net/publication/228409169_A_Survey_of_System_Platforms_for_Mobile_Payment

2. Mobile payment based on Wireless Application Protocol (WAP): Allows users to make payments using a browser or specialized applications (Chen & Li, 2017). Payment through the browser requires the user to fill payment details, while the app allows users to complete the transaction using the mobile payment app installed on their device. Users must download and install the mobile payment application developed by a financial services organization in the specialized WAP-type application (Akinyokun & Teague, 2017).

Customer authentication will be carried by mobile phone number and passcode. The banking transaction will be carried out by the payment server with the banks concerned.

The data transfer is routed by WAP compatible telephone to the GPRS network. WAP communicates between the WAP gateway and material on the Internet using a specific WML language, and it translates WML to HTML to allow delivery of WAP material to a suitable mobile device. In other words, the user submits the request over the GPRS network, and the WAP gateway directs it to the content server.

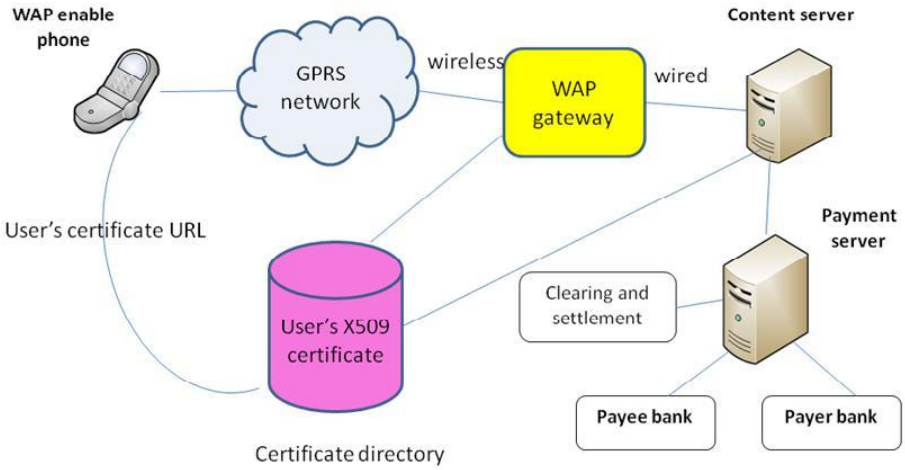


Figure 6: The mobile payment based on WAP/GPRS (*Hamid R. Rabiee 2010)*

Source:https://www.researchgate.net/publication/228409169_A_Survey_of_System_Platforms_for_Mobile_Payment

3. Mobile payment based on short range communication network (SRCN): In this technology architecture, purchase information may be communicated to a point of sale or vending machine over a short-range communication network such as NFC technology. This payment system is designed for micropayments and is based on a business model focused on the operator. This platform may provide mobile services such as purchasing and reserving electronic and physical products. NFC is a sort of contactless technology that enables for immediate data exchange by just approaching a device within 5 cm of a receiver. Pham & Ho, (2015) defined NFC as a communication protocol in which NFC-compatible material is integrated or installed in mobile devices, allowing contactless payments by establishing wireless communication between two technical devices, such as a phone and a terminal.

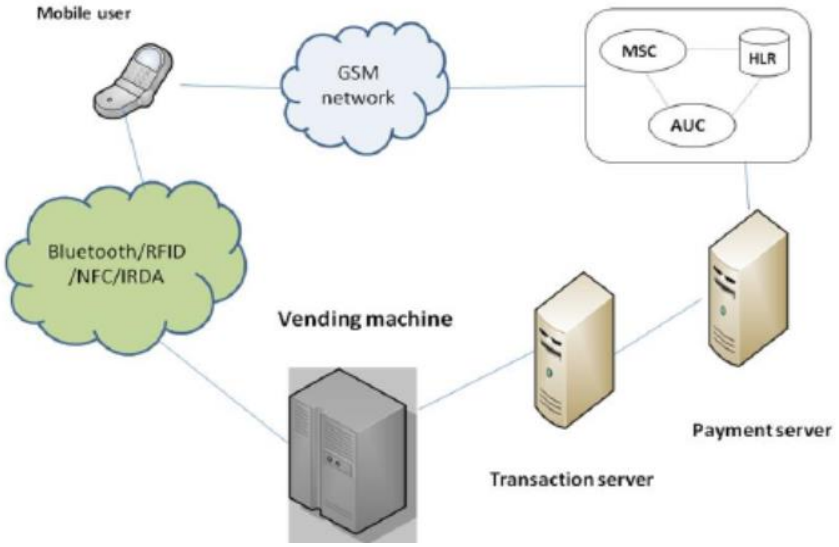


Figure 7:The mobile payment platform based on SRCN (Hamid R. Rabiee 2010)

Source:https://www.researchgate.net/publication/228409169_A_Survey_of_System_Platforms_for_Mobile_Payment

4. mobile payment based on phone-based

on this platform, the payment software will be downloaded on the mobile phone from apps store. After downloading the mobile payment, user have to sign up by filling their information. A communication channel (SMS, USSD, or WAP) is required to communicate payment information to the mobile payment system. J2ME, sometimes known as BREW, is a payment software development platform for GSM or CDMA networks. The constraints of this platform include only being compatible with JAVA phones, requiring manual installation and upgrading, and having different versions for different phones. The advantages of using J2ME include end-to-end security, content encryption, and increased network capacity consumption.

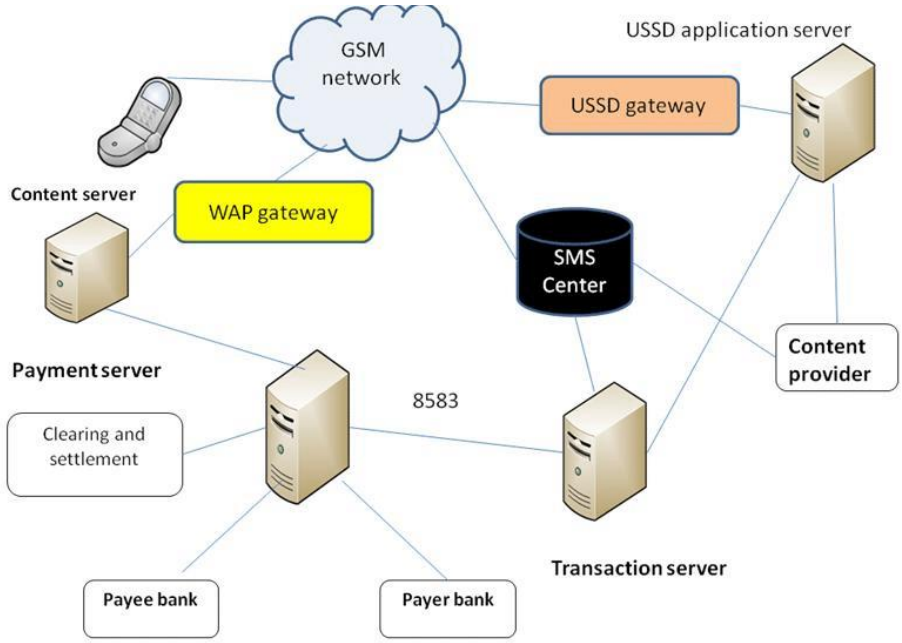


Figure 8: The mobile payment based on phone-based application (Hamid R. Rabiee 2010)

Source:https://www.researchgate.net/publication/228409169_A_Survey_of_System_Platforms_for_Mobile_Payment

5. mobile payment platform based on Unstructured Supplementary Service Data (USSD)

USSD is a GSM network function that may be used to send data between the mobile phone and the application. The USSD gateway service provider communicates with the GSM network via the SS7 protocol. The code structure has been established, and the information of each operation has been specified; the contents might include the account's USSD code, amount, currency, destination mobile number, and so on.

As seen in the image, the user makes an Unstructured Supplementary Service Datar equest to the USSD gateway by entering a code into his mobile device, The USSD gateway starts a conversation and sends session information to the appropriate application; the application returns this information to the Unstructured Supplementary Service Data Gateway as XML, and the USSD Gateway generates a USSD message and transmits it to the user.

The payment server may interface with the banks involved in the banking transaction. This platform may enable mobile services such as the purchase and reservation of electronic content (tickets, restaurants, etc.).

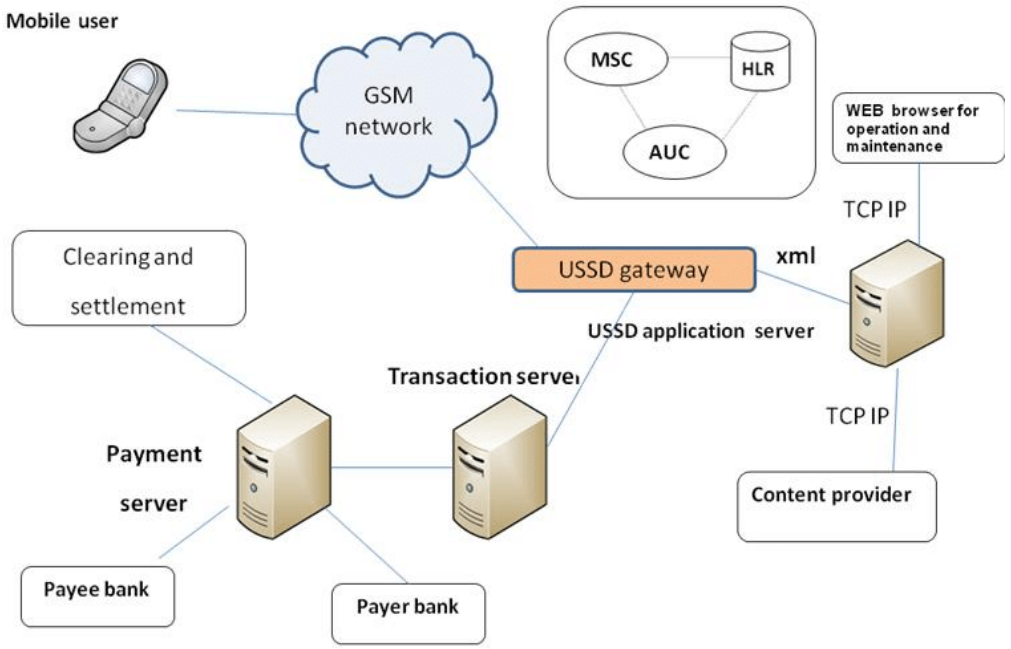


Figure 9: The mobile payment based on USSD (Hamid R. Rabiee 2010)

Source:https://www.researchgate.net/publication/228409169_A_Survey_of_System_Platforms_for_Mobile_Payment

2.2.4 NFC Contactless Payment

Near Field Communication (NFC) is a wireless data transfer technique that allows devices in close proximity to transfer data. NFC technology is utilized in mobile wallets such as Apple Pay and Android Pay, as well as contactless cards, enables contactless payments. This technology is comparable Bluetooth but NFC does not need device detection or manual synchronization also comparable to radio-frequency identification technology, however it is restricted to exchanging data with devices within four inches. As a result, while using a mobile wallet, the user must keep their smartphone near to the contactless payment scanner.

A customer waves his or her mobile phone near a reader module while using a smartcard-enabled mobile phone. The vast majority of transactions do not need authentication; however, some do need PIN verification before the transaction may be processed. The money might be debited from a pre-paid account or debited to a mobile phone or directly from the bank account. Two-way communication is being developed with contactless technology which offers a faster and better way of communication between entities. Furthermore, suppliers can handle a large number of transactions

over a few miles per second, helping unbanked customers in the market. In 2020, due to the COVID-19 pandemic, the use of the NFC payment method has increased, everyone prefers to use this system to avoid contamination. "COVID-19 was more efficient than any marketing campaign ever would have hoped in raising awareness of the benefits of contactless payment. Consumers are looking for contactless ways and traders want to respond to the largest possible audience by means of mobile and card solutions.

Figure 10: Contactless Payments (NFC) (Prime Meridian Capital Management, jul 23,2020)

Source: https://twitter.com/pmifunds/status/1286129779528228864

2.2.5 Point of Sale (POS)

In the market POS is a significant market driver. The point of sale (POS) is the machine where consumers pay for goods or services in the shop, supermarket or restaurant. With the help of an external card reader device and an application designed for the required hardware, the mobile phone may be used to accept card payments. The card reader reads and typically allows payments to be made between consumers, small and medium-sized enterprises, and big companies. This sort of contactless technology's capacity to enhance commercial operations such as transaction speed, instantaneous product information, interactive marketing, and organizations' capacity to recognize purchasing behaviors, among other things, makes it an enticing tool for businesses and consumers.

Figure 11: POS Workstation

Source: https://ilico.in/Erp/point-of-sale-pos

2.2.6 Quick Response Code

QR Code is a two-dimensional code variant. A barcode is an optical label that can be read by machines and carries information about the object to which it is attached. Masahiro Hara from the Japanese company "Denso Wave" developed the two-dimensional barcode in 1994. The objective was to track automobiles while they were being manufactured. This barcode was initially made up of black squares placed in a square grid on a white background but now everyone can choose the colour.

QR Codes are rapidly becoming a useful technique that helps users to scan and quickly pay. In practice, it often carries data for a location, identifier, or tracker that refers to a website or application. With this payment method, the user scans the QR code with his/ her mobile device's camera to gain access to an account that will allow him/ her to manually enter the amount to pay in order to complete the transaction (Chen & Li, 2017). Several payment applications, such as WeChat and Alipay, include the QR code in their QR code programs (Huang, 2017), but if the user uses a payment application that does not include the QR code, he must install QR code recognition software.

The Quick Response system gained popularity outside of the automobile sector due to its quick reading and larger storage capacity when compared to normal UPC barcodes. QR codes, which were originally used to monitor components in automobile manufacture, are now utilized in a considerably broader variety of applications. Commercial monitoring, entertainment and transport tickets, and so forth. It may also be used to store personal information for use by businesses. encoding URLs, website addresses, business cards, etc… In order to utilize the QR code, users scan the picture to show text, contact details, transfer money and make payment. QR code has become one of the most common matrix barcode variants and one of the most helpful payment models.

1. Structure of QR Code

The square shape form is essential for a QR Code construction, outperforming barcodes by a long distance. Here are 3 reasons about the rationale behind the square shape in the QR code structure.

- **Higher data capacity:** the square design enables QR Codes to be read in two dimensions, for example, horizontal and vertical data. This indicates a lot of information in a little code, making them a flexible tool.

- **Improved error correction:** QR Codes can resist to more damage, reducing margin error from 7 to 30 percent, which is critical in the inventory department, as many organizations are aware.

- **Fast to read:** Scanning a QR Code may be done with almost any device; just download the program on a smartphone, PC, or tablet. Because QR codes are here to stay, gadgets now include a QR Scan with their camera.

The QR Code is advantageous and very useful nowadays, it allows to store information on a single square image. it can contain your information and redirect you to your social media applications or to a specific link, can allow you to install (download) an application, can allow you to transfer or make a quick payment, share and collect information on different e-mail addresses etc... All the uses are possible through the QR Code structure with a square shape form.

2. QR Code Secret Component

- **Version Information**: with this section you can specify which version of all the QR Codes is used.
- **Timing Pattern**: these are lines that tell the scanner the size of the data matrix.
- **Format Information**: these patterns include the information about error tolerance and data mask pattern, to simplify the scan of the code.
- **Data and Error Correction**: here is where the data is shown.
- **Quiet Zone**: this is a blank space that helps to scan programs to differentiate between the code and the surroundings.
- **Alignment pattern**: when using larger codes these markings can help with the orientation.
- **Position Detection Pattern**: indicate in which way the code is printed.

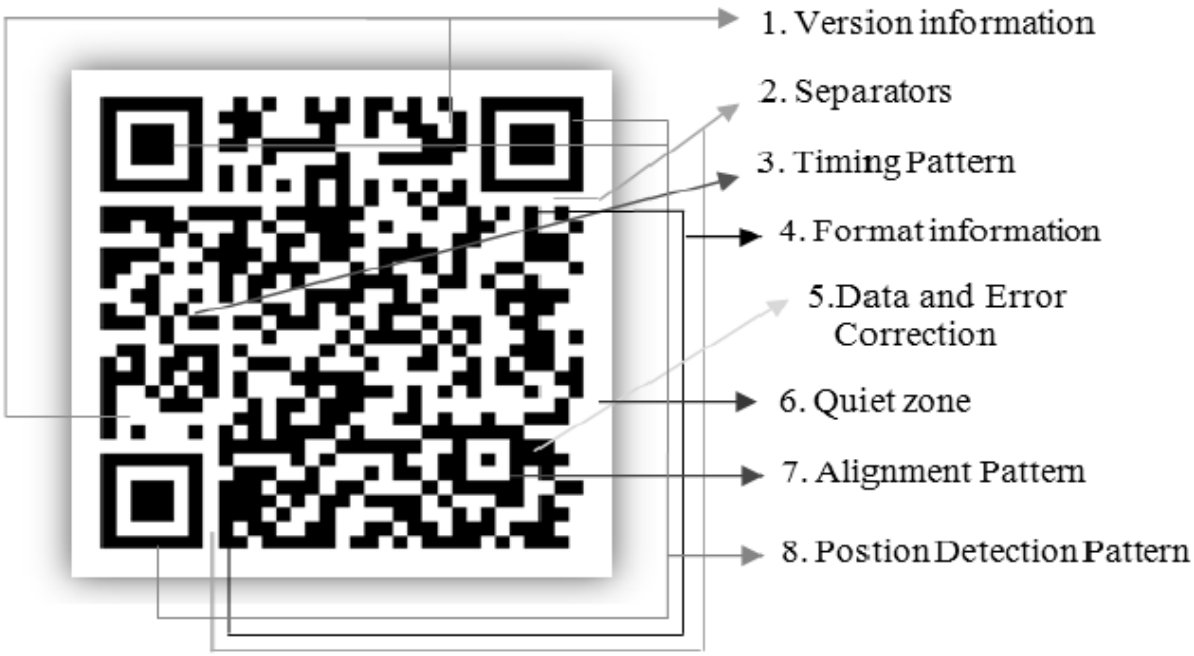


Figure 12: QR Code components (Jumana Waleed,April 2015)

Source: https://www.researchgate.net/publication/275650586_An_Immune_Secret_QR-Code_Sharing_based_on_a_Twofold_Zero-Watermarking_Scheme

2.3 Definition

Mobile payment: xin, et al, (2015) defined Mobile payment as a method of conducting a payment process through any mobile devices.

Mobile wallet: According to the study of Anna omarini (2018) A mobile wallet is a service which enables users to purchase and maintain access to electronic funds and to make use of digital payment technologies and solutions.

Innovation: is the enhancement of acceptance, integration, and use of a value-added invention in economic and social areas. It is the renewal and expansion of goods, services, and markets or the creation of new production process.

Telecommunications: Is any transmission or reception information by various types of technologies.

2.4 Technology Acceptance Model (TAM)

The Technology Acceptability Model (TAM) is the most extensively used models for understanding user acceptance and innovation implementation (Davis 1986). Technology Organization Environment (Pudjianto et al.,2011), Diffusion of Innovation Theory (Rodgers, 2003), and Technology Acceptance Model (Venkatesh et al., 2016) are some of the models and theories that have been used to describe the acceptance and adoption of new technologies. Among these theories and models, TAM has been used in many researches because it highlights the adoption of using technology. The major TAM constructs are Perceived Usefulness (PU) and Perceived Ease of Use (PEOU). Perceived ease of use has been shown to have a direct effect on lower behavioral intentions or attitudes than perceived usefulness, as well as an indirect impact as one of the antecedents of perceived usefulness. In other words, perceived

usefulness moderates the impact of perceived ease of use. According to this research, there is a need to use TAM to boost the model's explanatory strength in forecasting user uptake of mobile payment. People are predisposed to approve new technology when it is beneficial and useful rather than when it is simple to use.

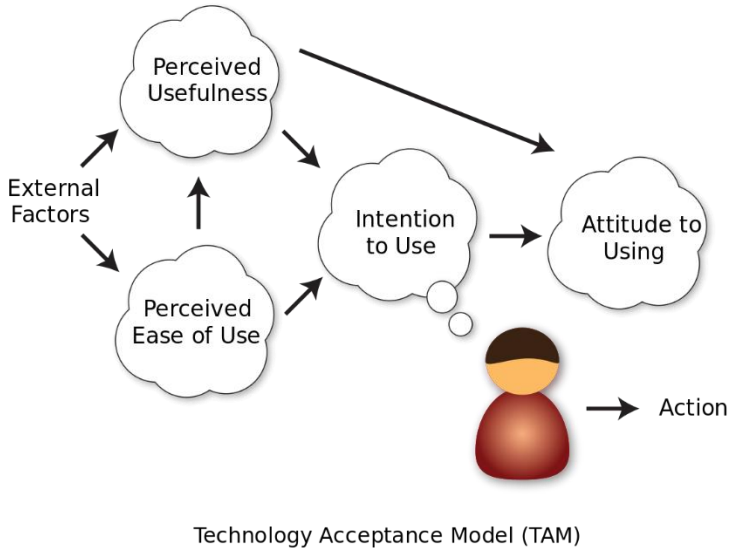


Figure 13: Technology Acceptance Model (TAM) version 1, Davis, Bagozzi & Warshaw (1989) p 985

Source : https://en.wikiversity.org/wiki/Digital_Age/Technology_Acceptance_Model

2.5 A Generic Model For M-Payments Application Service

Figure 14 demonstrates a general architecture for the source of mobile payments and shows the interaction of key actors in a mobile payment ecosystem, especially how key participants in a mobile payment system interact with one another. The major actors in the mobile payment service are the merchant and the client. The mobile payment application service provider (MPAS) is essential since it is responsible for delivering the infrastructure components (hardware and software) that will be utilized to process payments as well as serving as an intermediary between financial institutions and mobile network operators. To utilize the mobile payment service, the customer and merchant must first register with the MPAS, which entails gathering

information. The MPAS gathers the bank information of both the client and the merchant, as well as their authentic digital IDs, which are necessary for Both.

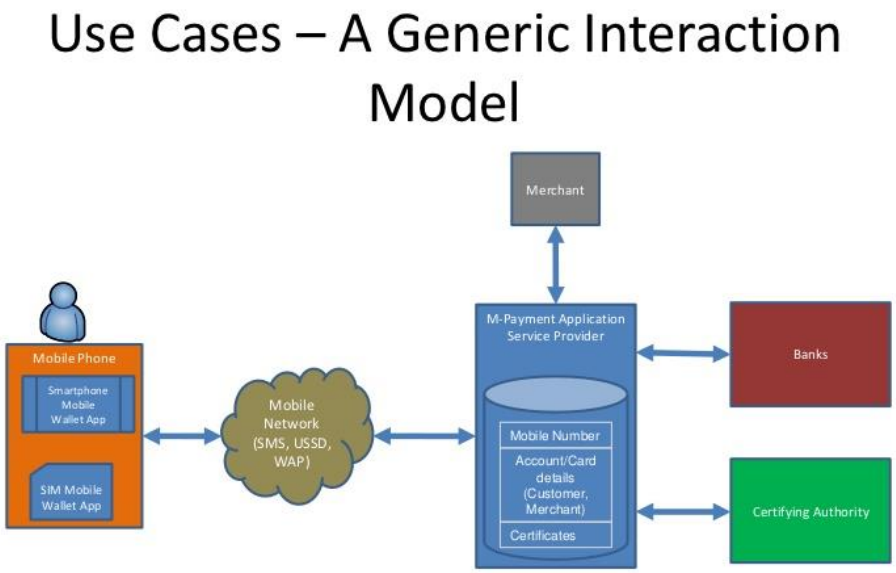


Figure 14: A Generic Model For M-Payments Application Service

Source: https://www.slideshare.net/LakshmanaKattula/mobile-payments-framework

accessed on 3june2021

2.6 Mobile Payment Transaction

To effectively execute a mobile payment transaction, three stages must be accomplished in order: making the payment request, approving the payment request, and settling the payment request (D. A. Montague, 2010).

Transaction in remote mode is carried out via the network or “over-the-air” (OTA). OTA services make advantage of mobile device features that transfer data over GPRS, mobile data, or WIFI. In OTA m-payment, users can make transactions directly from their devices to the payment service provider. For widespread acceptance of payment requests, OTA payments often need a more sophisticated infrastructure (P. Sachar, 2004).

Depending on the proximity methods of communication accessible on the mobile device, contactless or proximity payments may be completely or paid over-the-counter

(OTC). in OTC payment, consumer have to be present at the point of sale, and the transaction is typically carried out utilizing a wireless device that employs proximity communication protocols but OTA payments, on the other hand, take happen while the customer is physically distant from the POS and closer to online payment gateways.

2.7 Public Key Infrastructure

PKI (Public Key Infrastructure) is the encryption and cybersecurity infrastructure that secures communications between the server and the clients, or users. By facilitating the verification and exchange of data across multiple servers and users, public key infrastructure helps to build a secure corporate environment. PKI operates by using two distinct cryptographic keys, a public key and a private key. These keys, whether public or private, encrypt and decode secure data.
PKI secures sensitive electronic information while it is exchanged between two parties using a two-key encryption method and gives each party with a key to encrypt and decode digital data. PKI security is utilized in a variety of ways, Email security and web communication security, signing apps digitally and Software that is digitally signed, File encryption and file decryption, Authentication by smart card.

2.7.1 PKI Components

the three mains component of PKI are Digital certificates, certification authority, and the registration authority. These components are required for the security and communication of digital information and electronic transactions.

1. Digital Certificate
A digital certificate is comparable to a passport, is a kind of electronic identification for websites. Because the identities of the parties may be authenticated via certificates, PKI allows safe connections between two communicating devices. You may produce your own certificates for internal communications; but, if you require certificates for a commercial website or anything on a bigger scale, you may get them from a reputable issuer known as a certification authority.

2. Certifying Authority

A Certificate Authority (CA) is used to verify the digital identities of users ranging from persons to computer systems to servers. Certificate authorities protect digital certificates against manipulation and control the lifespan of a certain number of digital certificates inside the system.

3. Registration Authority

The Certificate Authority (CA) authorizes the Registration Authority (RA) to issue digital certificates to users on a case-by-case basis. The certification authority and the registration authority keep all certificates that are requested, received, and cancelled in an encrypted certificate database. Certificate history and information are also stored in a certificate store, which is often docked on a particular machine and acts as a storage space for all memory connected to certificate history, including granted certificates and private encryption keys.

As previously noted, PKI is ideally suited for situations requiring digital security, in which encryption plays a critical role.

2.7.2 Encryption Used by The Public Key Infrastructure

PKI combines asymmetric and symmetric encryption. Because symmetric and asymmetric have their own strengths and optimum use cases, the combination of this two is very effective in public key infrastructure.

1. Symmetric encryption

Symmetric encryption protects the specific secret key generated during the first information exchange between the parties. In order for all parties to encrypt and decode the information provided, this encryption key must be passed from one to the next. This private key might be a passcode or a series of random numbers or characters generated by a random number generator (RNG).

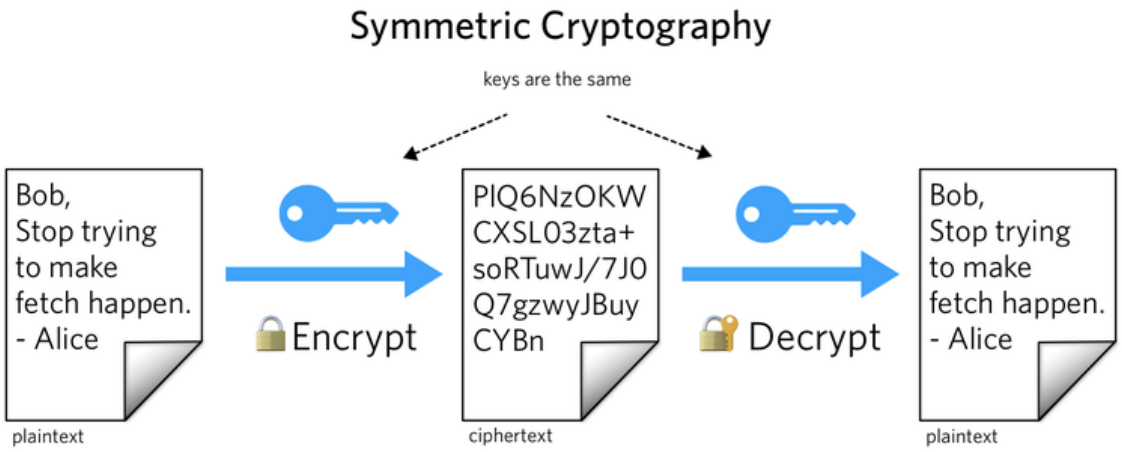


Figure 15: Symmetric encryption

Source : https://www.twilio.com/blog/what-is-public-key-cryptography ,Accessed on june2021.

2. Asymmetric encryption

Asymmetric encryption involves the use of two keys, one public and one private. The private key decrypts and the public key encrypts. It enables you to generate a public key for the party reporting to you, allowing them to encrypt their incoming data, which you can then decode using a private key.

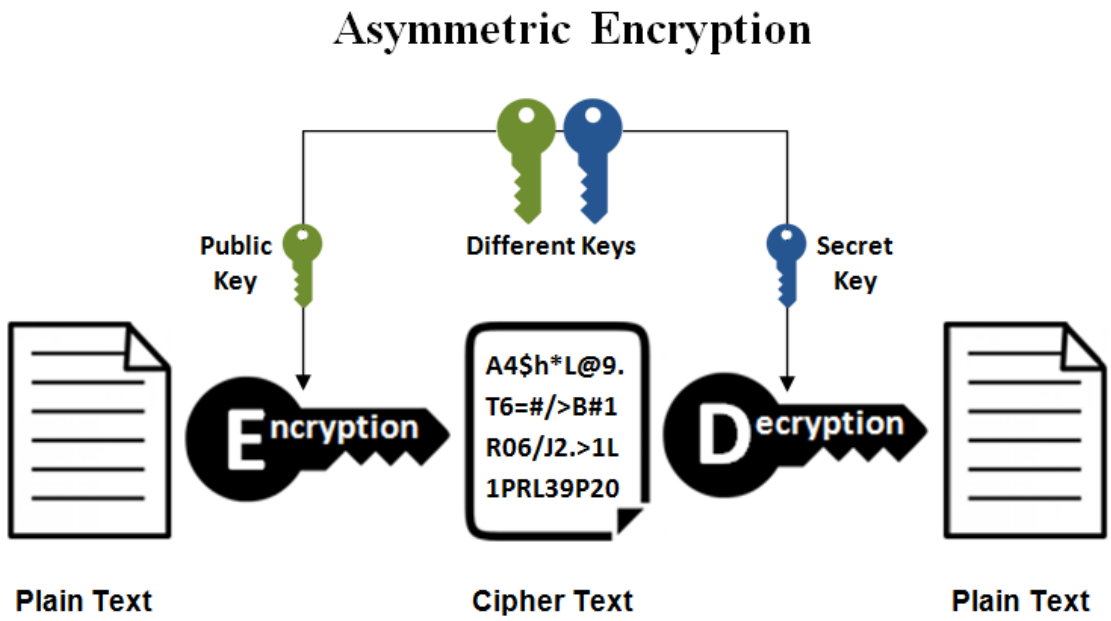


Figure 16: Asymmetric encryption

Source: https://foxutech.com/how-ssl-encryption-works/asymmetric-encryption/ Accessed on 9june2021

CHAPTER 3

THEORETICAL MODEL AND HYPOTHESIS

This study draws on the theory of technology adoption which refers to the acceptance, integration and use of a new technology in society and in which the acceptance process follows many steps. Many existing researchers focus on the factors influencing the adoption of mobile payment and electronic, and on the Technology Adoption Model (TAM), with additional constructs appropriate for the study of mobile payments, such as security, costs, confidence, speed of transactions, place of use, social comparison groups, facilitation status, privacy, device consistency, etc. According to the concept, when consumers are faced with new technology, a variety of variables impact their choices about how and when to utilize.

The literature revealed, from previous researches that social influence is a significant factor affecting intentions of using mobile payment systems (Pousttchi & Wiedemamn 2007). Chen & Nath (2008) demonstrated that transaction speed, security and privacy issues have all a substantial impact on adopting new technology; and for Shin (2009) and Liébana-Cabanillas et al. (2014), perceived usefulness have significant effects on users' attitude towards mobile wallets, and perceived ease of use, social influence and perceived usefulness as significant factors affecting attitudes and use intention of mobile payment systems. According to Yang, Lu et al (2012), social influence and personal innovativeness are the crucial predictors of propensity to use mobile payment systems.

3.1 Perceived Usefulness (PU)

This is defined as "the degree to which a person feels that using a certain system will improve work performance" (Davis, 1989). People feel like mobile payment adoption

will improve their job performance in the buying of items. However, if consumers feel that an e-payment system is useful, they are more likely to accept it. This is one of the main assumptions of TAM and its utility as perceived concept of usefulness in literature.

3.2 Perceived Ease of Use (PEOU)

One of the most important elements influencing customer acceptance of a system is how easy they believe the system is. Perceived Ease of use is described as the degree to which the user trust that using a specific system will be ease of use, such as mobile payment will be free of effort stimulation (Davis, 1989). According to the TAM created by Davis et al., if a system is viewed as simple to use, it also gives greater value to its users (Davis et al., 1992). The customer should find the system convenient to use for accepting mobile payment apps compared to their current payment methods; otherwise, an effort to adopt a new paying system may not be profitable. This feature revealed to be one of the most essential components in giving value and changing views in the mobile payment scenario (Dahlberg & Mallat, 2002; Liébana-Cabanillas et al., 2014; Ovum, 2012).

3.3 Perceived Security (PS)

According to Salisbury et al. (2001), "perceived security relates to the degree to which people believe that payment through electronic system is secure." As a result, security concern mobile payment system (Liébana-Cabanillas et al., 2014; Linck et al., 2007; Shatskikh, 2013). For example, customers are most concerned about losing mobile phones, which is not an unusual occurrence, and identity theft (Gross, Hogarth, &Schmeiser, 2012). Furthermore, the number of people using mobile payments may rise privacy and security concerns among the public. So, the necessity for safe operations is important to the success of electronic banking, as well as e-commerce websites and mobile payment.

3.4 Personal Innovation

Personal innovativeness is defined as an individual's openness to explore new ideas, new goods, or new technology (Chang,Cheung, & Lai, 2005). Another research found that personal innovativeness impacts innovation adoption behavior (Yi, Fiedler, &

Park, 2006). Innovative individuals have been demonstrated to be open, passionate, and active.

Because the majority of people still have limited knowledge of different new mobile services or technology, innovativeness is significant in new technologies. To illustrate this, it has been demonstrated that innovation affects adoption behavior in many systems (Chang & Chin, 2011), online shopping environments (Blake, Neuendorf, & Valdiserri, 2003), and mobile services (Zarmpou, et al, 2012). Personal innovation has a significant favorable impact on online purchasing choices.

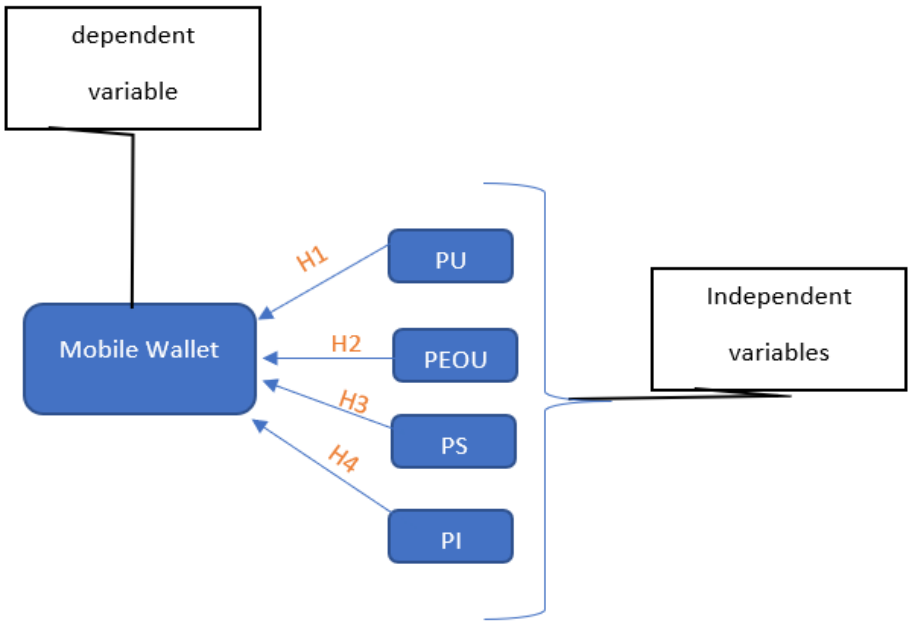


Figure 17: Research model (PHAGEL MWEMA, 2021)

Source: Author

3.5 Hypothesis

H1: Perceived usefulness can influence international student using mobile wallet for their financial transactions

H2: The ergonomic interface plays an important role in the acceptance of mobile wallet

H3: Security is one of the main advantages of using mobile wallet

H4: personal innovativeness can influence the use of mobile wallet.

CHAPTER 4

CONCEPTUAL FRAME

This chapter basically discusses the design and guidelines required for the implementation of the mobile payment system in accordance with the needs and ’s analytics. Since its invention, it has been almost hard to imagine living without a mobile phone. Mobile services are now widely available and frequently utilized for both personal and corporate needs.

Mobile service providers are now competing fiercely to gain new users and expand market share. The rapid expansion of these services underscores the importance of mobile payment. Designing a mobile payment system is a difficult process that takes various elements into account, including client preferences, the technical environment, social culture, security, and privacy concerns. In addition to these difficulties, mobile payment involves several actors who must be considered, including customers, merchants, providers, banks, and so on. Acceptance of mobile payment systems is largely driven by the platform and architecture used to make the payment.

Mobile wallet is an application stored in mobile phones allows users to save money for future online transactions. Users can use an electronic wallet to pay for online purchases from websites selling products, services, plane tickets et...
Mobile payments are a progression of electronic payment systems that allow for mobile commerce. It is any payment in which a mobile device is used to initiate, authorize, and confirm an exchange of financial value in exchange for goods and

services (Au and Kauffman, 2007). Here are some key factors to keep in mind when developing mobile payment application.

1. Prioritization of functions: An application is basically a collection of different functions and functionalities so above all it is important to do a thorough market research, in the way to find out the client's expectations, their demands and the prevailing market trend beforehand to create a mobile payment application. The success of an application is contributed by prudence when integrating functions and functionalities. the application must be friendly user.

2. Developer selection or templates: nowadays things have become easier, to develop an application or a website, there are now predefined templates or you can hire a developer. Because they are up to speed on latest technical advances and trends, mobile application development firms or a developer may assist you in developing electronic payment apps or any mobile application and website. However, before to conclude with a developer, you should fully review their profile, see whether they have completed similar tasks in the past, and ask any concerns you may have about the project. If you have your own developer within the company, it will be very easy for you to choose between the templates and the code.

Before you decide, on a developer, find 3 to 5 developers or mobile payment application development company, study their services and then make a decision.

3. Security: The security issue regarding mobile payment systems is a very important variable in the acceptance of new tech. the digital wallet can only be successful if customers can rely on its security structure. in case of partnership with a bank, a telecommunications company that offers payment services or another institution, it is the primary responsibility to ensure the security of customers' data using advanced technological methods because they will be forced to store their credit card information or enter their passwords. You should incorporate technologies that are difficult to decode in addition to normal safety and security methods.

4. digital receipt: digital receipt is proof of payment, confirmation of success or failure that users must receive after each transaction. Regardless of the transaction amount, it is important to provide a receipt after any transaction.

5. Reward points: the reward point is not a requirement, it is optional but for this study, we recommend it. Integrate the functionality of rewards points each time there are transactions and these points can be changed into digital currency or be used during

a payment. this system can make your digital payment application last longer. Example of Ctrip, it is an application which offers reservation services for plane, bus and train tickets, hotels, etc... This application offers reward points each time you book. If you opt to include this function, keep in mind that users can check the reward points anytime they want and redeem them more effectively.

4.1 Mobile Payment Concept

we named this application Mcash. Innovation is the improvement of things that exist. we are going from the principle that the mobile payment applications exist and for our part, we optimize it in ways that suit the clients' demands (international students). this application can work in collaboration with several services that brings us back to the Collaborative Technology Model (Chap2). as the figure illustrates, the application can be used for several things and several services can join it. this application primarily targets all foreign students, especially those who do not have bank accounts. nowadays mobile payment has become very useful, especially since the end of 2019 when covid 19 erupted. The aim of the research is to propose an optimized mobile payment application in order to resolve issues that foreigners living in North Cyprus face. speaking of an optimized payment application, we are going on the principle that all applications have some common’s points, such as the internet connection or the effect of linking the App to the bank account. Starting from the problematic that we have listed, we propose a bifunctional application, in other word, the application that will be operational in off and online. the main goal of this App is to facilitate transfer and purchase.

4.2 Mobile Payment Structure

Various architectures and mobile payment models were studied and assessed in this thesis based on the concept of our suggested study. There are two types of criteria to consider: operational and Structural. Structural and operational criteria should primarily apply system policy and what the system should be able to do in order to meet system needs. Efficiency, accessibility, security, confidentiality, and connectivity must all be taken into account.

4.2.1 Functionality

The Objectives of the Study is to set up a payment method that will allow transaction or payment through mobile terminals that are compatible with Wi-Fi, GPRS, 3G, and offline usage. In terms of functionality, the system meets the following criteria:

1. Establish a safe method of initiating, approving, and paying payments.
2. Create an integrated and secure customer registration system.
3. the exchange of information between the client, the merchant, and the agent
4. Allow customers to conduct their payment directly via payment systems; in addition, merchants should be able to record the transaction requests and the intermediaries' agents should be able to authenticate payment information on mobile payment transactions.
5. Keep track of payment details, such as user registration information (clients and sellers) and the status of financial transactions demands and transaction messages received by the system.

4.2.2 Security

In terms of security, the system's design must be compliant and compatible with the other components in the system. To fulfill the following security standards and achieve the necessary payment system performance:

1. The mobile application must follow the PKI standard requirements established by the certificate authority of public key certificate. The certificate authorities prevent tampering and oversee the lifespan of a certain number of digital certificates inside the system.

2. Providing mobile payment application, using unique customized keys to safeguard data storage and retrieval information, as well as mobile application transactions, so user profiles and information sharing must be safe to guarantee that no information is compromised.

3. All communications between mobile apps, primary gateways and servers must be secured.

4. All configurations information and folders should be safeguarded in mobile device secure sections using suitable and standard factor authentication modules.
5. Access to the mobile application's files and database should be limited to the application's unique interfaces.
6. OTC transactions should only be performed and authorized by the user

4.2.3 System Architecture

Based on our research, which is to develop an optimized payment application for international students. We suggest a secure app design for payment system that takes into account the demands of payment information. The recommended application design for this research is a mobile payment based on a phone-based application.
This application should contain components, protocols, and interfaces for registration, user security at various levels, and component protection. The system architecture should be structured in such a manner that additional compatible services and components may be plugged in without interfering with existing modules, services, and components.
To guarantee effective security, all architectural components that participate in the architecture, as well as connection between these components, must be protected. A critical component of the system architecture is an infrastructure for the support and payment of financial transactions. SAFE (Safe Applications for Financial Environment) is a system that is being planned and developed to provide a massive infrastructure that is protected, convenient, and reliable for mobile financial transactions.

4.3 Collaboration

For this study, it is important that the company works in collaboration with the residence permit office, banks, telecommunication companies as well as other services such as shops or restaurants that will want to work with the company.

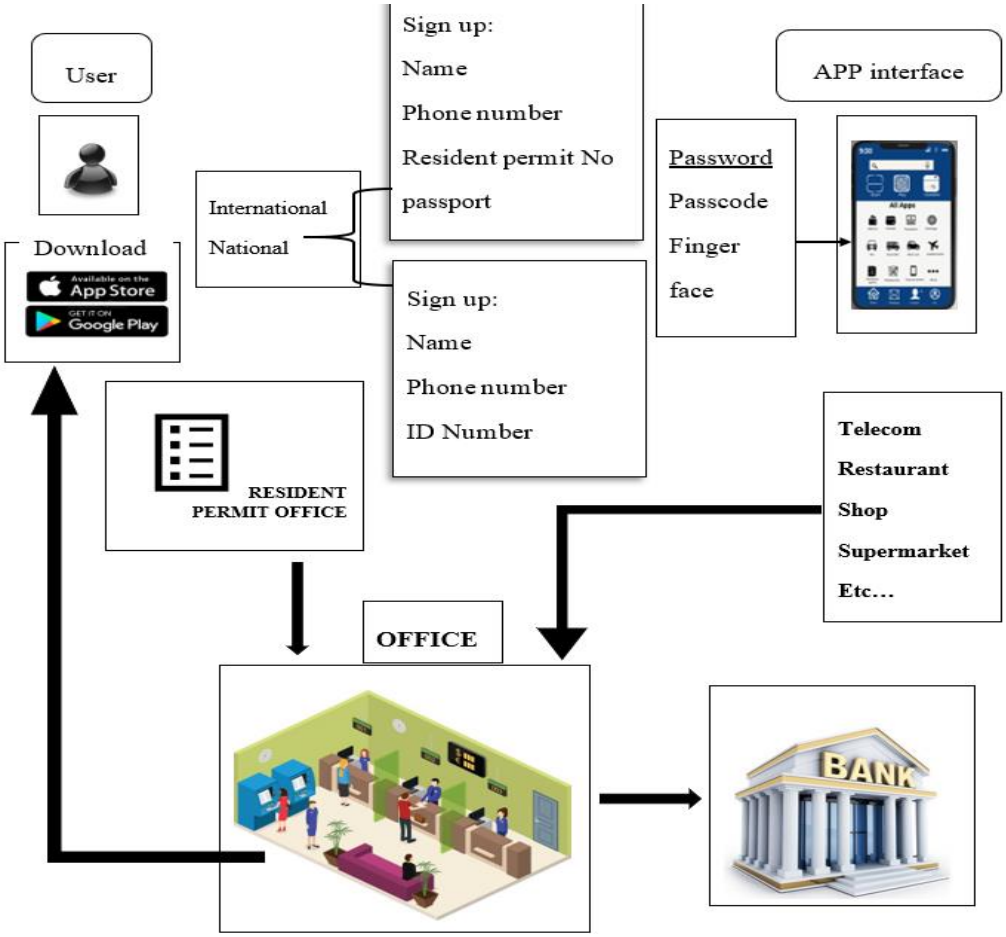
1. **Collaboration with Telecommunication Companies**: is the first and big partner because it plays a big role in the registration of users. all users will use their phone number as their username.

2. Collaboration with Banks: among the registration requirements, we have not put bank information but if the user has a bank account adapted to the application, he can link it. In the philosophy of developing an optimized application, we suggest that the users use the ATMs only to withdrawal the money in case of unavailability of the offices in charge or the agents. in other words, the banks and the company will work in collaboration, the bank gives access to the users to withdraw the money from the ATM and in return the company pays a commission to the bank. it's called win-win system.

3. Collaboration with the residence permit office: this collaboration will enable students to easily pay for their residence. many foreigners suffer because of that. to pay for residence students need to have a bank account and when they don't, they have to seek help. On the registration form the user must define his nationality and fill the residence permit number, so this collaboration will be based on data sharing.

4. other services: shops, supermarkets, restaurants, taxi service etc. can work with the company directly or indirectly. directly if they want their services to be incorporated into the app and indirectly is when they just allow customers to pay with the app.

Figure 18: Mcash mobile payment application structure, collaboration and registration (PHAGEL MWEMA, 2021)



Source: Author

4.4 How to Use the Mobile Payment Application Step by Step

nowadays, everyone uses a smart phone, for this application, we propose to put it on the 2 systems, the android system as well as the iOS in order to allow everyone to have it on devices.

1. Download the application from the App store: the application can be downloaded on all devices and will be on android system as well as IOS. after our study, we found that a lot of people use the iOS system.

2. Choose if you are international or national: after downloading the application, the user chooses between international and national. While this study targets all

international students, nothing prevents Cypriots from using it as well. Also this choice of specifying national and international is taken from the fact that certain services administered by nationals will be offered there such as taxi reservations, restaurants and many others,

3. Fill the registration form: all international users will have to scan their passports and residence permits, and nationals their identity cards to ensure secure authentication.

Create a passcode:

- password: a series of 8 characters that includes one capital letter, one number, and one case-sensitive special character
- finger print: The registration of the fingerprint will only be available for devices that support this technology

In order to certify the accessibility of the telephone number provided by the user, a confirmation and activation code will be sent via SMS

Now you are ready to use

NB: You are free to link your bank account information (optional) with the application.

we suggest that the application contains:

1.The QR Code

2. A wallet

3. An exchange which can allow users who will have to link the application to their bank account to change money and top up their wallet

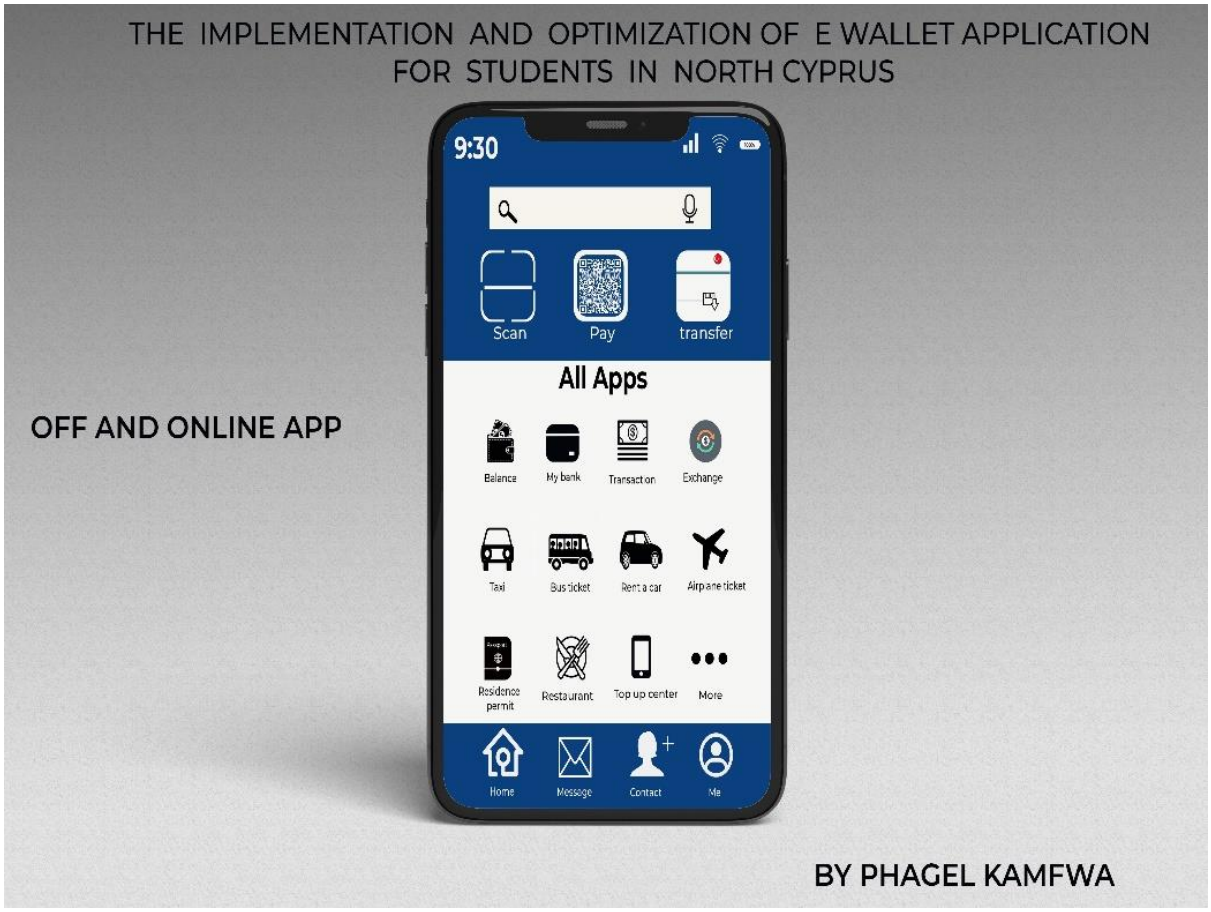
4. A resident permit payment tab. this feature will be of great help for students especially those who do not have bank accounts, they will be able to pay without much difficulty.

5. An offline map: this will allow users to know where they are in order to orient the taxi properly

etc ...

when to other services such as restaurants, taxi services, the purchase of airtimes etc. membership in the application depends on their targets

Figure 19: Mobile Interface (PHAGEL MWEMA, 2021)



Source: Author

4.5 How top up Money in The Wallet

There are 3 ways to top up the wallet:

1. from friends
2. from agents
3. from banks

Figure 20: How top up Money in The Wallet (PHAGEL MWEMA, 2021)

CHAPTER 5

DATA AND ANALYSIS

This chapter analyzes data from respondents. As described before, this study is a case study of mobile payment application for international students living in Northern Cyprus. As a such, questionnaires were made and sent to 300 NEU students via Google form in order to get key information and support the study. The questionnaires were related to the acceptance of e wallet and mobile payment in order answer the research question of how international students can conduct easily and quickly their financial transactions. For the sample size to be representative, the sampling strategy was based on a purposive and snowball sampling method. the questionnaires were sent to international, female and male students of all educational levels (undergraduate, postgraduate and PhD), whose ages ranged from 15 years and over.

5.1 Descriptive statistics (Demographic)

Figure 1 above shows the number of each gender who took parts in the studies, i.e Males is 54% while Female is 46% meaning that there were more male respondents than Female.

Figure 21: the number of each gender

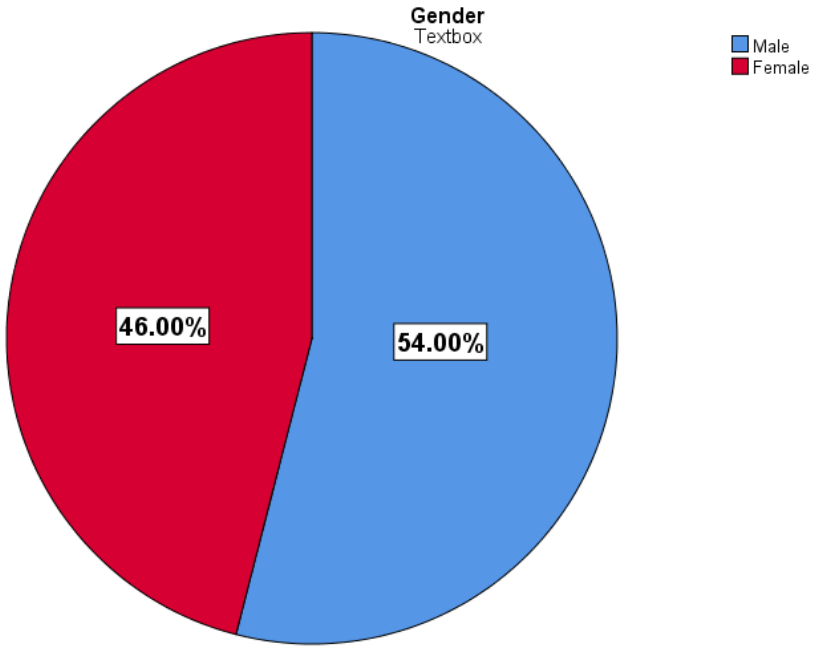


Table 1: Demographic information (Age Categories)

Valid Number	**250**	**15-25**	**95**	**38.0%**
Missing	**0**	**26-35**	**129**	**51.6%**
		36-50	**20**	**8.0%**
		50 and above	**6**	**2.4%**
		Total	**250**	**100.0**

Table 1, Display the age bracket of participants and the corresponding % for each age categories international students within the age of 26-35 (51.6%).

Figure 22: different nationalities who took parts in the studies

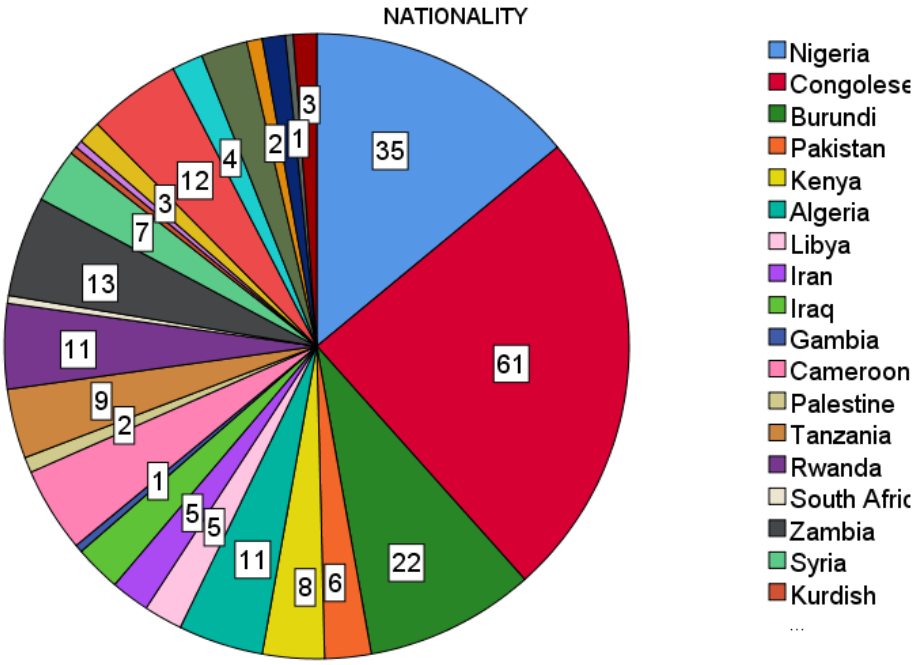
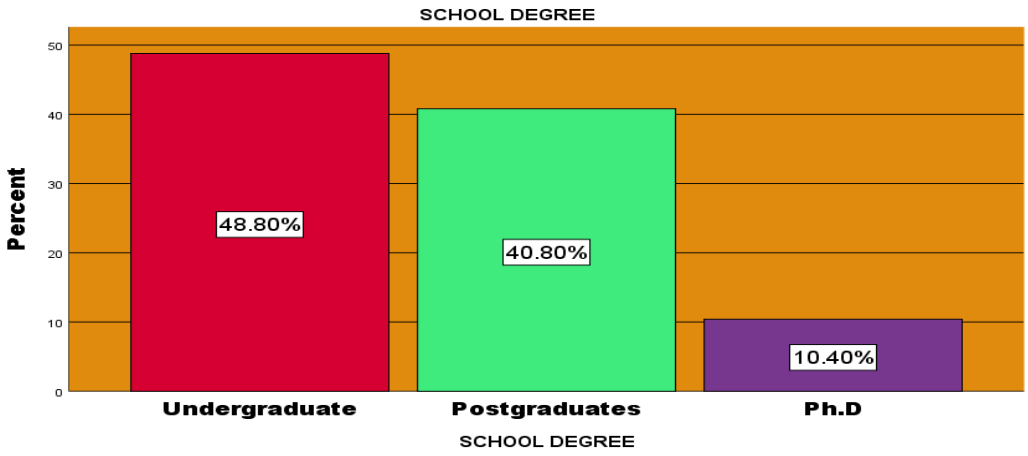


Figure shows the number of participants from each country, it appears that, Congolese and Nigerian nationals have more participants than the rest country

Figure 23: the education level of participants



From this figure, the bar chart indicates that, majority of respondents who participated in the studies were undergraduate e.g 48.80%, while that of postgraduate student were 40.80%, only about 10.40% of the respondents were student of Ph.D.

5.2 Descriptive statistics- measuring instrument.

5.2.1 Do you use smartphone

Table 2: Descriptive statistics for object 1 measuring mobile wallet

Valid	**Yes**	**230**	**92.0**
	No	**20**	**8.0**
	Total	**250**	**100.0**
Missing		**0**	**0**

Table 2 above shows the number of participants who use phone i.e 230 (92.0%) participants used phone, and 20 respondents do not used phone.

5.2.2 Do you use any online payment application?

Table 3: Descriptive statistics for object 2 measuring mobile wallet

Valid	**Yes**	**155**	**62.0**
	No	**95**	**38.0**
	Total	**250**	**100.0**
Missing		**0**	**0**

Table 3, object 2, show the number of international students who used online payment platform, from the result, it shows that 155 approximately (62.0%) students used online payment platforms, while 95 international students on the island do not use online payment gateway.

5.2.3 Previously, have you done any online transaction

Table 4: Descriptive Statistics for object 3 measuring mobile wallet

Valid	**Yes**	**166**	**66.4**
	No	**84**	**33.6**

	Total	**250**	**100.0**
Missing		**0**	**0**

Table 4, instrument measure the number of international students who have previously used performed online transactions, 166, (66.4%) international students have previously used online payment to initiate transactions, 84 (33.6%) have not performed online transaction before.

5.2.4 Mobile Wallets are Beneficial for individuals to purchase products

Table 5: Descriptive statistics for Object 1 measuring Perceived Usefulness

Valid	**Agree strongly**	**105**	**42.0**
	Agree a little	**80**	**32.0**
	Neither agree nor disagree	**52**	**20.8**
	Disagree strongly	**11**	**4.4**
	Disagree a little	**2**	**.8**
	Total	**250**	**100.0**
Missing		**0**	**0**

Table 5, above seek to measure the usage of mobile payment relating to Perceived Usefulness,185 respondents selected agree and strongly agree that their friend use mobile payment, while only 65 participants indicated that their friends do not use online payment.

5.2.5 24/7 Service available for making payments is a useful factor.

Table 6: Descriptive statistics for Object 2 measuring Perceived Usefulness

Valid	**Agree strongly**	**82**	**32.8**
	Agree a little	**101**	**40.4**
	Neither agree nor disagree	**53**	**21.2**
	Disagree strongly	**11**	**4.4**

	Disagree a little	**3**	**1.2**
	Total	**250**	**100.0**
Missing		**0**	**0**

Table 6, object measure the relative importance of using online payment or mobile wallet, approximately 183 international students agree and strongly agree that online payment is very important for making daily transactions, only 67 respondents ticked neither, disagree strongly, to this question.

5.2.6 I believe Mobile Wallet is useful as it is anywhere and anytime accessible.

Table 7: Descriptive statistics for Object 3 measuring Perceived Usefulness

Valid	**Agree strongly**	**96**	**38.4**
	Agree a little	**88**	**35.2**
	Neither agree nor disagree	**53**	**21.2**
	Disagree strongly	**12**	**4.8**
	Disagree a little	**1**	**.4**
	Total	**250**	**100.0**
Missing		**0**	**0**

Table 7, above show the statistics of the items measuring the Perceived Usefulness of using mobile wallet in Northern Cyprus, 184 international students believe that mobile payment is very useful and accessible in carrying out financial transactions, only 66 respondents neither agree, disagree and strongly disagree to this question.

5.2.7 I intend to use the Mobile Wallet to manage my payment information in the future.

Table 8: Descriptive statistics for Object 4 measuring Perceived usefulness

Valid	**Agree strongly**	**61**	**24.4**
	Agree a little	**92**	**36.8**

	Neither agree nor disagree	**66**	**26.4**
	Disagree strongly	**27**	**10.8**
	Disagree a little	**4**	**1.6**
	Total	**250**	**100.0**
Missing		**0**	**0**

Table 8, object 4, relate to the frequency of online payment usage and transaction management, 61 and 92 respondents respectively ticked strongly agree and agree that, they often use online payment platforms to managed their transactions, and also have the intention to use it for the management of online payment, while 66, 27, and 4 participants selected neither agree, disagree and strongly disagree.

5.2.8 Utility of Innovation is an Important Factor for choosing Mobile Wallet as Payment Mode.

Table 9: Descriptive statistics for Object 1 measuring Perceived Innovation

Valid	**Agree strongly**	**82**	**32.8**
	Agree a little	**95**	**38.0**
	Neither agree nor disagree	**59**	**23.6**
	Disagree strongly	**12**	**4.8**
	Disagree a little	**2**	**.8**
	Total	**250**	**100.0**
Missing		**0**	**0**

Table 9, object 1 measures the level of awareness and benefits of using a mobile payment in making transactions, 177 (70.8%) of the respondents selected agreed, and strongly agreed, that they mobile wallet is beneficial in making payments, while only 73 participants disagree, strongly disagree and neutral to this question.

5.2.9 I believe to have an Openness to Experience new methods of payment.

Table 10: Descriptive statistics for Object 2 measuring Perceived innovation

Valid	**Agree strongly**	**92**	**36.8**
	Agree a little	**94**	**37.6**
	Neither agree nor disagree	**49**	**19.6**
	Disagree strongly	**13**	**5.2**
	Disagree a little	**2**	**.8**
	Total	**250**	**100.0**
Missing		**0**	**0**

Table 10, object 2 measure the area of perceived innovation relating to openness of using online payment, 186 participants ticked selected agree, and strongly agreed that they are open minded to using online payment facilities for their financial transactions, only 64 respondents out of the 250 participants disagreed, strongly disagreed and neutral to the item.

5.2.10 I worried about the use of mobile payment application

Table 11: Descriptive statistics for Object 1 measuring Perceived Security

Valid	**Agree strongly**	**45**	**18.0**
	Agree a little	**69**	**27.6**
	Neither agree nor disagree	**69**	**27.6**
	Disagree strongly	**30**	**12.0**
	Disagree a little	**37**	**14.8**
	Total	**250**	**100.0**
Missing		**0**	**0**

Table 11, object 1 examine the worried state of participants about mobile payment application, 45 and 69 participants selected agreed and strongly agreed respectively,

that they worried about the security of e-payment, while, while 69, 30, 37 ticked neutral, disagree and strongly disagree.

5.2.11 I wonder if mobile payment is secured

Table 12: Descriptive statistics for Object 2 measuring Perceived Security

Valid	**Agree strongly**	**26**	**10.4**
	Agree a little	**58**	**23.2**
	Neither agree nor disagree	**62**	**24.8**
	Disagree strongly	**52**	**20.8**
	Disagree a little	**52**	**20.8**
	Total	**250**	**100.0**
Missing		**0**	**0**

Table 12, object 2 measure the security of mobile payment, 84 participants ticked agreed and strongly disagree, that security of online payment matter when making a decision to adopt mobile wallet, while 62 participants selected neutral, 52 ticked strongly disagree and lastly, another 52 participants selected disagree to this questions that they do not worry about the security of online payment.

5.2.12 I believe Payment through Digital Wallet Is Not Safe and Secure.

Table 13: Descriptive statistics for Object 3 measuring Perceived Security

Valid	**Agree strongly**	**108**	**43.2**
	Agree a little	**79**	**31.6**
	Neither agree nor disagree	**51**	**20.4**
	Disagree strongly	**12**	**4.8**
	Disagree	**-**	**-**
	Total	**250**	**100.0**
Missing		**0**	**0**

Table 13, object 3 examine the perceived security of online payment system relating to secured service availability, 187 international students selected agreed and strongly agreed, that secured online payment is a critical factor when considering online payment applications, 51 respondents ticked neutral while 12 others selected strongly disagree to this question.

5.2.13 I am Satisfied Using Mobile Wallet Service.

Table 14: Descriptive statistics for Object 1 measuring Perceived Ease of Use

Valid	**Agree strongly**	**34**	**13.6**
	Agree a little	**41**	**16.4**
	Neither agree nor disagree	**62**	**24.8**
	Disagree strongly	**42**	**16.8**
	Disagree a little	**71**	**28.4**
	Total	**250**	**100.0**
Missing		**0**	**0**

Table 14, object 1 above measure the perceived ease of using a mobile payment, 75 international students who participated in the study agree and strongly agreed that they either use online payment because they see their friend using it, 175 ticked neither disagree nor strongly disagree that they do not use online payment because of their peers.

5.2.14 I Believe Mobile Wallet Is Easy to Use.

Table 15: Descriptive statistics for Object 2 measuring Perceived Ease of Use

Valid	**Agree strongly**	**45**	**18.0**
	Agree a little	**70**	**28.0**
	Neither agree nor disagree	**68**	**27.2**
	Disagree strongly	**43**	**17.2**
	Disagree a little	**24**	**9.6**
	Total	**250**	**100.0**

Missing		**0**	**0**

Table 15, examine the frequency of online payment by participants link to perception and safety reasons 115 international students both agree and strongly that, they not often use mobile payment because they perceived it is safe, 125 disagree and strongly disagreed that online payment is not safe.

5.3 validity test

Table 16: validity of objects used in the survey

Variables	Cronbach's Alpha	N of Items
Mobile Wallet	**0.543**	**3**
Perceived Innovation	**0.783**	**2**
Perceived Usefulness	**0.775**	**4**
Perceived Security	**0.590**	**3**
Perceived Ease of use	**0.407**	**2**
Total Overall	**0.810**	**14**

The validity liability table 16, show there is internal consistent between the object, with a very good overall statistical validity of 0.810 meaning the measuring objects is suitable for the study.

5.4 Correlation

Table 17: Correlation.

Variables	1	2	3	4
Mobile Wallet				
PERCEIVED INNOVATION	**0.217****			
PERCEIVED SECURITY	**0.441****	0.346**		
PERCEIVED USEFULNESS	**0.276****	0.745**	0.480**	

PERCEIVE EASE OF USE	**0.221****	0.020	0.575**	0138*

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

N = 250, P<0.05

Table 17, show the correction between all the studied variables and mobile wallet, it indicate that all variables are positively related, I,e mobile wallet is positively related to perceived innovation **(r= 0. 0.217**, p<0.05),** also, mobile wallet is related to Perceived security**, (r =0.441**, P<0.05)**, again mobile Wallet is also related to perceived usefulness **(r=0.276**. P<0.05),** and lastly, Mobile wallet is positively related to Perceived ease of use by **(r= 0.221**, P<0.05).**

Summarily, all the variable shows a positively significant relationship.

5.5 Regression analysis

Regression analysis is used to make prediction on the likely effect of one variable to another variable in hypotheses testing, hence the effect of mobile wallet payment system on the reactions and perception of international students in North Cyprus.

5.5.1 Perceived usefulness versus Mobile wallet

Table 18: Model Summary b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	**.276[a]**	**.076**	**.072**	**2.794**

a. Predictors: (Constant), TOTALPERCEIVEDUSEFULNESS

b. Dependent Variable: TOTALMOBILE WALLET

Table 18, shows the model summary between perceived usefulness and mobile wallet, the R square of 0.076% difference in the use of mobile wallet is due to perceived usefulness or importance of using mobile wallet payment

Table 19: Anova

Model	Sum of Square	df	Mean Square	F	Sig.
1 Regression	32.379	1	32.379	12.287	.001[b]
Residual	653.557	248	2.635		
Total	685.936	249			

a Dependent Variable: TOTALMOBILE WALLET

b Predictors: (Constant), TOTALPERCEIVEDUSEFULNESS

ANOVA table 19 shows the fitness of the relationship and the significance of the data e.g P<0.05, R2 0.076, F=1,248, (12.287).

Table 20: Coefficients

Model	Unstandardized Coefficients. B	Std Error	Standardized Coefficients Beta	Sig.
1 (Constant)	3.088	0.166		.000
PERCEIVED USEFULNESS	.087	0.019	0.276	.000

a. Dependent Variable: TOTALMOBILE WALLET

From coefficient table 20, standardized beta table depict the predicted effect of perceived usefulness of mobile wallet e,g for every units of increase in perceived usefulness, there will be 0.276 predict units increase in the use or adoption of mobile wallet. Therefore;

Hypothesis 1 is supported that; Perceived usefulness influences international student in adopting the use of mobile wallet for their financial transactions in North Cyprus.

5.5.2 Perceived ease of use versus Mobile wallet

Table 21: Model Summary b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.221[a]	.049	.045	.894

a. Predictors: (Constant), Total Perceived Ease Of Use

b. Dependent Variable: TOTALMOBILE WALLET

Summary table 21, show the variation in the dependent variable of mobile wallet (R2=0.047%) influenced by the independent variable of perceived ease of usage, in practice the higher the perceived ease of usage, there will be higher variation in the use mobile wallet and vice versa.

Table 22:Anova

Model	Sum of Square	df	Mean Square	F	Sig.
1 Regression	10.172	1	10.172	12.714	.000[b]
Residual	198.424	248	.800		
Total	208.596	249			

a. Dependent Variable: TOTALMOBILE WALLET

b. Predictors: (Constant), Total Perceived Ease of Use

Table 22, (ANOVA) display how the variables correspond to fit the model

P<0.05, F=1, 248, (12,714).

Table 23: Coefficients a

Model	Unstandardized Coefficients .	Standardized Coefficients Beta	Sig.

	B	Std Error		
1 (Constant)	**3.208**	**.174**		**.000**
Perceived Ease Of Use	**.098**	**.027**	**0.221.**	**.000**

a. Dependent Variable: TOTALMOBILE WALLET

Table 23, Coefficient standardized beta of 0.221, indicate that for every one unit increase in the independent variable of perceived ease of use, there will be equal increase of 0.221 in the dependent variable of mobile wallet payment system, what that mean is, the more international students perceive that mobile payment applications are designed in a way that makes it friendly and easy to operate, the higher the tendency to adopt or download such e-payment wallet. Thus,
Hypothesis 2 supported that; the ergonomic interface plays an important role in the acceptance of mobile wallet.

5.5.3 Perceived Security versus Mobile wallet

Table 24: Model Summary b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	**.441[a]**	**.194**	**.191**	**.823**

a. Predictors: (Constant), TOTALPERCEIVEDSECURITY
b. Dependent Variable: TOTALMOBILE WALLET

The summary model table 24, show the variation in the dependent variable of mobile wallet application cause by the influencing effect of the independent variable of perceived security, for example, under R square 0.194% variation in mobile wallet the (dependent variable) is cause by perceived security (the independent variable).

Table 25: Anova

Model	Sum of Square	df	Mean Square	F	Sig.
1 Regression	40.537	1	40.537	59.820	.000[b]
Residual	168.059	248	.678		
Total	208.596	249			

a. Dependent Variable: TOTALMOBILE WALLET

b. Predictors: (Constant), TOTALPERCEIVEDSECURITY

The ANOVA table 25, show how the variable fit the model and the significant of the data i.e P<0.05, F=1, 248 (59.820).

Table 26: Coefficients

Model	Unstandardized Coefficients . Std B	Error	Standardized Coefficients Beta	Sig.
1 (Constant)	2.586	.165		.000
TOTALPERCEIVEDSECURITY	.154	.020	. 0.441	. .000

a. Dependent Variable: TOTALMOBILE WALLET

Coefficient table 26, show the like future effect of the independent variable of perceived security on the dependent variable of mobile wallet payment gateway, for example for every units of increase in the independent variable of perceived security, there will be a corresponding increase of 0.441 in the dependent variable of mobile wallet.

In essence what that means is, the more international student feel secured about using mobile wallet to initiate online payment, the greater the chances of adopting online medium of payment, then security of mobile wallet applications is perceived by international student as a serving advantage therefore; Hypothesis 3 is sustained that, perceived Security is one of the main advantages of using mobile wallet.

5.5.4 Perceived innovation versus Mobile wallet

Table 27: Model Summary b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.217[a]	.047	.043	.895

a. Predictors: (Constant), TOTAL PERCEIVED INNOVATION

b. Dependent Variable: TOTAL MOBILE WALLET

From summary table 27, shows that the variation in the dependent variable of mobile wallet of (0.47%) is responsible by Perceived innovation, meaning that, 0.47% of the reaction to adopting mobile wallet by international students to use e-payment is determine by their level of innovation and level of awareness or openness to experience online payment system.

Table 28: Anova

Model	Sum of Square	df	Mean Square	F	Sig.
1 Regression	9.847	1	9.847	12.287	.001[b]
Residual	198.749	248	.801		
Total	208.596	249			

a. Dependent Variable: TOTALMOBILE WALLET

b. Predictors: (Constant), TOTALPERCEIVEDINNOVATION

Table 25, (ANOVA table) depict how the data fit the model, significantly i.e.

P<0.05, F=1.248 (12.287).

Table 29: Coefficients a

Model	Unstandardized Coefficients . Std Error	B	Standardized Coefficients Beta	Sig.
1 (Constant)	3.319	.147		.000
TOTALPERCEIVEDINNOVATION	.120	.034	0.217	.001

a. Dependent Variable: TOTAL MOBILE WALLET

Coefficient table 26, shows how the regression analysis likely predict interactions between the dependent variable of mobile wallet payment system and independent variable of perceived innovations at 0.217, this means that every one unit increase in perceived innovation of international student in TRNC, for example, the higher the level of awareness and innovative mindset of international students in North Cyprus, the greater the chances to adopt mobile payment system

Therefore Hypothesis 4 is thus supported that, personal innovation influences the use of mobile wallet.

CHAPTER 6

CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion and Findings

This study examined the implementation and optimization of mobile payment application for international students in north Cyprus. It aimed at answering the research question of How international students can conduct easily and quickly the financial transactions in North Cyprus. In discussing the importance of mobile payment, the study argued that the implementation and optimization of mobile wallet can facilitate users to save deposit and access to electronic banking, e-commerce websites and more, and this can operate anywhere at any time, especially in today's world which is characterized by the covid-19 lock-down. Many payment methods have been developed but there still need for more specialized new payment methods to reach people's and clients' demands worldwide.

In the case of the international students in Northern Cyprus therefore, the implementation of the mobile payment is deemed to be a solution to the challenges they face and this has an impact on their online purchasing choices. Comparing to physical wallet, e-wallet presents the advantage of securing money asymmetric encryption method. In addition, the lack for all foreign students in Northern Cyprus to have a bank account, mobile payment appears to be the solution to their concern. E-wallet App would ensure a fast, secure and futuristic way of transaction as people or users are more concerned with security and confidential personal financial information. For example, bank's balance details and information, authorization details, and more.

This is the main concern of such a system to avoid frauds within the electronic environment.

This study covered the influence of e-wallet on online transactions, and was defined as a single case study of Northern Cyprus based on the implementation and optimization of the mobile payment system. But there is a need to conduct further in-depth research on the security of mobile payment applications, taking into account the most accessible technology on the management of numeric money.

From the findings of this study, we find that those hypotheses are supported and showed that they can influence international students to adopt and use the mobile wallet for their financial services.

6.2 Recommendation and Implications

The study's study implies that digital transactions are safer and can be tracked more reliably, which reduces potential instances of fraud. In addition, all e-wallets require some form of verification before payment, which means that even if someone steals anybody phone, they cannot steal the money in the e-wallet. By using a digital wallet, users can complete purchases easily and quickly with near-field communications technology, and they can create stronger passwords without any inconvenience.
security plays a significant role in the areas where human kind live, including the consumption of products and services. Telegram acquired a large number of subscribers in 2020 as a result of accusations that WhatsApp applications were not secured. This accusation shows that security is still the major concern when it comes to embrace or not online services.

Practically, the implementation of a mobile payment application is a forceful method in doing online financial transactions especially in today world of covid-19, and international students in North Cyprus will manage and benefit managing their money, making quick transfers, paying residence permit without having a bank account.
Although, security is still a concern in using e-wallet as cyber-attack is increasing. But they should not get deceived by a rise in e-wallet users and must endeavour to e-wallet otherwise. The mobile payment apps is the most available technology in today

world. This study shows that there is significant relationship between mobile payment system and online services, although it should be more effective and secure, and there is a scope of improvement in terms of effectiveness and standardization that should be examined for further research.

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APPENDIX

1. Questionnaire

Section A Demographic data

1 Gender

Male ☐ **Female** ☐

2 AGE

15-25 ☐ **26-35** ☐ **36-50** ☐ **50, and above** ☐

3 Nationality

4 School degree

Undergraduate ☐ **Master** ☐ **Ph.D** ☐

Section B Mobile wallet

1 Do you use smartphone

Yes ☐ **No** ☐

2 Do you use any online payment application

Yes ☐ **No** ☐

3 Previously, have you did any online transaction?

Yes ☐ **No** ☐

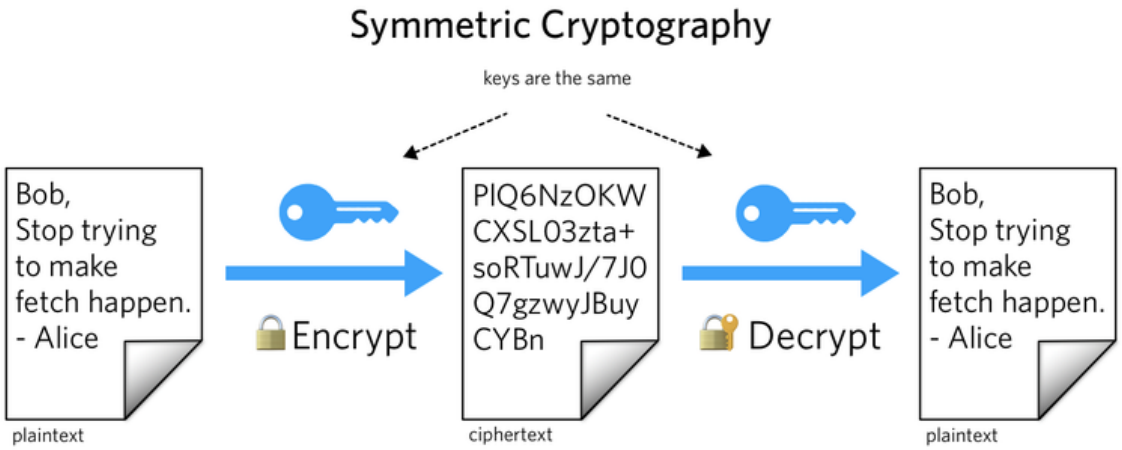
1= Agree strongly, 2= Agree a little, 3= Neither agree nor disagree,4= Disagree strongly,5= Disagree a little

Perceived Usefulness

1	**Mobile Wallets are Beneficial for individuals to purchase products.**					
2	**24/7 Service available for making payments is a useful factor.**					
3	**I believe Mobile Wallet is useful as it is anywhere and anytime accessible.**					
4	**I intend to use the Mobile Wallet to manage my payment information in the future.**					
	Perceived Innovation					
1	**Utility of Innovation is an Important Factor for choosing Mobile Wallet as Payment Mode.**					
2	**I believe to have an Openness to Experience new methods of payment.**					
	Perceived Security					
1	**I feel risk of not getting reimbursement of money if I cancel my order.**					
2	**I wonder if mobile payment is secured**					
3	**I believe Payment through Digital Wallet Is Not Safe and Secure.**					
	Perceived Ease of Use					
1	**I am Satisfied Using Mobile Wallet Service.**					
2	**I Believe Mobile Wallet Is Easy to Use.**					

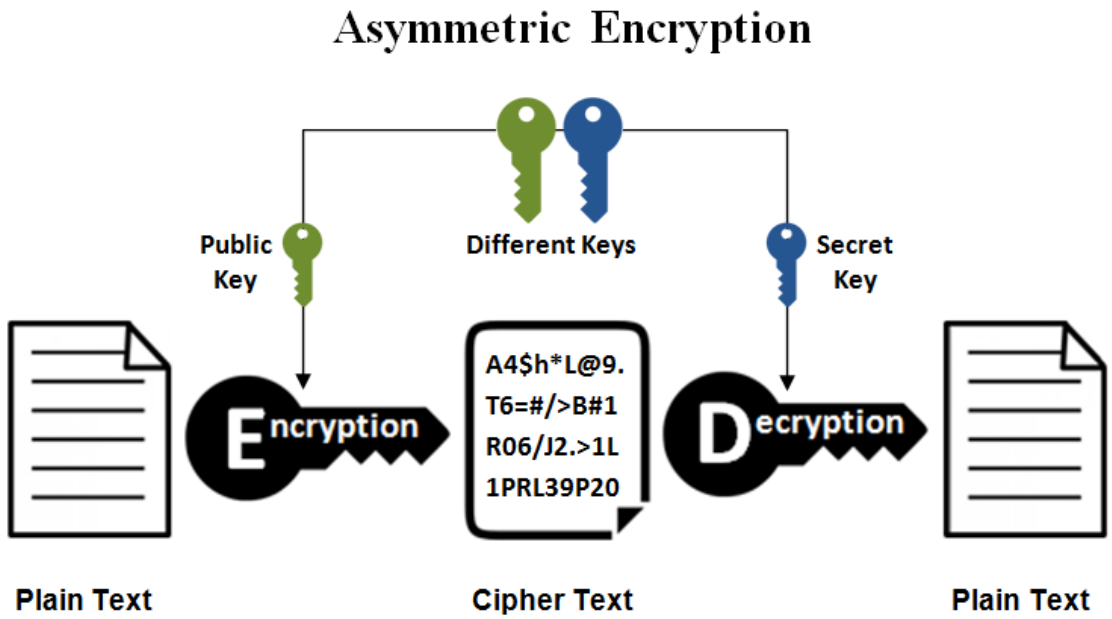
2. Symmetric cryptography

the same key is used in both directions. For further information chap 2 page 29

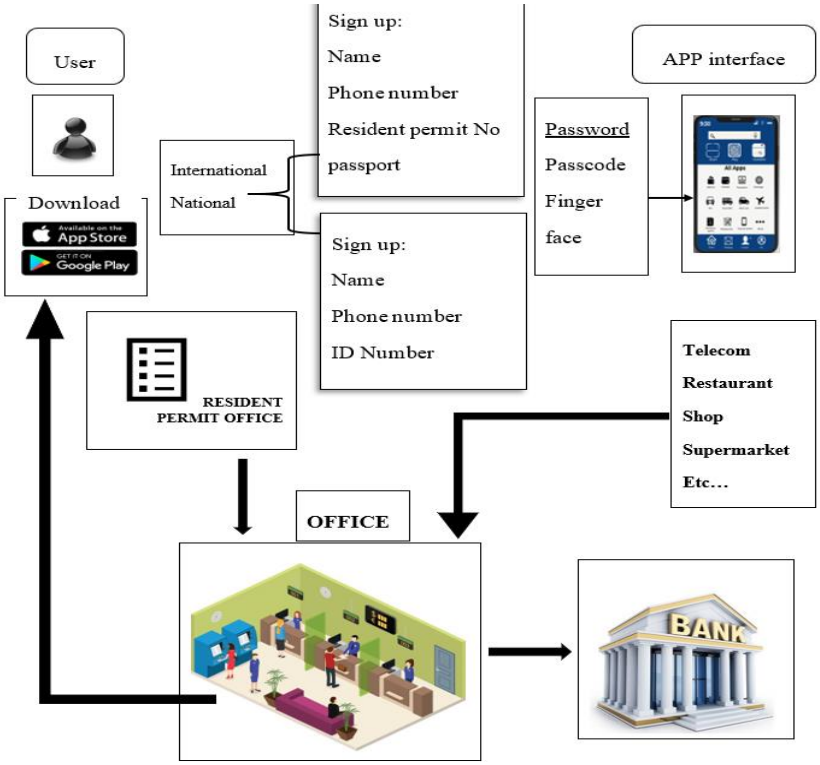


3. Asymmetric Encryption

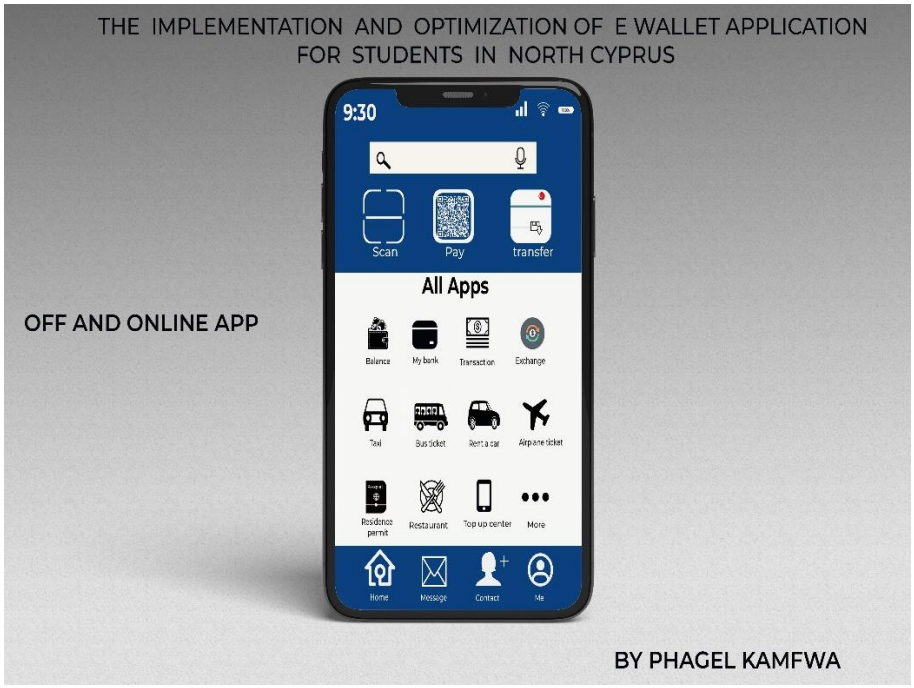
In asymmetric encryption private and public keys are use. Furthermore, chap2 page 29



4. Architecture of Mobile Payment Proposal



5. mobile payment App interface



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ETHICS COMMITEE APPROVAL

YAKIN DOĞU ÜNİVERSİTESİ

BİLİMSEL ARAŞTIRMALAR ETİK KURULU

03.05.2021

Dear Phagel Mwema Kamfwa

Your application titled **"The Study on Implementation and Optimization of E-Wallet System for International Students in North Cyprus: A Case Study on Mobile Payment"** with the application number NEU/SS/2021/935 has been evaluated by the Scientific Research Ethics Committee and granted approval. You can start your research on the condition that you will abide by the information provided in your application form.

Assoc. Prof. Dr. Direnç Kanol

Rapporteur of the Scientific Research Ethics Committee

Direnc Kanol

Note: If you need to provide an official letter to an institution with the signature of the Head of NEU Scientific Research Ethics Committee, please apply to the secretariat of the ethics committee by showing this document.