ELECTRONIC CURRENCY AND MOBILE WALLET

Qureshi Muhammad Majad Iqbal

Master's Degree in
Information Technology
May 2017

ABSTRACT

Are we going to grab the cash all our life? This paper will try to answer this question and also try to find what lies in the future of money, how it can change our life.

How much money do you have in pocket right now? I am guessing not that much. From developing countries to highly developed nations, the decline in use of cash is noticeable. Finland is not leader in cash less society, that title goes to neighbor Sweden, but advancements in technology and innovations of this century has global affects. It is expected that Finland along with many other nations will become cash less society in the future.

Nordic countries like Finland will experience this shift earlier than rest of the world. This research focused on comparison of different types of digital currencies and how it work, mobile technology and its role in future of the digital payment system.

CONTENTS

1   INTRODUCTION

Money is very private thing in our society, especially in a country like Finland where personal space is comparatively large. Let's think for a moment how unpleasant it might be when on coffee break person next to you turn and ask how much money do you make? This is surely one of those personal information which you would never like to share. Accepting the fact that we don't want to share such information one may start to puzzle why it's so private about money.

It seems that we have close psychological bond between money and power, over the time that impact gets deepen. We are a bit fearful about what might happen if I know how much money my friend has and what if he found how much I am making. Knowing this information we will start ranking each other, and our resulting thoughts may get change. In case, I have too much information about others, may I fall into different scale of power? And fall into the temptation to start thinking, ranking and judging them according to the money they hold. Keeping this information to yourself is justified because society as a whole do not like the idea of ranking individual according to the money he holds. Do someone has a right to earn respect this way? Nobody would agree, but there is something we will all agree, and that is the fact that society needs a concept of money to work properly, and it's hard to progress without it.

No matter how private is money for any individual we eventually need money to keep trade running. Monetary system is essential for a society to progress we cannot live without it, however we can manage it according to the situation and requirement of our culture in which we live, such as we can set different standard to represent money. In simple money can be expressed as something we can exchange in order to buy, sell or trade different services. Money don't belong to any individual rather it can be earned by trade. One may have more money than his friend, sharing information about how much money someone has is rather personal choice which doesn't affect the functionality of financial system.

2   CURRENT MONEY SYSTEM (MONETARY SYSTEM)

Future of money is a fascinating topic to discuss, money is always considered something we can feel by touch. This is not 21st century phenomena, actually ancient form of money was also physical presence of something, examples of money in past are the sea shells (Museum Belgium 2017), gold and silver coins (Roman coins 2016), playing cards, or in some ancient cultures even animals and gifts were standard money (Gift Economy 2016).

When its time to pay there was always a physical element to be traded, we need something which is visible to eyes, and could be handle over to others. Money always had a value worth of what been traded since the start of this century. However, in recent time economist refers to our current money system as fiat money system (Fiat money, David Gordon 2000, p 159). In other words money is now something which actually do not have any value itself. It is valuable because some trusted authority guarantees, and we agree that value set buy that authority is real, such as a piece of paper set to the value of 10 Euros means that whoever trade this piece of paper is actually trading a worth of 10 Euros. In modern era these financial institutes responsible for setting value of money are international banks (Banking laws 1997). These central authorities run economic cycle of the country and are responsible of issuing currencies, monetary policies and keeping inflation low For example Finland uses Euro as a currency managed by European Central Bank (About ECB 2016). In the future, it seems that these central banks may become more influences with have large domain. This new monetary system has its own merits and demerits.

2.1   Weakness of the system

Fiat currency is sort of illusion which have very real consequences to society, money can get de-value over time, and may become worth less at some point for example in case of government default. It can also be counterfeited, and fear that the holder of abstract money can lose value when the issuer is bankrupt. Problem with fiat currency is that holder of that currency do not control its value. French philosopher Voltaire once

said "Paper money eventually returns to its intrinsic value as zero". Voltaire was versatile writer, produced works in many literary forms, 1694-1778.

2.2   Strength of the system

On the other hand fiat currency is easy to manage and monitor, also this type of currency fit in modern trading where we cannot transfer physical commodities, such as big transaction of commodity like Gold over a long distance is very impractical. It seems that future form of currency will based on current fiat currency, or close to the concept given by this system.

This system brought the concept of banking with it, and banks not only responsible for taking care of monetary regulations but also provide other essential services, such as secure and fast transfer of money. International banks are backed up by strong insurances in these days. Nordea (Nordea homepage 2016) is a well-known Swedish bank in Finland, according to bank their private customers are backed by strong consumer protection, depositors can feel secure even in times of financial turbulence, reinforcing the preconditions for financial stability. In case the bank goes default, the insurance provides compensation up to 950,000 kronor per depositor (Riksgälden Sweden. 2017). Nordea is just an example, almost every bank offers similar type of insurance because banking industry is heavily regulated In Finland since 1980s. In recent time many official services (Population data Finland 2017) trust on banks for identification which is often performed in VETUMA also known as "electronic authentication and payment service for citizens" (Vetuma palvelu. 2017).

3   MONETARY SYSTEM IN FUTURE

Before discussion about the future of money, let's remember when was the last time you took your paycheck and went to bank to receive cash? your answer may not differ from other people of the survey conducted by ING (ING Survey 2016). Survey shows that one out of five people rarely carry cash in Europe. The trend of using cash is replaced by alternate, such as credit or debit cards. When question was asked "In case you have no access to ATM or other cash withdraw system, how long do you think you'd get by without cash?". Nearly 50% response was "about a week", while one of third was comfort up to 3 days and few said they can live up to a month without a cash.

Situation all over the globe is not the same, there is group of people which depends on old style pay-checks systems because they are not register to banking system. This population group often found in developing countries, but a part of them is also present in developed countries like USA. Most of these people live near the poverty line and do not have enough saving which require banking or in few cases they live in remote areas which are inaccessible to banking services.

3.1   Increase in account holders

According to world-bank's statistic, in USA 6% of the population over the age of 15 donot have access to bank accounts, and about 76% can use services provided by banks such as credit or debit cards (Worldbank IDA USA 2017). If such population group exists in any country, it is nearly impossible to implement an advance infrastructure which is suitable to whole society, such as providing online check-outs facility or removing cash counters from stores. On the other hand Finland have almost zero un-banked population, 96.7% have access to debit card and online banking system (Worldbank IDA Finland 2017). According to the latest press release from petroleum and biofuel association of Finland there are 1827 refilling station working in the country, and 1065 of those stations are unmanned, thesse stations are operated with credit or debit card payment systems (Petroleum and biofules Finland 2017). Other

Nordic countries like Sweden also shows similar statistics because is easy to provide service like this when public have access to basic economical infrastructure.

Good news is that noticeable drop in un-banked population is seen in recent years, such as 20% drop in the number of un-banked according to 2014 Global Findex (Report unbanked drop 2017). One reason of huge drop in number is that un-banked population cannot enjoy the luxury of the services provided by banks, such as fast money transfer. Person without bank account will spend extra money if he needs to transfer cash from one place to other, in some cases this fee can sum upto extra 5%. That spending is saved by population connected with banking system. Thanks to competitors, banks are trying to reduce extra fee on funds transfer. In Finland funds transfer from one bank account to other do not cost any extra, but it may take few hours. Every bank in Finland operate in realtime when transfer funds among their own customers but to cross bank transaction still take up to 24 hours while cross-country payment take 3 days, example from Nordea (Credit transfer Nordea 2017).

There are other reasons to have a bank account, for example most of our payments goes in paying monthly bills, in recent years the nature of payment do not require us the physical amount of money that is used to buy stamp and meld in the bill, instead bills are paid digitally. This type of payment is more natural to digital system such as peyment by credit or debit card. In Finland almost every bill is payable without visiting bank office, every bank provide online service to pay bills.

It is projected that in near future we may use more electronic transactions and lose physical image of money which was there since time. We already buy things routinely online by using our debit or credit cards. In recent time people have become more comfortable with these online services because of the speed and added benefit over regular cash. In the future both cash and digital payment will be affected by technology, lets take a look what are the possible changes we may expect in near future.

3.2 New design or shape

Paper form of money or "Cash" is physically hard to track that make it more popular in the burglars, drug dealers and other criminals including illegal activities on street such as prostitution. I never experience this situation in Finland but there are cities in the world where using ATM after dark is a risk. Cash is the fuel on which street crimes burn, it would be a useless effort for a burglar to steal credit or debit cards when he can't use it for any benefit. Luckily we do not have high crime neighborhood in here but, rest of the world is full of these problems, even part of Europe is not safe as robbery is sky-rocketing in some countries. Imagine the nature of street crime when cash disappear all together. I don't see any criminal activity is going on the streets, the shape of those crimes will get change. We may not have a crime drop but we will certainly have shift in the nature of crime, and this can give law enforcement people an extra control because cyber crime is more easy to track.

In current monetary system the money represented by piece of paper is called bill, in early 1900 these bills were simple printing papers out of printing press. Later on these bills, which also known as bank notes were need to be packed with security features to make it hard to duplicate illegally. Currently material used to print bank note is special type of paper with quality to build basic security, and anti counterfeit features to discourage criminal when try to duplicate but there are still limitations while printing money on paper. If money doesn't go digital in near future, still there are great chances that current paper notes will replace by something better or durable because using ordinary paper is not very suitable for some security features. Current bank notes get rough when in use for a long time, also these paper notes can get damage when in contact with water.

In the future chances are that currency note will based on different material than ordinary paper, such as in recent time polymer is used to print currency notes. Canadian bank introduce it in 2011 (Plastic currency Canada. 2016). Finland is not printing polymer based bank notes because Finland do not have its own paper currency since 2002. It could have been a different situation if country had its own currency like in past when Markka along with Rubble and Swedish currency was in use (Banknotes Finland 2016).

Table 1 and 2 compare pro of using polymer based bank notes and cons of using this technology, it can be seen that when using polymer based bank notes we will have more pros than there are cons.

TABLE 1 Pros when using Polymer bank notes

Polymer Note	Paper Note
Hard to counterfeit	Easy to duplicate
Average 15 years life	Average 5 years life
Waterproof	Water can damage
Clean and good look	Get dirty over time

TABLE 2 Cons when using Polymer bank notes

Polymer Note	Paper Note
Feel Slippry, counting is hard	Easy and quick to count
Security feature increase cost	Security features not cost much
Hard to fold	Easy to fold

In the future if Finnish government ever decide to print its own bank notes, my recommendation is to go for polymer as it will stay longer in operation with some extra benefit such as waterproofing. In Europe few governments are planning to switch from the paper to the polymer, and some already have tried it, such as Romania was the first European country to introduce polymer banknotes between 1999 and 2001 (National bank Romania 2017).

3.3   Money is digital

Money is represented by physical bank notes that we often exchange, but indeed money of our time is not physical at all it is much more like bits of data traveling over the internet cables between different banks. Increase in online shopping is another reason for a new shape of monetary system, credit and debit cards are frequently in use, people feel more secure using plastic money than it was before.

About 10% of all money supply is in the form of bills while other 90% is only electronics signals on computers of banks and financial institutes, figure 1.1 shows per capita usage of credit or debit cards in different countries, Nordic citizen are more frequent in using credit or debit card.
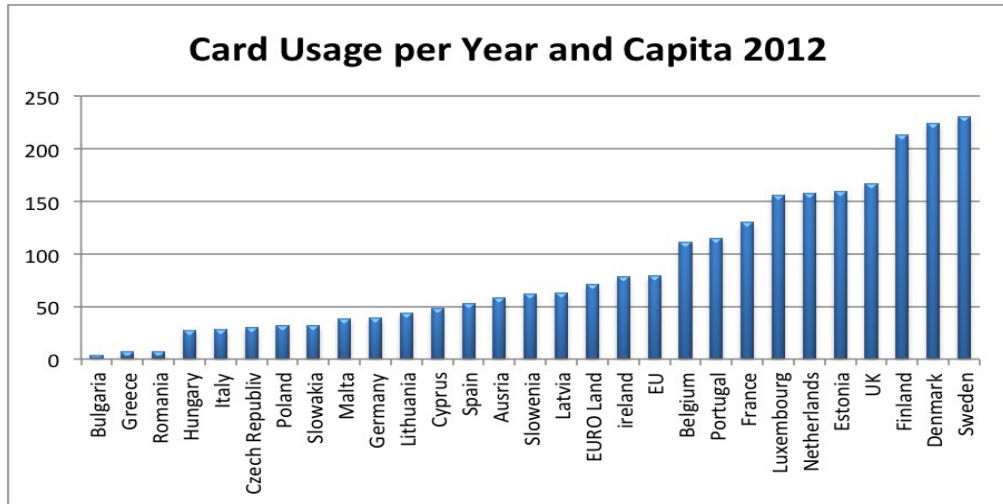

FIGURE 1.1 Digital money usage per capita (card usage 2017)

.

3.3.1 Crypto currencies

There are a type of currencies that do not need central banks, one of them is Bitcoin. These crypto currencies works without the need of printing actual bill and mostly used as alternate to digital money. Bitcoins are only digits in online account, which can be traded to other non crypto currencies, commodities, and services. This conversion make it possible to use Bitcoin as a regular currency. Bitcoin is not the only one of its kind, there are others too but Bitcoin have really gained a lot of popularity in recent years (Introduction Bitcoin 2016).

There is no bank or central authority who manage and set the value of money, and that make it less possible to become devalue over time. The encryption technology behind crypto currency and open source system of how these currencies work is a strong point that gives them certain level of credibility. All transactions of Bitcoin or similar currencies can be found online, it is seen that compare to USD the price of Bitcoin is keep going up, figure1.2 shows that people are buying Bitcoin currency over past few years.

Price Of Bitcoin
US Dollars; 9th of each month, 28th Dec, 3rd Jan

$1,020
$980
$725
$651
$622
$615
$585
$576
$461
$449
$413
$418
$380
$418
$373

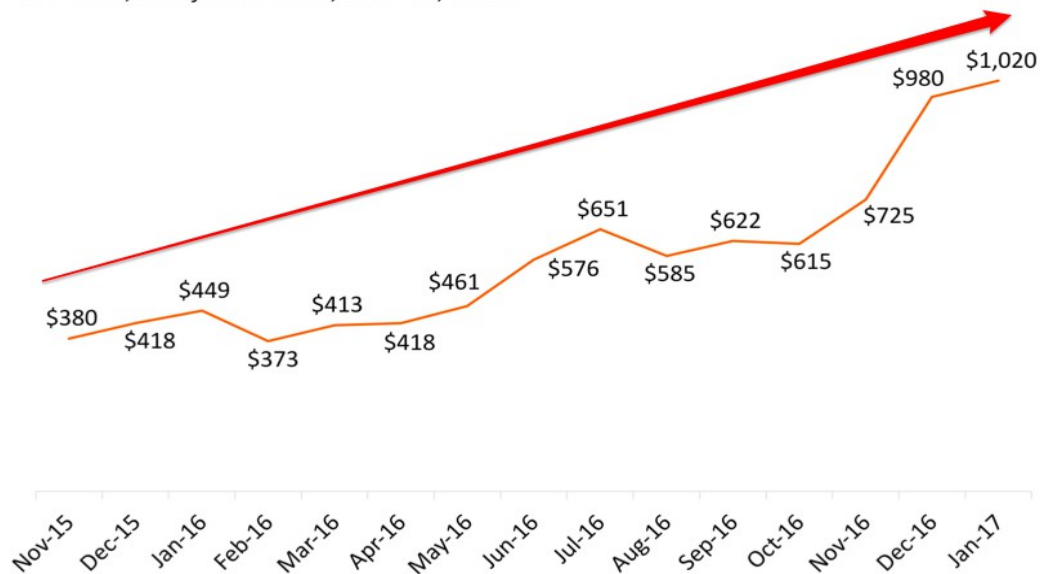Nov-15 Dec-15 Jan-16 Feb-16 Mar-16 Apr-16 May-16 Jun-16 Jul-16 Aug-16 Sep-16 Oct-16 Nov-16 Dec-16 Jan-17

FIGURE 1.2 Bitcoin price chart against USD (Bitcoin chart 2017)

These currencies are not really very well understood yet. These are computer algorithms set by programming languages and can be created or "mined". If someone has knowledge how to do it, in other words anyone with right knowledge can create it but the word "mining" is used so that it can match with the similar concept of mining commodities out of earth, such as gold.

Crypto currencies have another unique concept that it will duplicate automatically over specific period of time to keep inflation in balance, but there is a limit set to this process, it is said that there are fix number of Bitcoins which will ever be circulated online and that number is 21 million. This phenomena keeping the inflation in constant and make it impossible for counterfeiters to create it illegally. Estimated current value of all Bitcoins in circulation is nearly 3.3 billions and that may increase in future (Telegraph UK on Bitcoin. 2017). Bitcoins have gained a lot of appeal by those who are naturally suspicious of governments, tax collectors and bankers, also to those who involve in illegal trades such as money launders, and drug dealers.

Future may hold a promise for crypto currencies but I have reasons to believe that any of these currencies could ever become dominant global currency. Reason for my believe is the very fact that government will ever go in favor of implementing these type of monetary system which is hard to take a closer look, and maintain regulatory procedure.

My findings are mostly consistent with the hypothesis that future of money is digital currency, technology will shape current monetary system into more digital form, either we will be using polymer based cash or crypto currencies, but one thing is for sure that it will change our life style, buying habits, shopping trends and perhaps the shape of our regular wallet. Along with the arrival of digital money there is possibility of our traditional wallet becoming digitize as well. Instead of using leather wallet we may prefer using electronic wallet. When it comes to digital wallet, our mobile phone is suitable candidate for that purpose, mobile can play very important role in shaping the current payment system.

Mobile is a device which already revolutionized the way we navigate internet, how we communicate, capture our moments to photos, how we read news and watch movies. Mobile phone usage has increased over time especially in developing countries where mobile is recently introduced, according to world bank in 2001 there were 25 millions mobile phone on the continent of Africa, and in 2015 that number went up to 900 millions which is still growing (Worldbank data cellular subscriptions 2017). On the same graph the Finland have shown decrease in number of new mobile subscribers since 2015, because country reaches to the point where almost every one have access to mobile phone, we may call this a stable point while other countries in Africa and Asia are trying to reach toward that stable target.

4 ROLE OF MOBILE PHONE

In 21st century society that we lived in, mobile phone is served as a life line, if you can afford laptop, and the Internet bills, you can also afford mobile phone. It is used to navigation, search for health services and it can even be used to search and apply for jobs which most of the population actually do. Mobile is an invention that can work as multipurpose electronic device, it can be a good quality camera or scanner on one time while communication device on other, watch movies or play video game and keep up busy listing music, everything is possible with one device. It also has a potential to replace our regular wallet. Concept of mobile as a payment device is very simple, just integrate credit card with mobile app and you are a click away from paying online.

Our mobile may contains anything that we usually keep in our leather wallet, such as tickets, some old recipes, coins, cash and few debits or credit cards along with paper notes. By using mobile we can keep all those things in digital form and in few cases the better version of those stuff can fit in our pocket, we can scan or take a photo if there is hard to find digital version of some items, all we need is the right application (Figure 1.3).

FIGURE 1.3 Regular wallet and Mobile as wallet

4.1   Mobile as wallet

Banks are regular user of digital money because digital money made It possible to pay over the distance in seconds, and has been in constant evolution over past few decades. Web technology made it possible to bring buyer and seller on single platform, but technology is in constant development. It was never the same level of trust on web technologies or digital money that we seen in these days.

In start web technology was only for communication, which was built in late 80s while the early and mid 90s was the time of search engine revolution because of the reason that data was more important and there has been a lot of data scattered over different locations, and finding related contents was hard. This gave birth to the concept of search engine and web because hub of communication and search. In early 2000 public showed interest in online shopping, web technology was upgraded once again to support security and online payment system. New businesses such as credit card processing companies, and merchants came along with the revolution but it was not very long before people start moving away from online shopping because of the extra processing cost. Credit card theft was reported frequently until late 2010 when internet security was revived once again and public went back to online shop, and we see that web has also become financial hub.

Evolution in technology is slow process and technology tries to perfect its inventions over the time. Similarly, once mobile was electronic device with almost no processing power and using this device to access Internet was just a dream, but over the period of ten years mobile device got more processing power than the computers of late 90s. Web is not anymore limited to home computer only, recently we went one step further in web development by redefining the concept of browsing, and web pages are designed to target mobile users. Almost every online shopping store is compatible with mobile interface. QR code "Quick Response Code" which was the standard for automobile but it has now moved to smartphone industry (QR code 2017). Almost every product have QR code on the cover, which contains web page location of the product.

Bloomberg technology wrote an article that smartphones devices will overtake computers in e-business traffic (Bloomberg tech 2017). Following the public interest and increase in online business are the main reasons why banks also got involved

resulting that middle level credit card processing companies are out from the business, and credit card charging and processing fee drop to zero. Internet shopping is far more secure and cheap than it was ever before, Figure1.4 shows how a smartphone caused an increase in e-commerece over past few years.

FIGURE 1.4 Trade using smartphone (Mobile ecommerece 2017)

Powered by two main technologies Internet and mobile network, a brand new concepts of banking has emerged. In highly developed countries mobile is common equipment to use banking services which can also provide strong authentication. In Finland mobile certificate service based on the Mobile Signature Service standards is used for authentication and accepted by many official web sites, this service have been developed over a time by mobile operators and mobiilivarmenne (mobiilivarmenne 2017).

Currently two different type of mobile wallets are in use, depending on the availability of resources. First type of mobile wallet is popular and often found in developing countries, such as African and Indian nations while second type which is a much advance shape of mobile wallet is found in developed countries, lets take a look on a difference and how it operates.

4.1.1 Mobile wallet in developing nations

One of my Nigerian friend told me that mobile revolution in Africa is real because we are trying to solve real problem which farmers and other rural area dwellers are facing in their daily life. Problem is that most of us living in rural area have no access to banking system and rarely you can find a farmer who owns a bank account because of that reason most of us cannot trade on the scale that we have potential to do so, such as we have corps and fruit ready, but trading over far distance is not possible as there is no trusted way to exchange money without banks. In result, we have limited options to trade vegetables and other livestock in local market. Neighbor are growing same corps which result in more supply with less demand and lot of these fresh vegetable get expire because of the other problem which is we have no storage facilities. All we can do is sell as quick as possible but due to the lack in banking infrastructure, whole population is suffering poverty as a result of bad commerce.

Recently came mobile technology, and introduced revolutionary idea of commerce by using communication technology and mobile infrastructure. Safaricom, a mobile operator in Kenya made it possible to provide basic banking services such as secure credit transfer from one location to other, and gave whole new means to micro finance. One of the service is so popular that in a short span of time it gains popularity in 70% of Kenyan household. Service is so far reliable and affordable, known as M-Pesa (M-PESA Rates 2016). In past few years farmers have been successfully doing business by using this mobile wallet services.

M-Pesa is a service based on "Short Message Service" also known as "SMS" to transfer credit in real time with reasonable fee. Wallets based on SMS service do not require smartphone device because SMS service is text base message service which do not need Internet access to work (Android Authority on SMS 2016). During my research I found that most of these wallet providers are happens to be mobile phone operators as well because if company owns a mobile network they can implement better security and smooth functionality. Providing mobile wallet service using SMS message service is easy and affordable. Mobile wallet users on both side can manage their account by sending simple text message. Let's take a look how whole system works.

How it works

For example, I need to send money to my friend who lives in other city. The first step is to take a look into my account and see if I have enough balance, and to check my current balance I will send service message such as #*123221*#. In return, I receive text with information about my current account balance and found that I have enough money. Step two is to send money which I will transfer by using similar message but this time I will include information that how much amount I want to send and to whom it will concern. My friend will receive a message in realtime which will include one time computer generated code including unique information, such as receiver name and amount.

Cash points are available all over the country, these are independent business holder with similar type of mobile wallet, and these guys will happily convert message into cash, because on doing so they will get a bit of extra money into their mobile wallet, and now having money in their own mobile wallet they can sell it to next customer. This process contains a chain of beneficiary, but still total cost is far less than what bank will charge on transfer of same amount. Money can also be withdrawn from ATM, or can be transfer to other registered or unregistered users. People often use it to pay their daily needs and school fees, gifts or giving out loans to others. This is all happening in the Africa in 2016, in Tanzania people are using mobile wallets in the area where they have no access to electricity and using solar cells to light their home along with charging their mobile phones. M-pesa is not the only one of its kind there are others similar service providers.

Following the success of Safaricom many mobile operators in other regions are also trying to get their hands on the profit. Paytm is another wallet service provider in India (Paytm India 2017), working since 2014 and claim to have over fifty thousand service points locations in India. There are many other similar service providers in India including M-pesa, but M-pessa in India is operated by Vodaphone, British mobile phone operator (Vodafona 2017). It is common to find similar service provider in almost every country of Asia and Africa.

These providers have more or less similar type of services to offer, Paytm however, provide some extra bit such as you can pay bills, recharge your mobile balance, and buy tickets. This wallet is commonly used in B2B type business where people do business with each other, such as buying and selling used items.

4.1.2 Mobile wallet in developed nations

During my research most amazing finding which I came across was that SMS based mobile wallets works perfectly on old mobile phones, these devices are in very high demand because of long battery life and durability also these are affordable to almost every one. Nokia is alive in those regions, and once again company is revolutionizing the communication, however this time in different part of the globe. In the meanwhile in Nokia's birth place another revolution is about to emerge, people love technology here, almost every bank in Finland have their own mobile app which provide their customers quick access to bank account and facility to manage their daily banking needs. To access banking service most important thing is one time generated codes which often distributed on papers called "code cards". Mobile usage is so common here that many banks announce to end their "code cards" and suggest their customers to install mobile app that will generate code for them when they need it, without that app customer may not use online banking services (Nordea code app. 2017).

It is easy to convert mobile phone into authentication device by harvesting the processing power of hardware which smartphones are shipped with such as GPS (Global positioning Sensor), and Biometric (Fingerprint) sensors. Smartphone has more chance to work as digital wallet than any other digital device of the time. Osuuspankki, another Finnish bank launched mobile wallet application in 2014 called Pivo which has been downloaded 500,000 times since 2015 (Nfcworld on Pivo app 2016). Nfcworld announced that Finnish customers will be able to make peer to peer mobile payments (Nfcworld on Finnish P2P trade. 2016) using a new platform by ATM operator Automatia (Automatia is Finnish company owned by OP Bank Group), Nordea Bank and Danske Bank. When it comes to transfer money using mobile device, Siirto is pretty much generic name used by almost every bank in Finland, it can be translated as "transfer", for example S-pankki siirto application (S-Pankki Siirto 2016).

As discussed earlier that smartphone includes numerous sensors, such as GPS and Biometric data reader, but one such sensor which is essential for mobile wallet to operate is known as "Near Field Communication" or NFC sensor (NFC Forum 2016). In the previous case where SMS technology was found the reason of existence of mobile wallet in Asia and Africa, NFC is the key elements for next generation of mobile wallets. Mobile cannot perform contact-less payment without this technology. NFC is not the only difference, actually there are many other features such as, credit card storage and online shopping which are only possible using smartphone devices. Next generation mobile wallets depend on advance technology of radio, and Internet communication to work.

4.1.3   Power of NFC

NFC technology is build on "Radio Frequency Identification" also known as RFID, and is in constant upgrade, RFIDlab in Finland is working on the improvement of this technology (RFIDLab Finland 2016). NFC is read only and dead memory chip based on computer chip which is also knows as Integrated circuit or IC, in normal conditions that IC is waiting for the information inside the chip to be broadcast when it will power on. Receiver is another device with frequently changing magnet field which will cause that NFC chip to turn on and broadcast. Receiver or NFC terminal is that same device which will turn that NFC on and also read the broadcast to process. It is based on a phenomenon known as electric induction. This technology and infrastructure of RFID chips is very well explain by J Sweeny in his book "RFID for dummies" (RFID. J Sweeney 2005. page 84-86).

Process can be summarized as, NFC is turned on when powerful magnet field causes the induced current inside coil wrapped around NFC chip. RFID broadcast is not very strong, it works in very short range of about 10 cm sometime needs to tap device on receiver to actually make it work as to bring it to close range. This type of payment using NFC or RFID technology are also known as "contact-less payment". Difference in NFC and RFID is very simple, NFC contains RFID chip but information on that chip can be rewritten when needed thus make it possible to dynamically create new RFID information each time. NFC can convert any smartphone into RFID card that is one reason why it has gained popularity in recent years, because of its availability with

smartphone devices it is also good candidate to function as payment instrument. In mobile wallet application where these wallet applications often encode credit card related information to NFC device just a moment earlier before wallet is ready to pay. This makes NFC more secure over RFID cards as it can be turn on and off with extra security features, such as finger print or password protection, while ordinary RFID cards need to be protected by self care or shielded leather coating.

NFC brought an ease to customer when it is possible to pay quickly without need to enter security PIN also facilitate store owner when it is easy to set up and work with contact less-payment without installing new terminal. Most merchants provide extra option to receive contact-less payment using same hardware terminal, such as Paypal offers the ability to charge payment through either MSR or Chip based plastic cards as well as NFC payments are also possible by using same hardware (Paypal Card reader 2016). MSR stands for magnetic strip reader, which can read information encoded in the black stripe on the back of almost every plastic card such as debit or credit card (Techtarget MSR 2016).

NFC however needs software level security, because of its broadcast nature radio signals can be snoop by anyone nearby and always vulnerable to the man in the middle type attack. Mobile wallet using this technology are equipped with software level security such as data encryption or password protection. Another solution to make contact-less payment more secure is the use of method where the actual transaction do not share credit card number with terminal, but instead temporary number is generated for each transaction and used only once. In case that transaction is hacked by middle device, still that information is not usable anymore (Kaspersky blog 2017). Use of NFC used for payment is recent idea and work is in progress to make it more secure at software level.

4.1.4 New industry

Mobile phones are used for almost everything in these days, in the past this device was trying to be look like a computer in performance and in user-interface experience. Time have changed now, countless computer emulators and even few operating systems have been developed to support mobile application just to run on computer. Millions of dollars are traded in stock and online market using software on mobile devices. Many industry giants have shown interest in the technology and plan to use this device for their future business strategy. Some of them are already in business and few are just new to the stage, such as Apple, Microsoft and Google became recently active to get their shares in this new industry, while Paypal, Skrill and few others are already in the business.

New wallet providers are shown up every day, offering almost similar type of services, few of them have an extra bit to offer such as Apple pay (Apple pay 2016). Apple is not the first mobile wallet service provider on smartphones, actually PayPal and Google are already in the market much longer, but Apple is the first to protect mobile wallet with bio metric standard, and finger prints security is the highest security measures to date. On the other hand this advance feature also require the need of the latest mobile phone such as iPhone 6 or newer. Another problem with Apple wallet is that there are few thousand merchants all over the world where Apple pay is accepted, because Apple uses modified security standard of encryption and merchant require special terminal to read it.

Google is also in the business with two different names of almost similar product, Android pay and Google wallet (Google Wallet 2016), and almost same service to offer but is quickly surpassed the Apple pays functionality as Google uses the security standard which are readable by any standard NFC terminal. Merchants do not need to install special terminal on their cash counters, there are few other added benefits over Apple Pay such as money can also be shared with a friend, gift vouchers can be charged by scanning. Google store personal data to online server while Apple pay will store it on device using secure tokens, which makes Google more flexible over Apple.

Another similar service provider known as Paypal (Paypal homepage 2016) already in business near 20 years and well knows for its online shopping store called Ebay (Ebay homepage 2016). Paypal offers mobile wallet, but user needs to sign in to their account to make transaction. Comparing this to other similar services it may feel slow process because customer needs to prepare for Paypal payment by using Paypal application and signing up which may consume time and also not suitable for rush hours. Even quite old in online payment business still when only few retailers are willing to accept Paypal, it does not seem attractive choice of mobile wallet application. It seems that Microsoft will always jump into any emerging IT business segment no matter if they have anything new to offer, to test the luck once again Microsoft is on the stage with their wallet which have nothing new to offer but a brand new slogan "tap and pay". If we try to compare the availability and functionality of the offered services by these providers, we can assume that In the future Google may get successful because of flexibility of its wallet and the popularity of its mobile operating system.

4 RESEARCH METHODOLOGY

This research is exploratory in nature, discussion is about the future which is always unsure that is one reason why some part of my discussion may seems hypothetical images from the future. Analytic approach of problem solving is often used for individual business but in my case I have discussion on whole industry which may contains domain of corporations in the near future, that's why it is good idea to take a wider look, and analyze the public trend towards mobile payment. Future can be predicted by analyzing the data, I have been using both qualitative and quantitative approach to collect data. Quantitative data used here is often statistic from well knows organizations such as world bank, and qualitative data come from survey feedback which was conducted during early part of 2017.

4.1   Survey

Designing of survey project was not possible without previous study of related subjects during last academic year. Survey was conducted on small scale and result can be improved with increase in number of participants. Web questionnaire comprised nine questions, each with the intention to find out perception from users on the use of digital payments. Taking advantages of web technologies It was easy to create survey page, each question with multiple answers and participant will choose one answer to express the choice. Target of queries was to explore possibilities and any fear or obstacle, while at the same time try to find out future trends on the implication of mobile as a payment device. Personal data was not collected other than information about gender, and age. Appendix 1-5 include all programming codes that were used (Survey project by Qureshi Muhammad 2017).

Initially survey was distributed by using emails list, but after waiting over a month with two valid responses I decided to changed my strategy. It is proven that sending emails to random users was useless approach in 2016 when almost every email service is packed with spam filters. My next option was to send email only to those people who are in my social network and those who are personally known to me. This was good decision, and worked fine, and I was able to collect enough data. Participants of the

survey are from Finland, Germany and Sweden. Few of them are Nordic citizen while most of them are foreigner students living and studying in Finland. Total number of respondent so far 37, among them are 11 women and 26 men with age group 24 to 38. Some of them are permanent resident of Finland but most are living in Finland for 3 or 4 years and working as part-time. Answer for each question is presented as a chart with a summary of results. Figure 1.5 shows the screen shot of survey web page.

Survey questions

Select your Gender and Age:

◉ Male ○ Female

Age = 37

Survery Questions:

▸ **Do you often shop with...**
 ○Regular cash ◉Debit or Credit cards
▸ **Do you keep cash when traveling?**
 ○Always keep some Cash ○Never keep cash
▸ **Do you own a smart phone?**
 ○ Yes I have Smart phone ◉No I have regular phone
▸ **Have you tried online shopping?**
 ○Never ○Yes
▸ **How often do you use your mobile...**
 ○Few hours a day ○Under one hour a day ○Few time in a week ○Never used mobile
▸ **Have you been a victim of money theft..?**
 ○I lost my money or someone stole it ○Never happen
▸ **Have you been a victim of credit card / cyber theft?**
 ○Yes my Credit or Debit card was hacked ○Never
▸ **Have you ever heard of NFC or contact less payment?**
 ○No idea what is NFC or Contact-less payment ○I heard about contact-less payments
▸ **Will you consider to use mobile phone as a wallet?**
 ○Yes I would like to try if it ○No I am scare to try

Send Survey

FIGURE 1.5 Web survey (Survey project by Qureshi Muhammad 2017)

4.2 Result

The first question on survey list is "Do you often shop with...?" and answer is the choice between "Cash" or "Credit card". The reason to ask this question is that our primary form of money is bank notes which dominate current payment system, but in past few years another approach of payment is also been noticed when people pay by using credit or debit cards. Aim of this question was to find out the level of trust between cash and digital currencies. The response are summarized in Figure 2.1.
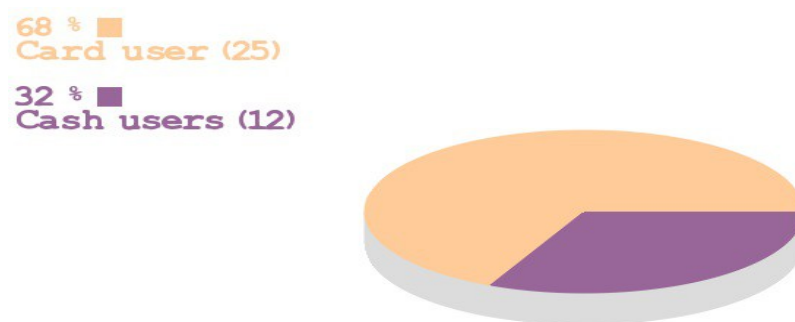

FIGURE 2.1 Survey result of question 1

Result shows that 68% responded are familiar with the idea of cash less payment system, as we see that 25 users like to pay by using digital money, I believe that this question might result in different chart if survey is conducted in any other region of the globe such as, if the survey is conducted in Pakistan I am sure response towards shopping by credit card can not be more than 5%. Scandinavian countries have been in practice of using card payment since 2000. According to The Gardian article published in June 2016, Gardian wrote "cash transactions made up 2% of all payments made in Sweden in year 2015". Article further wrote "about 900 of Sweden's 1,600 bank branches no longer keep cash on hand or take cash deposits" (Thegardian article 2016).

Second question is "Do you keep cash when traveling?", and answer was the choice between "Always" and "Never". The aim of this question was to find out if people are ready to trust their credit card when they are away from home. This question came to my mind out of curiosity because in my personal experience I do keep cash when travel abroad. I am not going to trust on credit cards because of my personal experience of frustration in 2008 when I was stuck in unfamiliar situation while on traveling far from home I was in need of cash and could not find ATM which accept my card.

Answers are represented in simple chart and this shows that 2.5% are ready to trust on their cards (Figure 2.2).

97.5 % ■
Always keep cash(28)

2.5 % ■
Never keep cash (9)

FIGURE 2.2 Survey result of question 2

This question was not very different from the earlier only difference is that the situation when someone is traveling have changed the opinion of trust. Result shows that those who can trust on credit card when they are at home are not willing to trust on the same card when they are away from home, point I want to make is that the level of trust has been dropped. We need to build trust on electronic payment to get customer acceptances. I believe that over time when technology is more efficient this low confidence will get improved, just like there was a time when online shopping was scary experience but now it is considered quite secure. Another reason that traveler usually keep cash for other reasons, such as not every shop accept credit cards and somewhere card don't work also there is always a chance to decline of transaction for any technical fault.

Third question is "Do you own a smartphone?" and answer was the choice between "Yes" and "No". The aim of this question was to find out the percentage of smartphone users. Result shows that almost 100% participants own a smartphone. This question would make more sense if asked a few years earlier. Currently old phones are not even sold on shops especially in a country like Finland. It is fact that future customer of mobile wallet will be among those who already own a smartphone.

Next question is related to personal experience, the question is "have you tried online shopping?" with the answer choice of "yes" and "no", the aim of this question was to find out how frequent people buy from online stores. Online shopping is an experience that help in building trust on digital currencies, result shows that 62% of participants have been using online store, few of them share their stories with me that they have used Ebay regularly to buy clothes, shoes and other stuff that they could easily buy from neighbor store (Figure 2.3).

FIGURE 2.3 Survey result of question 4

There are many reasons to buy from online stores and among them one is that online shopping is more affordable than neighboring store, but as the matter of fact when someone prefers online store over the regular store price may not be the only reason there might be other reasons as well, such as online shopping is unique experience of shopping which can be performed in any part of the day, even without leaving bedroom. There is element of fear is present when using internet, but over the time online shopping is proven to be more secure than it was before. Online stores are working hard to keep their customers satisfied, one such effort is the introduction of Paypal buyer protection policy for buyers and sellers (Paypal Protection 2017).

Next question is "How often do you use your mobile?" with possible answers are "Frequently", "Regularly", " Rarely", and " Never", aim of this question was to find out how often an average mobile is used. Multiple answers offer more flexibility in selecting the right choice, result shows that almost 70% regularly use their mobile phone while rest is divided among rare and frequent mobile user. Answer was presented with some hints such as, Frequent users are those who use mobile few hours a day, while regular users are those who use it less than an hour a day, and rare use means that mobile was used once in a few days. Figure 2.4 shows choice of answers and number of

participants for specific answer, as well as their answer feed back in over all percentage. Zero means nobody was found who have response that " I never used mobile".
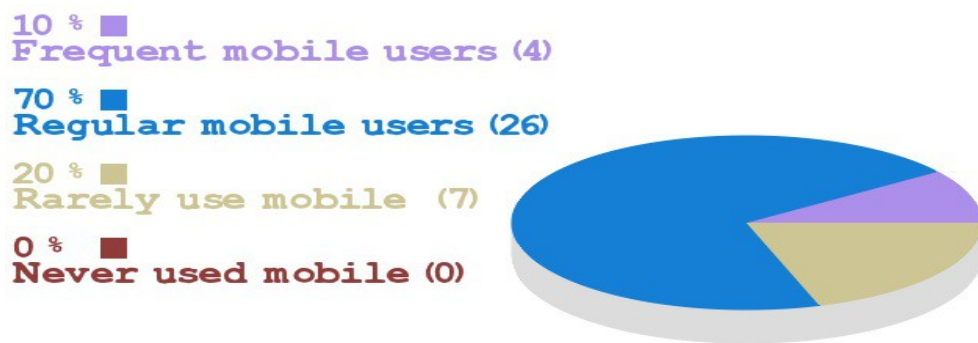

FIGURE 2.4 Survey result of question 5

Mobile have become a necessity of our life and it is hard to find someone who is not familiar with it. According to Gallup survey, smartphone usage is increasing over the time. Figure 2.5 is graph from similar web survey conducted in USA where over 81% population owns smartphones, it is reported that average American smartphone owners spend an hour with device. Survey has information related to smartphone usage according to age group, gender and education level of participants, survey report is worth reading (Gallup survey 2016). I cannot find huge number of frequent mobile users in my survey but result may show different statistic if it is conducted in places other than Finland over numerous participants.
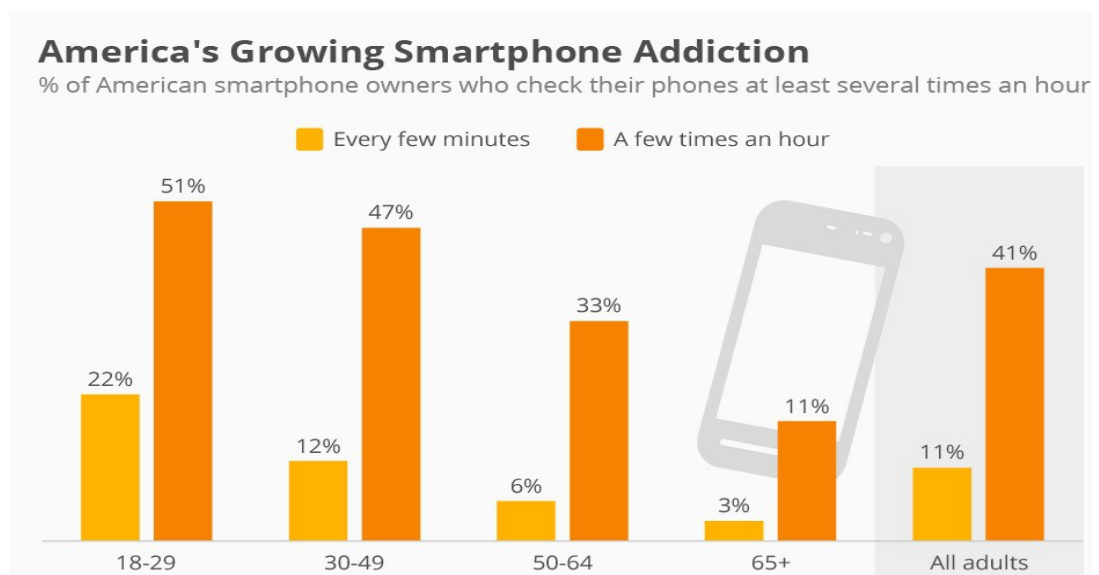

FIGURE 2.5 Gallup smartphone usage survey (source: Gallup survey usage, 2016)

Next two question are similar in nature, first questions is "Have you been a victim of money theft?" and the next is "Have you been a victim of credit card / cyber theft?" These question were asked to measure possible threat to digital currency and level of fear in people's experience while using digital currencies. Result from these two question was surprising. I found that 2 people have been victim of credit card theft while rest 35 never experience any trouble with card payment. On the other hand nearly 19% (7 out of 37) participants had experience, that they lost money or someone stole their money on purpose (figure 2.6).
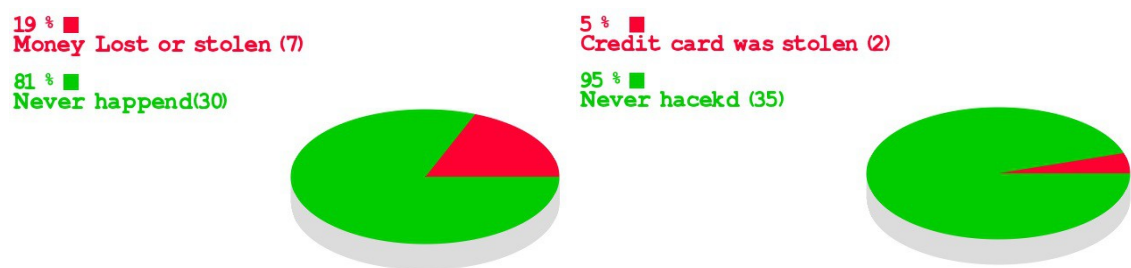

FIGURE 2.6 Survey result of question 6 and 7

Credit card hacking is a reality and there is no denial of that fact, but possibility of losing cash is equally present all the time. According to my survey result if we assume that all credit card users are interpreted as mobile wallet users of the future then on comparing the possibility of theft between regular wallet and mobile wallet we have to accept the interesting fact that mobile wallet is far safer than regular wallet.

Another important question of survey "Have you ever heard of NFC or contact-less payment?" The aim of this question was to measure the awareness of new emerging technologies among participants. It is again proven that most people of our time are not as aware as we might think they are, it is human nature and in our daily life we have seen that many of our neighbor living in the town are not interested to know what is going on the other side of the river. In my personal experience I have found contact-less terminal in almost every big store in Finland. Contact-less payment is available but most of the people have no idea what this technology is and how they can reach it using their own smartphone.

It is easy to see in the result chart that only 13% of participants have knowledge about contact-less payment. During discussion around coffee table I found that lot of my friends have pretty good idea of what contact-less payment actually is and it can be made by using some special credit card which banks will issue but not every one knows how it works in figure 2.7 the result of question is shown as a chart.

FIGURE 2.7 Survey result of question 8

I am sure those who have no knowledge of NFC are actually holding a smartphone capable of that very same technology. Only problem is lack of awareness, all we need is to educate them about what are the possibilities with the device they already owned. Only few have idea that installing mobile wallet app such as Google wallet, can turn their smartphone into wireless payment card. It is indeed very new technology and over the time people will become more aware. I am also sure that if same survey is conducted a few months later, result will show high graph of awareness.

We have reached the last question of survey which is about the choice of participants in the future as question is "Will you consider to use mobile phone as a wallet?" with three choices of answers, "Yes", "No" and "Maybe". Aim of this question was to collect enough data to support my hypothesis and also to find of what most participant will share. Result shows 18% (about 7 people out of 37) of response was "No", while the rest is divided into a group of people who want to try it or at least will think about it, figure 2.8 shows the result as a chart.

32 % ■
Want to try mobile as wallet (12)

18 % ■
Do not want to try mobile as wallet (7)
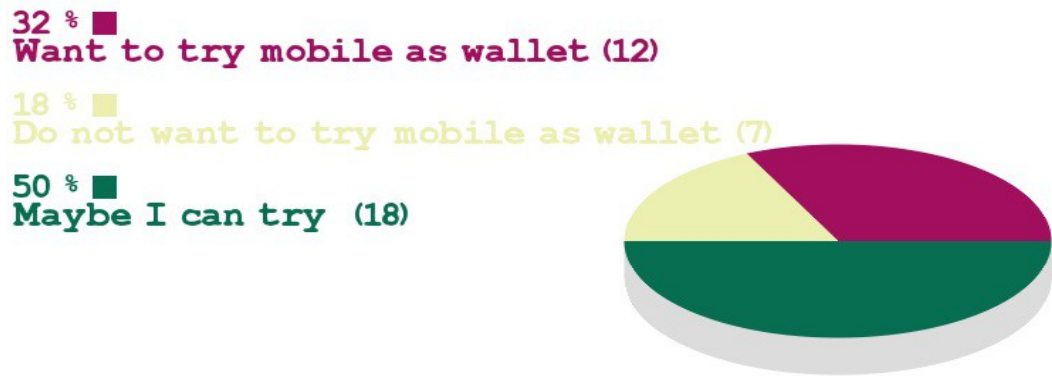
50 % ■
Maybe I can try (18)

FIGURE 2.8 Survey result of question 9

Young generation of our time have been experiencing quick change in the technology over a short span of time, and do not feel any obstacle in going further with technology they already have build faith in. While there is also population of those people who do not feel happy with the impact of technology in our daily life, these are often people with mature age and experience of life. Our society is mixed with all type of opinions, but when we take a look on a wider picture it is easy to see that majority is not afraid of any new experience when it comes to technology.

5 SWOT

SWOT analysis is very famous summery technique (Businessnewsdaily 2017), most often used in business study, we use SWOT to summarize the facts in single place, it brings all the strengths and weakness as well as any opportunities and obstacle present in the system. I will present SWOT analysis for the mobile wallet system before my conclusion. SWOT analysis will be the foundation of my conclusion.

5.1   Strengths

- Mobile wallet can pay faster than regular transactions because it doesn't involve transfer of physical cash.
- Payment using mobile wallet is much easier, in these days many apps offer simple user interface to interact with digital wallet. These interfaces can be customized according to needs. Contact-less payment can be made without need to enter security PIN for a limited amount. Microsoft slogan "tap and pay" is a good description of how simple mobile payment can become.
- These payment systems are available to almost every place where mobile can work, in the future with possibility of offline mobile transaction, mobile wallet will even surpass normal wallet in functionality.
- Digital payments can be tracked quickly when compare to cash payments, and easy to manage.
- With mobile wallet there is always a possibility of peer to peer transfer, which will increase buyer to buyer business.

5.2   Weaknesses

- Mobile payment depends on radio communication, this can become a weakness because these broadcast can easily be seen by unwanted guest, broadcast is always vulnerable to man in middle type attack.

- Mobile is an electronic device which depends on a power source to work such as battery, and wallet out of mobile device will only be usable if device is working properly any problem with mobile may result in frustrating situation.

- Similar to credit card theft mobile wallet is also easy to get attack by cyber criminals because of the nature of Internet it can be accessed globally even from the area which are not in the reach of law enforcement authorities.

- We also need a NFC terminal in store counters to make this payment works, in the future it might be available to all neighboring stores but at the moment limited availability is a weakness of mobile wallet.

5.3   Opportunities

- Mobile usage is increasing over time, it is estimated that there are more mobile users than register bank account holder. Many emerging economies in Asia and Latin America are beneficiary of mobile network system. Especially in Africa where new mobile financial system brings access to financial services and expedite the trade.

- Each mobile can also act as a point of sale, resulting that people not only can send money but they can also sell products to charge money from others.

- There are many possibilities when network provider is not involved. Offline credit transfer is one such possibility which may be seen in near future.

- Mobile wallet have been creating new trends in mobile application, wallet also have brought new concept to web developers.

- Recently I was in Pakistan, my home country, I found that one mobile operator have started similar type of business which M-pesa is doing in Nigeria. This time the idea is to franchise their distributing points which will result in easy management and will create thousands of new jobs.

5.4 Threats

- Any mobile device acting as a wallet does not change its overall value, it is still the same worth as it was before installing any wallet applications, in other words no matter if you have few hundred in the wallet or there are billions, your login to account will work as long as your provider wants it and as long as the service provider is not default, your money is not in your hand when it is in your mobile device.

- Wallet application is a computer program and all of our activities are tracked, consumer privacy is not possible when purchase tracking is right there inside your own wallet.

- When mobile is also our wallet it is hard to become careless with our device, we cannot leave it unattended nor we can handle it to every one, it will limit our usage and handling as well.

- Digital currencies never regulated by any government, and there have been numerous fraud in market, many well-known services providers similar to Bitcoins have been shutdown because of illegal activities. Any such activity will result in seizing all investment and public will lose their money, one example is Liberty reserve (LR Story 2016).

6   CONCLUSION

In recent years finance section is seeing the rise of new technologies related to its core business segment such as digital payments. Mobile devices are not only taking over the communication but also online and digital marketing, media, and advertising channels are in the reach of that amazing technology. People have already shown interest in products and services offered by web technologies, and willing to get into trade by using similar medium.

It is believed that next stage in the evolution of the web is digital finance, and in the future it is also possible that financial services such as investment and loans are available using mobile payment. The system with web technology has the capability to bring buyer and seller to single platform. In the horizon of web there are new stars shining such as well-known search engines, huge social network platforms, famous online stores and entertainment service providers.

Information technology giants are into the business knowing that any mobile payment provider will play a leading role and will be a serious competitor in the future market for standard financial services which is the core business segment of International banks. On the other hand many banks are already trying to keep up with this payment system, however traditional financial institutes have years of experience in security, this may give them a professional advantage over regular IT based business when offering services in mobile payment segment. Future hold a promise to digital payment system and related businesses not only in Finland but all over the world are trying to secure their financial share by adjusting their strategies in the battle of mobile payment, which has only just begun.

REFERENCES

About ECB. 2016. Read on 22.06.2016.
https://www.ecb.europa.eu/ecb/html/index.en.html

Android Authority on SMS. 2016. Read on 10.07.2016.
http://www.androidauthority.com/what-is-sms-280988/

Apple pay. 2016. Read on 15.12.2016. https://www.apple.com/apple-pay/

Banking laws, Willian A Lovett, Michael P Malloy.(1997). Banking and Financial Institutions Law in a Nutshell, 8th Edition.West publishing co USA. ISBN:978-0-314-28850-9.

Banknotes Finland. 2016. Read on 2.06.2016.
http://www.atsnotes.com/catalog/banknotes/finland.html

Bitcoin chart. 2017. Read oned 05.05.2017.
source:http://static1.businessinsider.com/image/586b99b4dd089510208b4d0f/this-chart-shows-just-how-much-the-price-of-bitcoin-has-soared-over-the-past-year.jpg

Bloomberg tech. 2017. Read on 05.05.2017.
https://www.bloomberg.com/news/articles/2016-07-25/smartphones-overtake-computers-as-top-e-commerce-traffic-source

Businessnewsdaily. 2017. Read on 01.02.2017.
http://www.businessnewsdaily.com/4245-swot-analysis.html

Card usage. 2017.Read oned 04.1.2017. source:http://en.cashhandling.eu/wp-content/uploads/2015/03/Card-Usage-year-capita1.png

Credit transfer Nordea. 2017. Read on 05.05.2017. https://www.nordea.fi/en/personal-customers/everyday-finances/accounts-and-payments/credit-transfer.html#tab=Credit-transfer

Ebay homepage. 2016. Read on 11.05.2016. http://www.ebay.com/

Fiat money. Daid Gordon.2000, Chapter 9 Page 159. An introduction to economic reasoning, Ludwig Alabama. ISBN:0-945466-28-5.

Gallup survey. 2016. Read on 12.12.2016.
http://www.gallup.com/poll/184046/smartphone-owners-check-phone-least-hourly.aspx?

Gallup survey usage. 2016.Read oned 12.12.2016
source:http://infographic.statista.com/normal/chartoftheday_3666_frequency_of_smartphone_usage_n.jpg

Gift Economy. 2016. Read on 4.11.2016. https://www.intelligenthq.com/social-business-2/the-gift-economy-the-days-when-more-for-you-is-also-more-for-me/

Google Wallet. 2016. Read on 15.12.2016. https://www.google.com/wallet/

ING Survey. 2016. Read on:12.11.2016. https://www.ing.com/Newsroom/All-news/ING-survey-a-cashless-society-is-coming.htm

Introduction Bitcoin. 2016. Read on 22.06.2016. https://bitcoin.org/en/how-it-works

Kaspersky blog. 2017. Read on 01.02.2017. https://blog.kaspersky.com/contactless-payments-security/9422/

LR story. 2016. Read oned 04.12.2016. https://www.theguardian.com/world/2013/may/28/liberty-reserve-arthur-budovsky-arrested-spain

M-PESA Rates. 2016. Read on 10.07.2016. https://www.safaricom.co.ke/personal/m-pesa/getting-started/m-pesa-rates

mobiilivarmenne. 2017. Read on 05.05.2017. http://mobiilivarmenne.fi/ Language[Finnish].

Mobile ecommerece. 2017. Read one 04.1.2017.source:https://assets.bwbx.io/images/users/iqjWHBFdfxIU/ieCowlCJWRiU/v2/800x-1.png

Museum Belgium. 2017. Read on:21.1.2017. http://www.nbbmuseum.be/en/2007/01/cowry-shells.htm

National bank Romania. 2017. Read on 02.05.2017. http://www.bnr.ro/Coins-and-notes-1330.aspx

NFC Forum. 2016. Read on 12.10.2016. http://nfc-forum.org/what-is-nfc/

Nfcworld on Finnish P2P trade. 2016. Read on 10.07.2016. https://www.nfcworld.com/2016/11/16/348542/finland-get-multi-bank-p2p-mobile-payments-platform/

Nfcworld on Pivo app. 2016. Read on 10.07.2016. https://www.nfcworld.com/2015/03/16/334586/finnish-banks-add-hce-payments-to-pivo-mobile-wallet/

Nordea homepage 2016. Read on 11.05.2016. https://www.nordea.fi/en/

Nordea code app. 2017. Read on 05.03.2017. https://www.nordea.fi/en/personal-customers/everyday-finances/internet-mobile-and-phone-services/nordea-codes-app.html

Paypal Card reader. 2016. Read on 12.12.2016. https://www.paypal.com/us/webapps/mpp/emv

Paypal homepage. 2016. Read on 11.05.2016. https://www.paypal.com/fi/home

Paypal Protection. 2017. Read on 01.02.2017.
https://www.paypal.com/uk/webapps/mpp/paypal-safety-and-security

Paytm India. 2017. Read on 09.05.2017. https://paytm.com/

Petroleum and biofules Finland. 2017. Read on 05.05.2017. http://www.oil.fi/en/media-press-releases/number-service-stations-finland

Plastic currency Canada. 2016. Read on 5.11.2016. https://www.thoughtco.com/canada-replaced-paper-currency-with-plastic-3971626

Population data Finland. 2017. Read on 4.1.2017. http://vrk.fi/en/check-your-registered-data-

Report Unbanked drop. 2017. Read on 3.1.2017.
http://www.worldbank.org/en/news/press-release/2015/04/15/massive-drop-in-number-of-unbanked-says-new-report

RFID, J Sweeney 2005. RFID for Dummies.Willey Publishing, inc. ISBN:0-7645-7910-X

RFIDLab Finland. 2016. Read on 12.12.2016. http://www.rfidlab.fi/rfidlab-in-english/

Riksgälden Sweden. 2017. Read on 2.1.2017.
https://www.riksgalden.se/en/deposit_insurance

Roman coins. 2016. Read on 4.11.2016. http://www.ancient.eu/Roman_Coinage/

S-Pankki Siirto. 2016. Read on 12.12.2016. https://www.s-pankki.fi/siirto   Language [Finnish].

Survey project by Qureshi Muhammad. 2017. Read on 06.06.2017.
http://koti.tamk.fi/~c6mqures/survey/

Techtarget MSR. 2016. Read on 12.12.2016.
http://whatis.techtarget.com/definition/magnetic-stripe-reader-magstripe-reader

Telegraph UK on Bitcoin. 2017. Read on 05.05.2017.
http://www.telegraph.co.uk/technology/2017/05/02/bitcoin-price-surges-all-time-high-1400/

Thegardian article. 2016. Read on 12.05.2016.
https://www.theguardian.com/business/2016/jun/04/sweden-cashless-society-cards-phone-apps-leading-europe

Vetuma palvelu. 2017. Read on 4.1.2017. http://www.valtori.fi/palvelut/vetuma
Language [finnish].

Vodafona. 2017. Read on 09.05.2017. http://www.vodafone.com/content/index.html

Worldbank data cellular subscriptions. 2017. Read on 12.03.2017.
http://data.worldbank.org/indicator/IT.CEL.SETS.P2?locations=FI-IN-KE-NG

Worldbank IDA Finland. 2017. Read on 3.1.2017.
http://datatopics.worldbank.org/financialinclusion/country/finland

Worldbank IDA USA. 2017. Read on 3.1.2017.
http://datatopics.worldbank.org/financialinclusion/country/united-states

APPENDICES

Attachments include client and server side programming codes and scripts which were used to create user survey page.

Survey is available at: http://koti.tamk.fi/~c6mqures/survey/

Total Appendices 5.

Appendix 1. Sql code for database.

```sql
SET @OLD_UNIQUE_CHECKS=@@UNIQUE_CHECKS, UNIQUE_CHECKS=0;
SET @OLD_FOREIGN_KEY_CHECKS=@@FOREIGN_KEY_CHECKS, FOREIGN_KEY_CHECKS=0;
SET @OLD_SQL_MODE=@@SQL_MODE, SQL_MODE='TRADITIONAL,ALLOW_INVALID_DATES';


-- -----------------------------------------------
-- Schema dbc6mqures663

CREATE SCHEMA IF NOT EXISTS `dbc6mqures663` DEFAULT CHARACTER SET utf8 ;
USE `dbc6mqures663` ;


-- -----------------------------------------------
-- Table `dbc6mqures663`.`survey`
-- -----------------------------------------------
CREATE TABLE IF NOT EXISTS `dbc6mqures663`.`survey` (
  `sid` INT NOT NULL Primary Key,
  `age` INT NULL,
  `gender` VARCHAR(25) NULL,
  `ans1` VARCHAR(45) NULL,
  `ans2` VARCHAR(45) NULL,
  `ans3` VARCHAR(45) NULL,
  `ans4` VARCHAR(45) NULL,
  `ans5` VARCHAR(45) NULL,
  `ans6` VARCHAR(45) NULL,
  `ans7` VARCHAR(45) NULL,
  `ans8` VARCHAR(45) NULL,
  `ans9` VARCHAR(45) NULL COMMENT 'Table to collect survey answers')
ENGINE = InnoDB;


SET SQL_MODE=@OLD_SQL_MODE;
SET FOREIGN_KEY_CHECKS=@OLD_FOREIGN_KEY_CHECKS;
SET UNIQUE_CHECKS=@OLD_UNIQUE_CHECKS;
```

Appendix 2. Code for "survey.js".

```javascript
var ang3 = angular.module("ang3", []);

ang3.controller("bodycontroller",function($scope, $http){
$scope.age = $scope.age;
$scope.Inform = function() {

$scope.surveyWin = true;
$scope.surveyThanks = true;

};

$scope.addN= function () {

        var tmpurl = "http://koti.tamk.fi/~c6mqures/cmd_api/project.php/survey";

                    var req = {
                        method: 'POST',
                        url: tmpurl,
                            data: { age: $scope.age, gender: $scope.gender, ans1: $scope.q1, ans2:
$scope.q2, ans3: $scope.q3, ans4: $scope.q4, ans5: $scope.q5, ans6: $scope.q6, ans7: $scope.q7, ans8:
$scope.q8, ans9: $scope.q9 }
                        }
                        // $scope.updateInfoArea = false ;

                        $http(req).then(function(){ $scope.Inform();
                      });

});
```

Appendix 3. Code for "index.html".

```html
<!DOCTYPE html>
<html lang="en" ng-app="ang3" >
<head> <meta charset="utf-8">
 <meta name="viewport"    content="width=device-width, initial-scale=1.0">

 <title>Survey Projet by Qureshi Muhammad</title>
<script src="http://ajax.googleapis.com/ajax/libs/angularjs/1.4.8/angular.min.js"></script>
<script src="https://ajax.googleapis.com/ajax/libs/jquery/2.1.1/jquery.min.js"></script>
<script src="survey.js"></script>
     </head>

<body ng-controller="bodycontroller">
   <h1>Survey questions</h1>   <div ng-show="surveyThanks">
   </datalist>
Thank you for your feed back.

</fieldset>
  </div>

 <div ng-hide="surveyWin">
   <form name="form" ng-submit="addN()" role="form">
   <datalist id="marks">
 <option value="0" label="0%">
   <option value="50" label="50%">

 <option value="100" label="100%">
</datalist>
 Select your Gender and Age:
   <fieldset><input type="radio" name="gender" ng-model="gender" value="male" required> Male
 <input type="radio" name="gender" ng-model="gender" value="female" required> Female<br>
 <input type="range" ng-model="age" step="1" min="18" max="70" > Age = <code>{{age}}</code><br/>

</fieldset>

Survery Questions:
<fieldset>
<li>   <b> Do you often shop with... <br></b>
   <input type="radio" ng-model="q1" name="q1" value="Cash" required>Regular cash <input type="radio"
ng-model="q1" name="q1" value="Card"/>Debit or Credit cards<br> </li>
 <li><b> Do you keep cash when traveling? <br> </b>
     <input type="radio" ng-model="q2" name="q2" required value="Always" >Always keep some Cash
<input type="radio" ng-model="q2" name="q2" required  value="Never"/>Never keep cash<br></li>
 <li> <b> Do you own a smartphone? <br></b>
```

```html
    <input type="radio" ng-model="q3" name="q3" required  value="Yes" > Yes I have Smartphone<input type="radio" ng-model="q3" name="q3" required  value="No"/>No I have regular phone<br></li>
 <li> <b> Have you tried online shopping? <br></b>
    <input type="radio" ng-model="q4" name="q4" required   value="No" >Never <input type="radio" ng-model="q4" name="q4" required  value="Yes"/>Yes<br></li>
 <li><b> How often do you use your mobile...  <br></b>
    <input type="radio" ng-model="q5"  name="q5" required value="Frequent" >Few hours a day<input type="radio"  ng-model="q5"  name="q5"  required     value="Regular"/>Under  one  hour  a  day<input type="radio" ng-model="q5" name="q5" required  value="Rare">Few time in a week<input type="radio" ng-model="q5" name="q5" required  value="Never"/>Never used mobile<br></li>
 <li><b> Have you been a victim of money theft..? <br></b>
    <input type="radio" ng-model="q6" name="q6" required   value="Yes" >I lost my money or someone stole it<input type="radio" ng-model="q6" name="q6" required  value="Never"/>Never happen<br></li>
 <li> <b>Have you been a victim of credit card / cyber theft? <br></b>
    <input type="radio" ng-model="q7" value="Card theft" name="q7" required  >Yes my Credit or Debit card was hacked<input type="radio" ng-model="q7" name="q7" required  value="Never"/>Never<br></li>
 <li>  <b>Have you ever heard of NFC or contact-less payment? <br></b>
    <input type="radio" ng-model="q8" name="q8" required  value="Never heard" >No idea what is NFC or Contact-less payment<input type="radio" ng-model="q8" name="q8" required  value="yes"/>I heard about contact-less payments<br></li>
 <li> <b>Will you consider to use mobile phone as a wallet? <br></b>
    <input type="radio" ng-model="q9" name="q9" required   value="Will try" >Yes I would like to try if it<input type="radio" ng-model="q9" name="q9" required  value="will not try"/>No I am scare to try<br></li>

</fieldset>


<button type="submit" >Send Survey</button>
 </form>
   </div>


</body>
</html>
```

Appendix 4. Server side codes, Slim framework.

```php
<?php
header("Access-Control-Allow-Origin: *");
use \Psr\Http\Message\ServerRequestInterface as Request;
use \Psr\Http\Message\ResponseInterface as Response;

require 'vendor/autoload.php';
require 'db2.php';
require 'fun_project.php';

$app = new \Slim\App;
$app->post('/survey',function (Request $request, Response $response) {  // API call to add product in item table

$body = $request->getBody();
$params = json_decode($body);
$json = addsurvey($params);
$response->getBody()->write($json);
return $response;
});
$app->run();
```

Appendix 5. Server side codes for "fun_project.php".

```php
<?php
// for adding survey answers to database
function addsurvey($params) {
$sql="begin;

insert into survey (age, gender, ans1, ans2, ans3, ans4, ans5, ans6, ans7, ans8, ans9) values (:01, :02, :
03, :04, :05, :06, :07, :08, :09, :10, :11);

commit;";


  try {

$db = getDB();
  $stmt = $db->prepare($sql);
    $stmt->bindParam(':01', $params->age);
      $stmt->bindParam(':02', $params->gender);
        $stmt->bindParam(':03', $params->ans1);
            $stmt->bindParam(':04', $params->ans2);
              $stmt->bindParam(':05', $params->ans3);
                $stmt->bindParam(':06', $params->ans4);
                  $stmt->bindParam(':07', $params->ans5);
                    $stmt->bindParam(':08', $params->ans6);
                      $stmt->bindParam(':09', $params->ans7);
                          $stmt->bindParam(':10', $params->ans8);
                            $stmt->bindParam(':11', $params->ans9);


  $result = $stmt->execute();
      $db = null;
   return '1';
   }
   catch(PDOException $e) {
     return '{"error":{"text":'. $e->getMessage() .'}}';


        }
          }


          //end
```