FINANCIAL TRANSACTION SYSTEMS USAGE IN VIETNAM

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***Abstract:** In ancient times, non-financial transactions were commonly conducted through systems of credit, in which goods and services were exchanged for a promise of future recompense. The financial systems have evolved from traditional banking to ATM banking, online and mobile transactions. New technologies such as blockchain, which uses continuously growing list of records, called blocks, which are linked and secured using high level cryptography In blockchain the transaction records are synchronized. Each copy is identical automatically updated, and immutable. This paper traces the development of financial transaction system and its evolution in Vietnam.*

***Keywords:** ATM, Banks, Financial transactions, Blockchain, Vietnam*

1. INTRODUCTION

"Every company is becoming a tech company… And we have this thesis that every company needs to be a financial services company, too" – (William Hockey, Cofounder of Plaid Technologies)

Nowadays, the FinTech sector has been evolving rapidly as new startups emerge and large financial institutions figure out how to adapt…or else get left behind.

Forget online banking. If there was ever an industry where mobile is not just first but full-steam ahead, it's the financial services industry, where FinTech — a.k.a. financial services technology — is finding new ways to make spending, managing, and investing our hard-earned money even easier than ever before. From Venmo to Apple Pay, we're seeing more and more consumers moving to digital currency — digital deposits — even digital investing. And it's forcing the entire industry to rethink its concept of both brick-and-mortar stores, and everything that goes along with them.

If it feels like this change is fast and furious, you're right. I can still remember the days of waiting in long shopping lines while folks pulled out check books and the numerous required forms of ID that went along with them. Today's transactions rarely need a signature, let alone a valid driver's license. In fact, in new stores like Amazon Go, there aren't even any checkout lines. Customers simply walk out the door and wait for AI to do the dirty work.
Clearly, the rise of FinTech has huge implications for the financial services industry, and all of us who use any form of money.

1.1 Financial transaction systems
In this study, to understand about the financial transaction systems concept, we would like to focus on the following headlines:
About Financial Transaction Systems

Use of Financial Transaction Systems
Bank Card System – An example of Financial Transaction Systems

Figure-1 Financial transactions

It involves a change in the status of the finances of two or more businesses or individuals. The buyer and seller are separate entities or objects, often involving the exchange of items of value, such as information, goods, services, and money. It is still a transaction if the goods are exchanged at one time, and the money at another. This is known as a two-part transaction: part one is giving the money, part two is receiving the goods.

In ancient times, non-financial transactions were commonly conducted through systems of credit, in which goods and services were exchanged for a promise of future recompense. Credit has certain disadvantages, including the requirement that traders or their intermediaries trust one another, or trust that authorities exist who can be relied on to enforce agreements. Debts must eventually be settled either with goods or by payment of money, a substance of agreed value such as gold and silver.

Systems of credit are evident throughout recorded history and from archeology. By contrast little evidence has been found of widespread use of pure barter, where traders meet face to face and transactions are completed in a single swap.

As cities, states, and empires were established, coins and other compact forms of specie were minted or printed as fiat money with set values, permitting the accumulation of assets that would not deteriorate over time as goods might and that had the relatively secure backing of a government which could adjust value by producing more or less of the currency. As fixed currencies were gradually replaced by floating currencies during the 20th century, and as the recent development of computer networks made electronic money possible, financial transactions have rapidly increased in speed and complexity.

A financial transaction system is the system that covers financial transactions and the exchange financial transactions between one part of giving and the other one of receiving. A system and method for conducting a financial transaction is disclosed. The system includes a first memory location embedded in a personal portable device. The first memory location stores a plurality of personal financial data files associated with a user. The system also includes a second memory location to store biometric information and a first input interface to receive authentication information after initiation of a purchase transaction session. The system also includes a security module including an input coupled to the first interface to authenticate the authentication information based on the biometric information and an output interface

comprising an input coupled to the first memory location and an output to provide personal financial data file information to a host device.

2. USE OF FINANCIAL TRANSACTION SYSTEMS

Financial system in today's world is perhaps the most important system among all the systems as all the economics of the world have become interlinked it has become a very complex system. The financial system in it includes all whether its banks or stock market or financial institutions. Let's see some of the important functions which are performed by the financial system:

i.   The first and foremost function which financial system perform is the channelization the savings of individuals and making it available for various borrowers which are the companies which take loan in order to increase the production of goods and services, which in turn increases the overall growth of the economy.

ii.   It is with the help of financial system that one can make payment whenever and wherever he or she wants with the help of checks, credit card and debit card. In the absence of financial system one has to take cash wherever he or she goes which would have been impossible.

iii.   Financial system also provides individual various options when it comes to protecting against various risks like risk arising from accidents, health related, etc. through various life insurance options.

iv.   Financial system also makes sure that one can liquidate his or her savings whenever he or she wants it and therefore individuals can have both the things, which involve return on investments as well as comfort that they can liquidate their investments whenever they want.

All transactions whether they involve individual buying house or a big company coming with an initial public offer they are effected smoothly because of financial system.

3. BANK CARD SYSTEM

Commercial banks have existed and developed hundreds of years associated with the development of commodity economy. The development of the commercial banking system has had a great impact on the development of the commodity economy and vice versa, the commodity economy has grown to the highest stage as the market economy, commercial banks are increasingly being finalized and become indispensable financial institutions. Through credit activities, commercial banks create benefits for depositors, borrowers and banks through interest rate differences that bring profits to banks.

Each commercial bank has specific functions such as credit intermediate function, payment intermediate function, money making function. The main services of commercial banks include: exchange, purchase and sale of foreign currency; commercial discount and commercial loans; accepting deposits; payment services; preserve valuables; fund for Government activities; provide trust services; consumer loans; finance support; money management; project financing; selling insurance services; provide brokerage services; provide investment banking services and wholesale banking; personal financial services and card services; online banking, etc.

3.1 Banking card services introduction

Within this paper, our team chooses the bank card service and bank card processing system to present an overview of bank card services and financial system infrastructure.
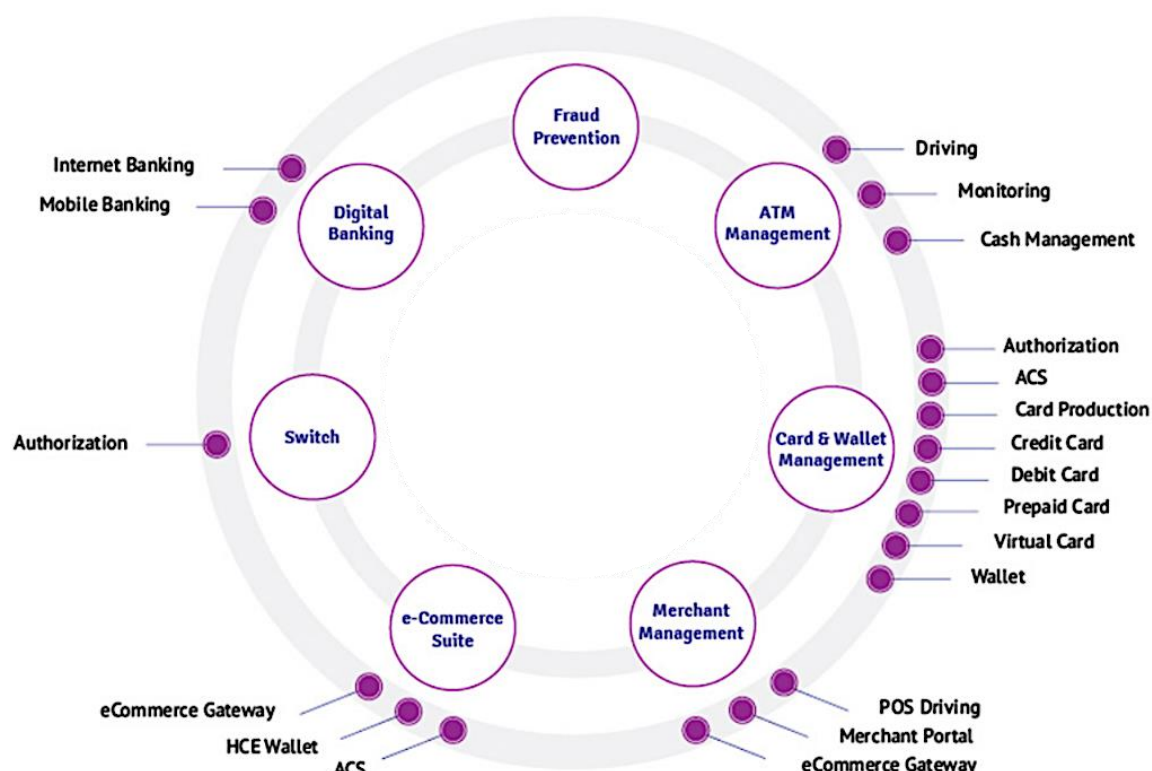
Figure 2. Bank card services (BPC Banking Technologies, 2018)

Basic card products/services of commercial bank include:

Debit card product: a card product that customers must maintain a minimum balance in their account and only spend within the available account balance.

Credit card product: a credit card issued by a commercial bank with credit limit based on the credit assessment procedure that processed by the consumer credit loan application. Customer allows to spend in the range credit limit is issued by commercial banks, then customers will have to repay consumption according to current regulations of commercial banks.

Prepaid card product: customer will advance money to use the card within the prepaid card limit.

Virtual card or anonymous card only uses when making online payment on the internet. Card payment methods are diversified by commercial banks with highest secure payment technology as follows:

Do payment for goods or services at Point-of-Sale (POS), which are linked to merchants and at ATM with basic transactions such as sale or payment, cash withdrawal, balance inquiry, mini statement, money transfer, change PIN, etc.

Pay for goods or services on the Internet through online websites call as Internet banking. With Internet banking services, in order to ensure the safety for customers when performing transactions, websites can link with local and international card organizations to deploy multi-factor authentication technology such as 3D-Secure. These technologies are 3D Secure of Visa, Secure Code of MasterCard, J/Secure of JCB, Safe Key of Amex, etc. With multi-factor authentication technology in card payment, customers not only enter information on card number, expiration date, CVV is imprinted on the back of the card, but also the customer has to enter a token code called OTP (One Time Password) sent to the customer through the specific

application, via SMS or via email that is registered with the financial organization or Issuer bank to conduct transactions. OTP number are usually only valid for a period of 02 minutes.

With the continuous development of high-tech payment cards such as cards with integrated electronic circuits, also known as chip cards or smart cards. These card products contain an electronic security chip embedded on the card. Chip cards communicate with the terminal via contact or non-contact RF interface.

RFID is a process by which objects are read out to a single code via radio technology. This system should include minimum a RFID tag, RFID reader and antenna. The reader sends a signal wave from the interaction with the tag through the antenna, which responds with a unique code. RFID tags are of two types: active and passive. Active RFID tags contain an energy source that allows it to transmit waves at distances up to 100 meters. The passive RFID tag itself has no power source. Instead, it is powered by the magnetic wave energy transmitted from RFID readers. Because radio waves must be strong enough to transmit energy to the tag, passive RFID has a fairly short read distance of up to 25m. The passive RFID tag basically operates under 3 frequencies as follows: Low Frequency (LF): 125 - 134 KHz; High Frequency (HF): 13.56 MHz; Very high frequency (UHF): 856 MHz - 960 MHz

NFC (Near Field Communication Technology) is a branch of HF RFID technology (RFID with a high frequency with range of 13.56 MHz). The NFC standards and protocols are also based on the RFID standards noted in ISO / IEC 14443, FeLiCa and ISO / IEC 18092. NFC devices have the advantage of limiting the frequency radio waves in close range. NFC devices must be exposed at close range, usually no more than a few centimeters, so it becomes a common choice for secure communications between payment devices, such as smart cards, contactless communication, smart mobile devices, etc.

In addition, with the development of mobile devices, card payment transactions can be handled from the customer mobile. Applications are developed exclusively on mobile phones with a high security mechanism for tagging into that specific application and using the NFC method to transfer card data to payment devices. Customers use mobile devices with integrated NFC to tag card information into specialized applications that communicate with the terminal.

According to statistics of Nilson Report and the report of the State Bank of Vietnam, card data is issued in the world is 19.090.000.000 cards, the number of cards issued in Vietnam is 132,000,000 cards accounted for 0.01% compared with worldwide (The Nilson Report, 2016). The number of ATMs in the world is 28.400.000, the number of ATMs in Vietnam is 268.813, accounting for 0.95% of the worldwide (ATMMarketplace, 2016). The number of POS equipment in the world is 3.500.000 units, the number of POS equipment in Vietnam is 17.558 units, accounting for 0.49% of the world. This is a relatively good number with the development of cards and payment facilities in Vietnam, the potential for e-commerce development is still great, especially in the context of Vietnam's integration into the world economy.

3.2 Bank card system connections

The bank card system is developed with the following main functions: manage payment devices such as POS, ATM, mobile payment equipment, merchant payment channels; manage card information, customer information, customer account information; issue cards to customers, managing card status, canceling services and customer cards; process online transaction such as transaction authentication, authentication of OTP codes in multi-factor

authentication; conduct reconciliation and settlement between financial institutions and other card organizations participating within the payment network.
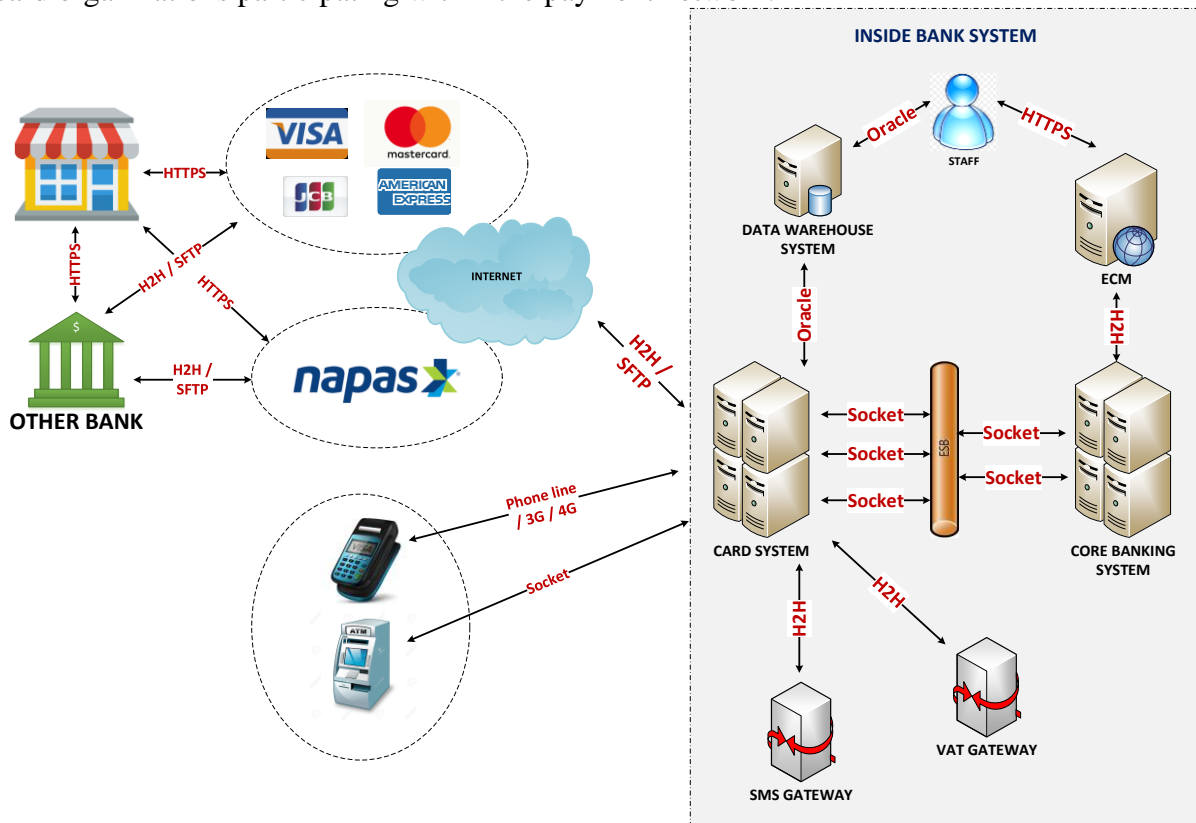

Figure 3. Bank card system connections

The card system is located at the center of communication with the core banking system via socket via the ESB system. The ESB system is a distributed system that connects components and applications to another system, which is considered as a bridge that enables systems with different message structures to communicate to each other. The ESB system allows to consolidate all security, redirection and data transfer issues in one place, the transition from one service to another is accomplished smoothly without changing any application connections.

When the customer wants to issue a card, the customer credit profile will be sent to the ECM system. This is a system to support credit approval to base credit limit for customers. Once the customer information is approved, the system creates new customer information, the account information associated with issuing the credit limit. This information will be sent to the card system to issue card to the customer. The card will be given to the customer. Card transaction data in one day is transferred through the data warehouse system to generate management reports.

Card transactions can be made from ATMs, mobile phones or Internet banking, and then transferred to international card organizations such as Visa, MasterCard, JCB, Amex, Discovery, etc., or transfer to Vietnam domestic payment system as Napas and transferred them to the bank card system. These card transaction is processed online with immediate response. The card system setups the value of the cutoff time at the end of the day to carry out the payment transaction data for the day, sends these card transaction data to other payment institutions to reconcile data between financial organizations and process the transaction settlement, transfer

money to the other financial organizations and credit institutions participating in the payment network.

3.3 Bank card system infrastructure

Typically, the bank card system infrastructure is divided into two physical server layer such as the application server layer and the database server layer. The card server system communicates with the system to the outside of the Internet through the conversion to virtual IP address to ensure security. The application server layer is installed in the server cluster at two geographic locations, such as the data center location know as DC site and the backup location for disaster recovery purposes know as DR site. At present, the usual mechanism is that the server equipment at DC is usually in Active mode, the transaction processing routine, while the server equipment at DR is usually in standby mode - sleep mode and only Activate when the system at DC has malfunction or disaster has not restored in a short time to ensure system uptime and minimize downtime.
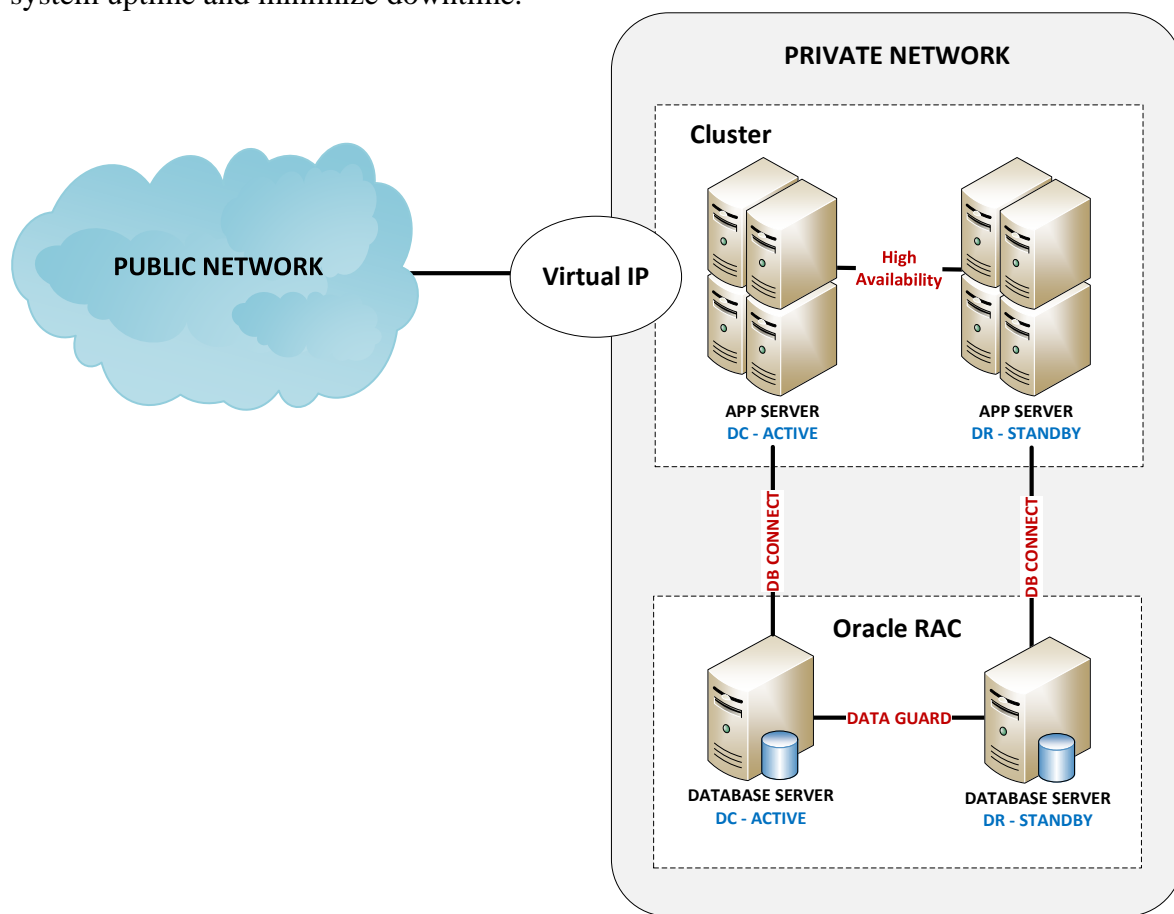

Figure 4. Bank card system infrastructure

The synchronous mechanism between the two systems DC and DR applies the High-availability (HA) mechanism. HA provides redundancy method in the network infrastructure, ensuring that hosts always have access to critical servers in the network or the Internet at any time.

The application server layer is connected to the database server interface via database connection (DB Connect) depending on the database technology is Oracle, IBM DB2, SQL Server, MySQL, etc. ... The database server layer is also usually set up in DC and DR respectively as the application server layer to ensure system operation smoothly, minimizing

downtime. Servers in DC and DR are also equipped with real-time data synchronization, known as Data-guard. Data in financial transactions is the source of important data, security with absolute accuracy, thus ensuring the system of database servers operating continuously and with high accuracy and security. always put on top priority.

Card system is an important system of the Commercial Bank. With the payment technology develop today, the card system will always be updated accordingly to meet the needs of modern payment, utility and security for customers.

4. TECHNICAL TRENDS IMPACTING THE INDUSTRY

We would like to state here top 5 Digital Transformation Trends in Financial Services. The following are a few of the trends currently impacting the industry.

Goodbye, Banks Reports show 40% of Americans have not stepped through the doors of a bank or credit union within the last six months. In fact, if you've had a difficult time finding a local branch lately, there's good reason. The number of physical banks has dropped by almost half from 1995 to 2015 — largely due to the rise of online and mobile banking. On the surface, that might seem like good news. With so many users going online (or on phone) to do their banking, banks no longer have to foot the bill for physical space. But the fact remains that many users aren't just going online, they're going elsewhere — finding mobile "financial wellness platforms" that allow them to budget, bank, pay, and crowd-fund, all without leaving their homes. In other words, banks are no longer the only game in town when it comes to financial management. There are lots of other companies that save, lend, and invest faster, easier, and cheaper than the former financial giants.

4.1 Hello, Blockchain

Blockchain might best be known as the technology behind digital currencies like Bitcoin. But the technology holds much more promise than digital payments. Blockchain essentially allows for safe and secure trading of almost anything—be it money, ideas, copyrights, or royalty fees — while also eliminating the middle man formerly needed to facilitate or manage the transaction. Blockchain can be used to manage investments, real estate — literally almost anything of value. And the best part is, it can all be done virtually, with limited security risk.

4.2 New Rules - And Experiences

FinTech has a huge benefit over traditional banking organizations in that FinTech firms are not subject to the same federal regulations. As such, they have far more freedom to create user experiences that make customers' lives easier. They aren't just eliminating the need to deposit your paycheck or send in your mortgage payment. They're offering opportunities for crowd-sourced investments, the chance to refinance or borrow — the chance to purchase your home or car, entirely via phone! In effect, FinTech is empowering users not just to bank — but to completely rethink their financial well-being. They're encouraging them to be active participants in their financial lives.

4.3 Eliminating the Need for Money

Bitcoin is a form of purely digital currency, not backed by any nation or government. And while the mysteriousness that surrounds bitcoin might cause some companies to be wary of using it, the fact remains that the digital currency genie is officially out of the bottle. Bitcoin has proven that currency no longer needs a government backer to exist or work in the financial world. That's huge as we consider the strides FinTech is already making in other areas of the financial services market.

4.4 Enhanced Security

After the financial collapse of 2007, many people started to reconsider the age-old idea of hiding their money under the mattress, rather than in a traditional bank. Fast forward 10 years, and technology like blockchain has not just eliminated the need for banks in financial transactions, it's made those transactions even safer than ever before. For those looking to buy, sell, or trade anything of value, the technology exists to do so with complete peace of mind—not to mention, the removal of a middle-man who could be tempted to skim from the top of the profits. While blockchain is not yet available widely as a consumer product, it undoubtedly will find its way further and further into the financial marketplace, allowing many of us to experience financial peace of mind, perhaps for the very first time. Any time money is involved, there will always be intense interest on the part of venture capitalists to keep the baller, bitcoin-moving. The changes we've seen thus far are nothing compared to what the future holds, largely backed by blockchain's potential and increasing consumer excitement and demand.

In order to demonstrate for the above technical trends, below are examples that have been impacting the industry:

5. MOBILE PAYMENT

Mobile Payment basically is a financial payment service by using portable electronic device, such as mobile phone, iPad, tablet, etc. In the past, cash, cheque or credit cards should be used, but mobile payment with plenty of services will replace all of old payment style. Mobile payments can be used in a "peer to peer" connection or for paying at a brick-and-mortar business. We can have the transactions everywhere and every time. With an app, we can pay the bill, buy things with one click, and send money to people, etc. directly from our bank account. Mobile wallet even can be used for faster transfers.

For example, this latest technology will help us to skip the queue line in the fast-food restaurants. We can directly pay online and straight to pick up the order.

One more example is normalizing things idea. Many things were combined into a phone nowadays, even wallet. We just go out with only a phone, touch to pay, click to transfer money. It is amazing!

Technology related: Mobile wallets, NFC payment, QR payment

5.1 Mobile wallets

It stores payment data on an end-device, usually an app. A digital wallet service like Apple Pay/Samsung Pay, cuts across several categories, allowing payment with the Apple Pay/Samsung Pay app on card terminals, in-app purchases, and on the web.

5.2 NFC payments

Near Field Communication (NFC) payments are a growth area in the field of mobile payments. NFC phones communicate with each other and with NFC enabled points of sale, using radio frequency identification. NFC payment is a face-to-face contactless payment that is initiated by tapping or waving a mobile device or NFC-enabled NFC card at an NFC-enabled merchant. NFC payments that are made with a mobile device are completed as either Secure Element (SE) where payment credential are securely stored on the mobile device, or Host Card Emulation (HCE) where token credentials are stored on the device, but token data is dynamically updated "in the cloud" periodically for increased security.

This figure illustrates the two way of NFC payments.

And what is about the security of mobile payments? As more and more consumers pay with their mobile devices, the need of data security becomes crucial. A new technology allow mobile payments are processing with high security is tokenization. The tokenization allows mobile

payments to be processed without the account details data exposure and the possibility of a compromise. It facilitates secure online and mobile payments by replacing the primary account number (PAN) with a token or digital account number for online purchases and transactions initiated with mobile devices. Because tokens don't carry the consumer's primary account number, there is less risk in storing tokens on mobile numbers, in cloud-based mobile applications and online by e-commerce merchants. Tokens can be limited for use with a specific mobile phone or tablet, or restricted for use with a specific merchant. In addition, many merchants encrypt account data at the point-of-sale to render it useless if intercepted between the POS and the Acquirer institution.
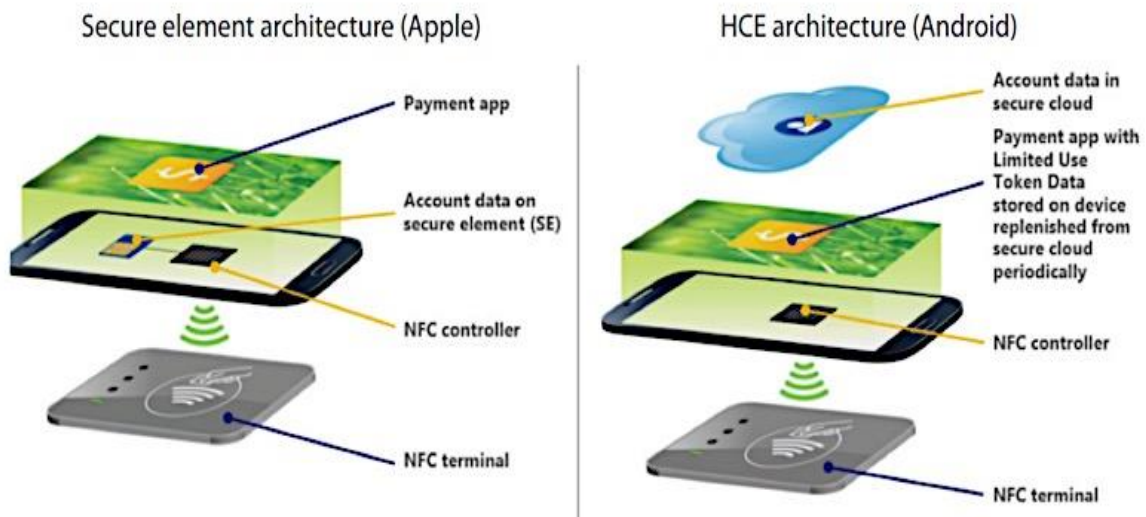
Figure 5. NFC payments

5.3 QR Payment

QR is the safe, simple and smart new payment solution that allows you to pay for goods and services using mobile phones at merchant outlets. Simply scan the merchant QR code with your banking app to make payments in 3 easy steps. This technology usually use in convenient store, without cash, without card. Customer can create their own QR Code contains payment information and send to other. The receiver can use this QR Code and QR mobile payment applications to purchase. All actions are processed very convenient, quickly and high security.

6. BLOCKCHAIN

A blockchain is a continuously growing list of records, called blocks, which are linked and secured using cryptography (The Economist, 2015). It is "an open, distributed ledger that can record transactions between two parties efficiently and in a verifiable and permanent way" (Iansiti & Lakhani, 2017). A blockchain shared database distributed across a network (of individuals, organizations or devices) that maintains a growing list of transactions between participants. Transaction records are synchronized. Each copy is identical automatically updated, and immutable. A blockchain can be understand by 5 main characteristics: database, network, decentralized, no single point of failure and consensus. First of all, a blockchain is simply a database that stores information. Moreover, it is also a network of computers. The database spreads out on many computers, each of these computers has a copy of the whole database. What makes blockchain special is that there is no centered authority. None has ability to change the information easily in the database because of the network of computers. These computers among themselves need to decide what to include into the database. Thus, the blockchain is a decentralized technology. In addition, there is no single point of failure, it is

very hard to take down the whole network at the same time. These computers have to reach a same consensus to decide together what is true and what is not.
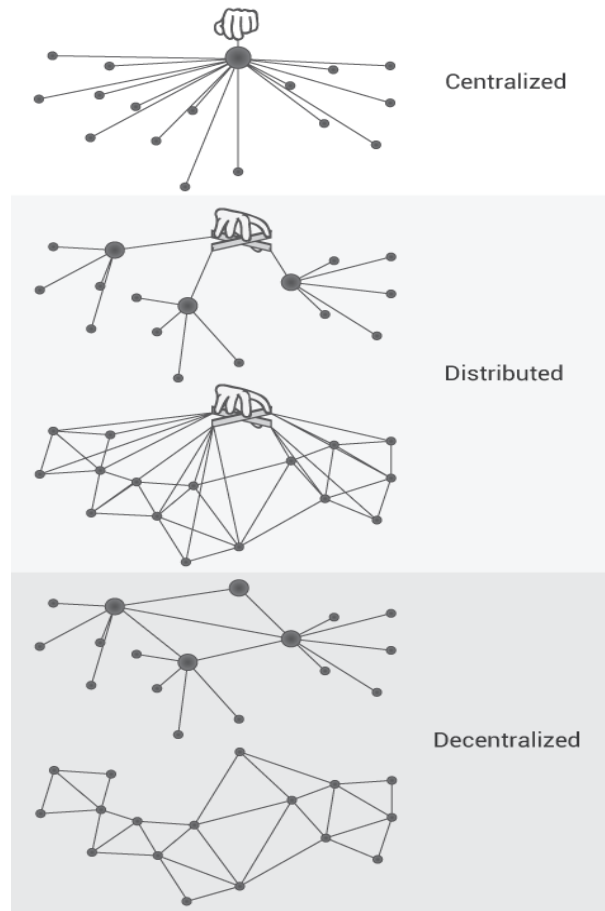

Figure 6. Centralized, distributed and decentralized networks (Paige, 2015)

Figure 5 is illustrating the difference between centralized, distributed and decentralized paradigms. It's mainly about authority and control.

The blockchain technology is tackling not only financial transaction system but also other sectors such as security, registration and value exchange. In the figure 6, it is showing the potential fields in the financial transaction system where blockchain can be applied in the near future: currency exchange, remittances, syndicated loans, private shares, treasury repos, loyalty points, interbank payments, P2P transfer and insurance, etc.
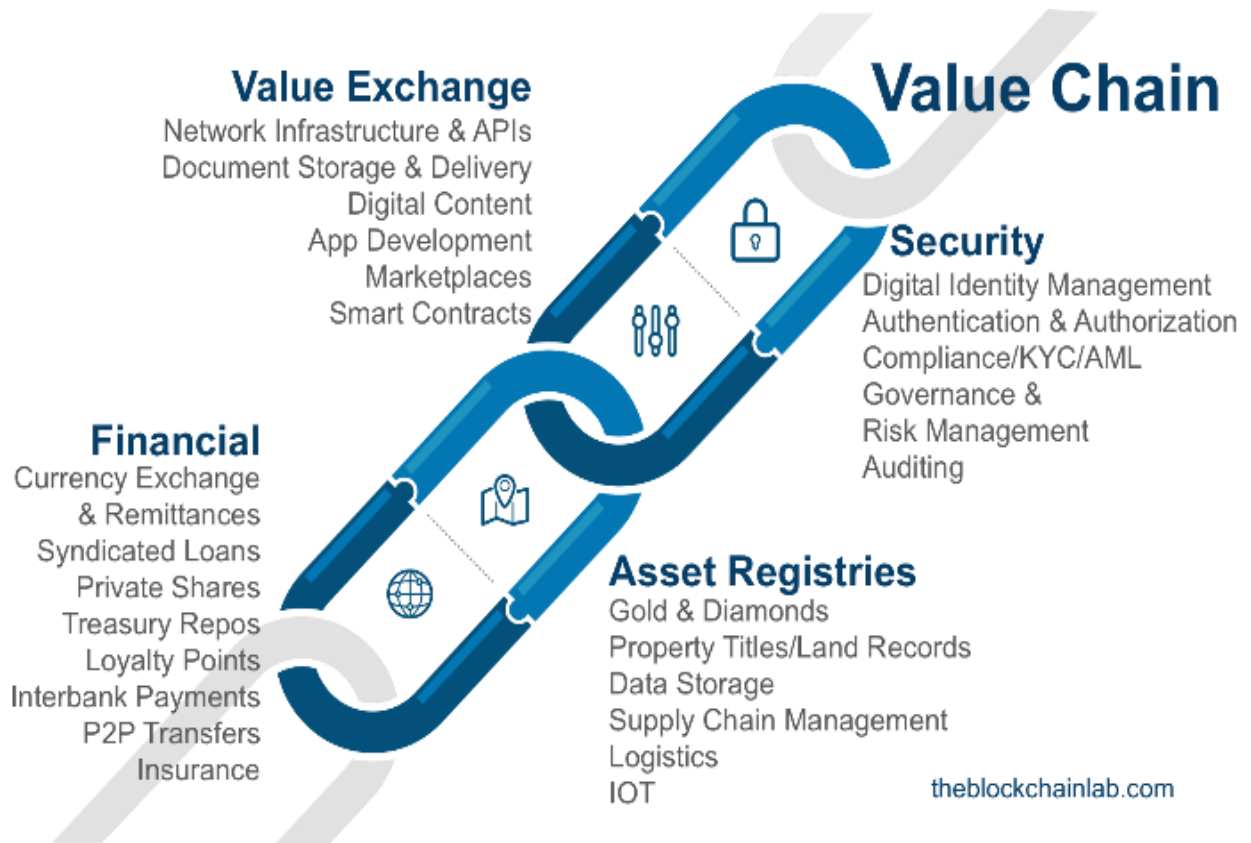
Figure 7. Value chain (Manie, 2015).

7. CONCLUSION

In the digital era and globalization, it has to be agreed that Financial Transaction System is one of the most essential and important to all mankind. As the world population is increasing especially in the urban area, the traffic on Financial Transaction System is expected to grow exponentially. Moreover, the way people make payments is changing faster than any area of financial services, impacted by the changes in digital technology, competitive forces and consumer demands. Thus, technology is the key to sustain the growth and revolutionize the system.

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