

2018 BOK Knowledge Partnership Program Nepal



Payment and Settlement System Development in Nepal



2018 BOK Knowledge Partnership Program
Nepal

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in Nepal*

2018 BOK Knowledge Partnership Program with Nepal Rastra Bank

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I. Introduction

Nepal is one of the low-income countries in South Asia with a per capita income of \$920.0 USD in 2017.¹ It has an agricultural based economic structure with less importance on manufacturing and service sectors.² It is quite unique that remittance income of overseas Nepali workers amounts as high as 30 percent of GDP.³

Payment and settlement system is a basic infrastructure for the economy, contributing to the improvement of the efficiency of the national economy. It is because all good and service and financial transactions will eventually accompany the payment and settlement service. Therefore, efficiency of payment and settlement system is one of the core determinants of the national competitiveness.

In the modern world, this payment service is mainly provided by the financial institutions including central banks. As a result, in many developing countries, development of payment system can be accompanied by improvement of people's financial accessibility.

¹ The population of Nepal is 29.7 million and size of the land is 147,181 km². IMF, World Economic Outlook Database, July 20, 2017, <http://www.imf.org/external/pubs/ft/weo/2018/01/weodata/index.aspx>

² The ratio of agricultural sector amounts 31.6 percent while those of industry and services do 14.2 percent and 52.5 percent, respectively in 2016. ADB, Key Economic Indicators, 2018.

³ At the year of 2016 and 2017, Nepal's remittance income amounted \$ 6,611.8 and \$6,946.5 million USD reaching 31.3 percent and 28.4 percent of GDP, respectively. World Bank, Migration and Remittance Statistics, <http://www.worldbank.org/en/topic/migrationremittancesdiasporaissues/brief/migration-remittances-data>

Nepal Rastra Bank (NRB), the central bank of Nepal, has tried to modernize its payment and settlement system to accelerate its economic development. It already recognized that modernization of its payment and settlement system would not only reduce the cost of commerce but also help to improve the government budget balance by increasing tax revenues. A modern electronic payment system raises the transparency of the society and eventually helps to find tax resource. In addition, it may stimulate the expansion of the digital economy. As well known, in the 21st century, the digital economy will cover the large range of the economy and the readiness on the digital economy will determine the future economic competitiveness of the country.⁴ In particular, Nepal Rastra Bank knows that the introduction of the world-renowned fin-tech will greatly improve quality of the payment service in Nepal.⁵ If a simple online payment or QR payment service is widely applied, then a considerable amount of electronic payment services can be utilized without involving a huge infrastructure cost.

Nepal Rastra Bank has tried to improve its payment and settlement system for the past decades. For example, it made a comprehensive payment and settlement development plan called ‘National Payment System Development Strategy’ in 2014 and implemented its action plan accordingly. According the

⁴ More detailed explanation on digital economy will be covered in the Appendix 1: A Digital Economy in 21st Century.

⁵ Fin-tech is a word representing the financial technology. It means a newly developed financial service applying newly developed ICT technology. It improves the productivity of financial industry. Generally, ‘newly’ means in 2010s and ‘newly’ developed that ICT technology supported mobile technology (from wired technology), big data analysis (from conventional statistical analysis), AI (artificial intelligence) etc. Before fin-tech, ‘electronic finance’ was used commonly.

Third Strategic Plan (2017-2021) announced by Nepal Rastra Bank in 2017, it clearly identified the establishing sound and effective payment system as a one of four core pillars to achieve the vision of Nepal Rastra Bank.⁶ In 2018, after recognizing the importance of the inspection and oversight on the payment system, Nepal Rastra Bank published a report of Payment System Oversight Framework.

This book is a policy consultation report to assist Nepal Rastra Bank to modernize the payment system of Nepal. It extensively studies on three major topics as below. The first topic is a proposal for the modernization of the payment and settlement system of Nepal while the second topic is to establish the supervision and inspection framework of electronic payment system focusing on financial ICT and fin-tech. The final one provides policy recommendations to improve electronic payment and fin-tech service in Nepal.

Each chapter is made of four steps or subsections. First, it reviews of general theoretical background of the topic and second, it checks recent development of each topic on the payment and settlement system of Nepal. Third, it extensively studies its development process in Korea and finally, it suggests the policy recommendation for Nepal Rastra Bank.

This report is an outcome of active collaborations between Korean scholars

⁶ The vision of 2017 Nepal Rastra Bank is ‘A Modern, Dynamic, Credible and Efficient Central Bank’ and its missions is “maintaining macroeconomic and financial stability for sustainable and inclusive economic growth through proactive and efficient monetary and financial policies”. Its strategy includes four pillars of ① Macroeconomic Stability, ② Financial Stability and Financial Sector Development, ③ External Sector Stability, and ④ Sound and Effective Payment System.

and staffs of the NRB. At the beginning, extensive discussion between Korean research team and staffs of the Nepal Rastra Bank was made to select the topics. And later, NRB staffs actively assisted Korean researchers to understand the current status and development experience of the payment system of Nepal. Without their helps, it will be very difficult for Korean research team to make any practical policy suggestions. Of course, if there is any mistake in this report, all the criticism should be made on the research team.

Finally, this report does not indicate that developing country like Nepal should follow the Korea's development path or that Korea's development model is the one of the best examples for Nepal to take. Instead, this report is an explanation what kinds of difficulty and obstacles Korea had to meet and how it had overcome them. Therefore, if the Nepal Rastra Bank gets some lessons from this report, it will be very meaningful.

II. Proposal for the Modernization of Payment Systems in Nepal

1. Introduction

A. National Payment System⁷

A national payment system, also referred to as a payment system, encompasses all payment-related activities, processes, mechanisms, infrastructure, institutions and users in a country. A national payment system is one of the principal components of a country's monetary and financial system and, therefore, crucial to a country's economic development.

Payment system includes payment, clearing, and settlement systems. Payment is the payer's transfer of a monetary claim to a party acceptable to the payee. Typically, monetary claims take the form of banknotes or deposit balances held at a financial institution or at a central bank. Clearing is the process of transmitting, reconciling and, in some cases, confirming transactions prior to settlement, potentially including the netting of transactions and the establishment of final positions for settlement. Sometimes this term is also used to cover settlement. Settlement is the discharge of an obligation in accordance with the terms of the underlying contract.

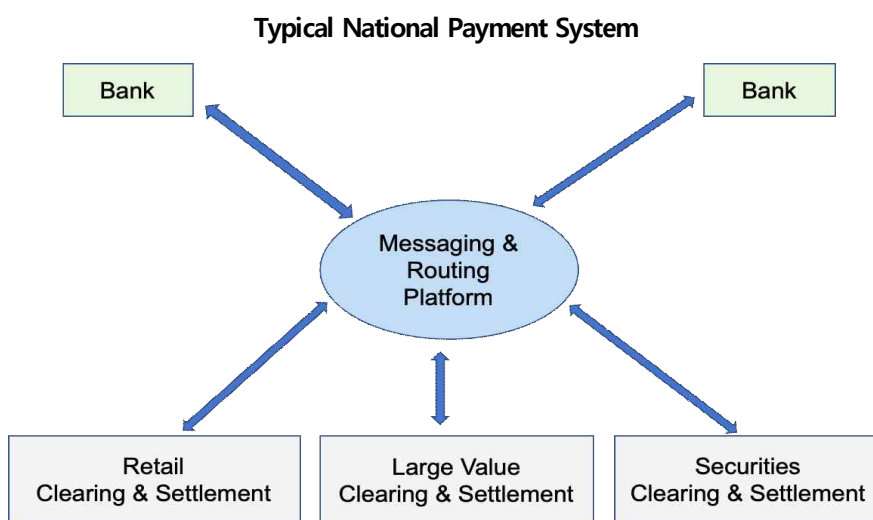
A payment system is generally categorized as a large-value payment system (LVPS), a retail payment system (RPS) and a securities payment system as

⁷ Definitions in this section are cited from CPMI Glossary and CPSS (2006).

shown in Figure 2-1. A large-value payment system is a funds transfer system that typically handles large-value and high-priority payments. LVPSs have been a focus of central banks for more than three decades, and they are nearly universally implemented nowadays. A retail payment system is a funds transfer system that typically handles a large volume of relatively low-value payments in such forms as checks, credit transfers, direct debits and card payment transactions. A securities payment system is made up of the institutional arrangements and infrastructures for issuing and administering securities liabilities, administering and safekeeping holdings of securities issues, and initiating, confirming, matching, transferring and settling securities transactions.

Banks and other financial institutions communicate with each other through a messaging and routing system.

<Figure 2-1>



Source: CPSS, "General guidance for national payment system development," BIS, January 2006.

A payment system may settle on a gross or a netting basis. Gross settlement is the settlement of transfer instructions or other obligations individually on a transaction-by-transaction basis for full value. Netting is the offsetting of obligations between or among participants in the netting arrangement, thereby reducing the number and value of payments or deliveries needed to settle a set of transactions. Some payment systems may operate more than one clearing and settlement platform, incorporating both netting and gross settlements.

A retail payment system may be operated by either the private sector or the public sector. In contrast to retail payment systems, many LVPSs are operated by central banks, using an RTGS or an equivalent mechanism.⁸ Real time in this context means that transmission, processing and settlement of a transaction takes place as soon as it is initiated.

B. Issues of Retail Payment Systems

(1) Fast Payments

(a) Definitions and Concept of a Fast Payment

The retail payments landscape has changed rapidly over the last decade. Fast retail payment services have been deployed or developing in many

⁸ The World Bank's Global Payment System Survey 2012 shows that RTGS systems are operating in 127 countries.

countries.⁹ CPMI (2016) defines a “*fast payment*” as “*payments in which the transmission of the payment message and the availability of final funds to the payee occur in real time or near-real time and on as near to a 24/7 basis as possible.*”¹⁰ This definition adopts the perspective that a fast payment ensures a credit of final funds¹¹ to the payee, which means a fast payment yields final funds to the payee almost immediately and at any time including weekend.

Benefits of fast payments may accrue to all the economic agents such as individuals, businesses, government entities as well as payment service providers (PSPs). End users benefit from the ability to complete time-sensitive payments at an adequate speed and whenever necessary. From the overall economic point of view, fast payments may serve as a crucial component in upgrading or enhancing a country’s payment systems. In particular, for emerging countries, fast payments may them leap-frog older technologies and provide the opportunity to move towards potentially more efficient electronic payments.

(b) Clearing and Settlement in Fast Payment

In order to provide fast payments for end users, all fast payment

⁹ See Appendix 1.

¹⁰ The terms used for fast payments may vary although the underlying meaning could still be the same. Other common terms for these services are "instant," "immediate," "real-time" or "faster" payments.

¹¹ Final funds are funds received such that the payee has unconditional and irrevocable access to them.

arrangements need an immediate interaction between the PSPs of the payer and payee. A fast payment is normally initiated when the payer submits a payment order to his/her PSP. Instantly, the PSP's internal process of validating and authenticating the payment, and verifying the availability of funds in the payer's account takes place. The payer's account is typically debited immediately. The clearing and settlement processes between the payer's and the payee's PSPs begin right after that.

Clearing takes three steps of transmission, notification, and netting. Transmission initiates the clearing and settlement processes between the PSPs and involves submitting the necessary transaction details to a fast payment system for clearing. In a fast payment, the transmission must take place in real time as soon as the payer's PSP receives the payer's instruction and completes its internal processing.

Notification, which is issued by the payment system to the PSPs, is to confirm that the payment order has been received and verified and is or will be settled. The PSP of the payee credits the funds to the account of the payee following the notification. The notification can be transmitted by both PSPs to their respective customers in order to inform that the payment has been successfully processed to the payer and funds are available to the payee.

In some case, transactions are subject to netting, the offsetting of obligations between or among participating PSPs in the arrangement, thereby reducing the number and value of payments needed to settle a set of transactions. Netting can be done on a bilateral basis between each pair of participating PSPs or multilaterally. This process can be done in real time or it can be deferred. However, most of the activities included in clearing have

to be performed in close to real time in order to provide fast payments to end users.

Once the clearing is completed, transactions must be settled between the participating PSPs, either on a gross or a net basis. Settlement in the accounts maintained by a settlement agent such as commercial or central bank determines the discharge of the obligations derived from the payment transaction between the sending and receiving PSPs. This final step can be done in close to real time or it can be deferred.

A settlement system can be classified on the basis of whether the settlement methods between PSPs are deferred or in real time and on whether netting occurs prior to settlement. Based on these, the main categories of settlement systems can be identified as deferred settlement system and real-time settlement system. In the case of deferred settlement system, transactions are transmitted, confirmed and notified in close to real time to the PSPs involved, but the inter-PSP settlement takes place after the payee's PSP has credited the funds in the payee's account. Although several variants of this model are possible, a deferred net settlement system is commonly observed in many countries like Korea, UK, China, India, Italy, Turkey and Singapore.

In the case of real-time settlement system, the payer's PSP sends the funds through the fast payment system to the payee's PSP before the latter credits the funds to the payee. This means that transactions are transmitted, confirmed, settled and notified in close to real time to the PSPs involved. This model is adopted by Mexico, Sweden and Australia.

(2) Interoperability

Interoperability is a situation in which payment instruments belonging to a given scheme may be used in systems installed by other schemes. Interoperability requires technical compatibility between systems, but can only take effect where commercial agreements have been concluded between the schemes concerned.

The interoperability of transaction infrastructures can achieve economies of scale and scope and reduce user cost with (i) the adoption of common standards for instruments, communication and transmission security for all networks to provide interoperable services; (ii) the facilitation of interconnectivity among proprietary network arrangements, notably ATMs and EFTPOS terminals; and (iii) the adoption of common equipment and software standards to allow interoperability at point of sale among competing networks.

Establishing payments interoperability is a formidable task. It is important to find the right balance between cooperation and competition when reforming retail payment systems. Despite the advantages that interoperability brings, not all market participants will necessarily embrace interoperability initiatives, for example, if they fear to lose their dominant position and/or competitive advantage.

Therefore, collaboration is key to make interoperability happen. If only two partners are involved, they can bilaterally agree on the arrangements. However, the value of interoperability will materialize if it is implemented at the industry level. So, a collaborative approach and a working cooperation framework are essential considering the complex arrangements and business

rules required to implement interoperable payment solutions. Another reason for cooperation is that no single entity possesses all the knowledge needed to address payment system reforms.

However, balancing cooperation and competition among private sector market participants is not easy. It would be best to leverage existing coordination structure to realize payments interoperability. Central banks in many countries have established a so-called National Payments Council or National Payments Committee.

From a technical point of view, interoperability can be achieved by adopting common standards for financial industry message. Standards for messages exchanged between the organizations to support financial supply chain have been developed by standardization organizations, ISO 20022.

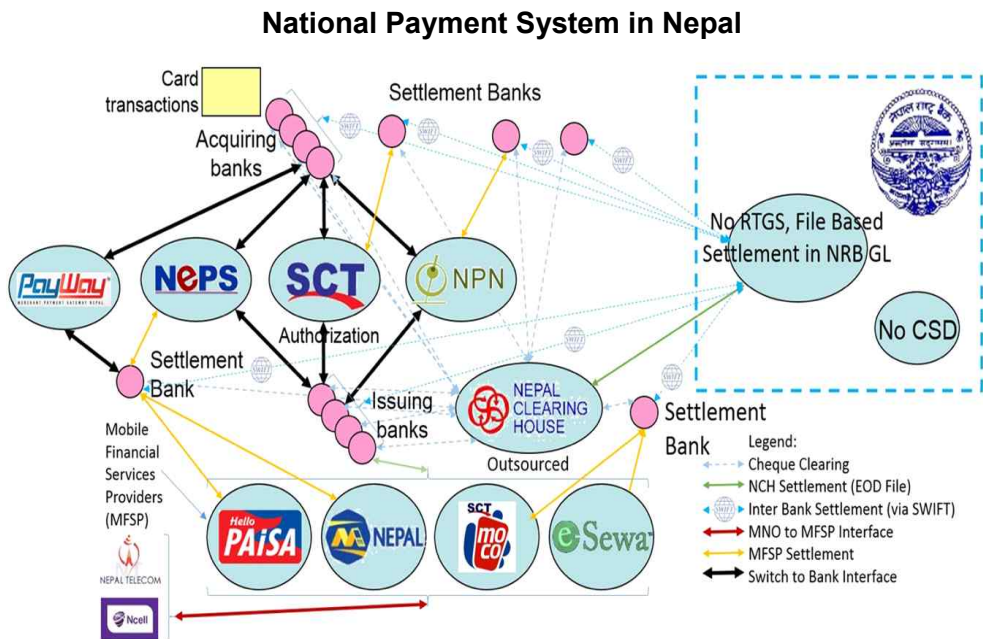
2. Recent Development of National Payment Systems in Nepal

The Nepal's current payment systems and its supporting infrastructures are far behind modern standards of the payment system of advance countries as seen in Figure 2-2. The NRB operates LVPS through a general ledger system while electronic securities clearing and settlement systems are not established yet. The current retail payment systems are separated with each other and thus they are not capable of supporting a comprehensive and efficient financial services.

The Nepal Clearing House Ltd (NCHL), the only clearing house, operates electronic check clearing which follows a modernized truncation procedure.

It is a public company established jointly by NRB, commercial banks and other financial institutions to handle all works related to clearing and settlement of cheques. It is currently utilizing the electronic cheque clearing system.

<Figure 2-2>



Source: Nepal Rastra Bank

It also operates interbank payments system (NCHL-IPS), an interbank payment infrastructure, which supports direct credit and direct debit for four currencies, NPR, USD, GBP and EUR. Funds are cleared in 6 sessions, and then NCHL calculates the net obligations of each session and sends it to NRB for final settlements. IPS can not make the fund to the payee available in real time or near-real time. Hence, IPS is need to be reformed to electronic funds

transfer system for a fast retail payment.¹²

Currently, many commercial banks provide basic internet banking service such as balance inquire or bank wire transfer. At the same time, several mobile payment services such as M-Nepal, SCT Moto, e-Sewa and IMR pay are provided with the cooperation of financial institutions and ICT companies as seen in Box 1.

Box 1: Major Mobile Payment Service in Nepal

M-Nepal is a mobile payment service provided by M-Nepal Ltd. The company was established in 2011 with the objective of providing a technical managed services and advisory services in terms of Mobile Money and Mobile Financial Services. It is owned by NIBL, Smart Choice Technologies Ltd, FOCUSONE, HIF (a private equity fund with an authorized capital of NPR 5 Billion) and other individual investors.

IME pay is a mobile money service offered by IME Digital Solution Ltd. (IME Digital) that facilitates payments ranging from simple person-to-person transfers, payments to various online and physical stores, mobile recharge, utility bill payment (TV/internet/electricity)

SCT Moto provided by SCT in collaboration with FOCUSONE Payment

¹² NCHL-IPS currently supports transaction with presentment cut-off time at 13:00, reply cut-off time at 14:30 and final settlement after 15:00. Large value cheques are cleared only at 11:30 am on weekdays. NCHL also offers express clearing service at 11:30 am, 12:30 pm and 1:30 pm on weekdays by levying a certain fee. It also offers regular clearing service at 3:00 pm, during which free of cost clearing service is provided for cheques worth less than Rs 200,000. It is made of a network of 58 banks and financial institutions, of which 26 are commercial banks, another 26 are development banks and six are finance companies.

Solutions enables registered users to make utility payments and financial transactions by using their mobile phones. The mobile application is also linked to a SCT debit card. The system makes use of existing telecoms, banks and merchant's ecosystems so that use of the service is as easy as having one more plastic card or a wallet in one's pocket. SCT MoCo users can make payments of any sort such as purchase payments, utility payments and online payments through their mobile phones. All payments can be made ON-SITE or OFF-SITE that will be revolutionary to any time of payments made in Nepal so far.

e-Sewa is a mobile money account from where customers can pay, send and receive money from their mobile phone and internet, instantly. It has been in operation since 2009 and has recently been licensed by NRB as payment service provider. For example, with eSewa you can top-up your mobile, pay postpaid, landline and asymmetric digital subscriber line (ADSL) bills, buy bus tickets, airlines tickets and movie tickets, transfer money from one bank to another.

Several payment networks of ATM/EFTPOS such as SCT-Network, NeSP, and NPN are linking the accounts of one bank to another as seen in Box 2. As shown in Figure 2-2, it is quite surprising that these ATM/EFTPOS and payment networks are settling mainly through commercial banks instead of settling by the central bank. The mobile financial service providers (MFSPs) also settle through commercial banks using checks or SWIFT. These initiatives are against the BIS Principles for Financial Market Infrastructures (PFMIs).

Box 2. ATM Networks in Nepal

NeSP is a consortium of seven national level commercial banks, with aim to pool the resources of these banks together and establish a common platform, which will be more secure, reliable and able to encompass the rapid growth of new technologies in electronic payments. Currently, NePS has 15 institutions as its shareholder consisting of commercial banks and development banks. Its main business is an ATM and POS management and monitoring.

National Payment Network (NPN) is a network of Nepal Investment Bank Ltd. (NIBL) which facilities aspiring financial institutions to issue & acquire National brand of debit, credit & prepaid cards and connecting together of NIBL and its member banks & financial Institutions through their financial switching system along with banking host to facilitate card transaction through ATM & POS for cash withdrawal/balance enquiry and purchase of goods/services respectively.

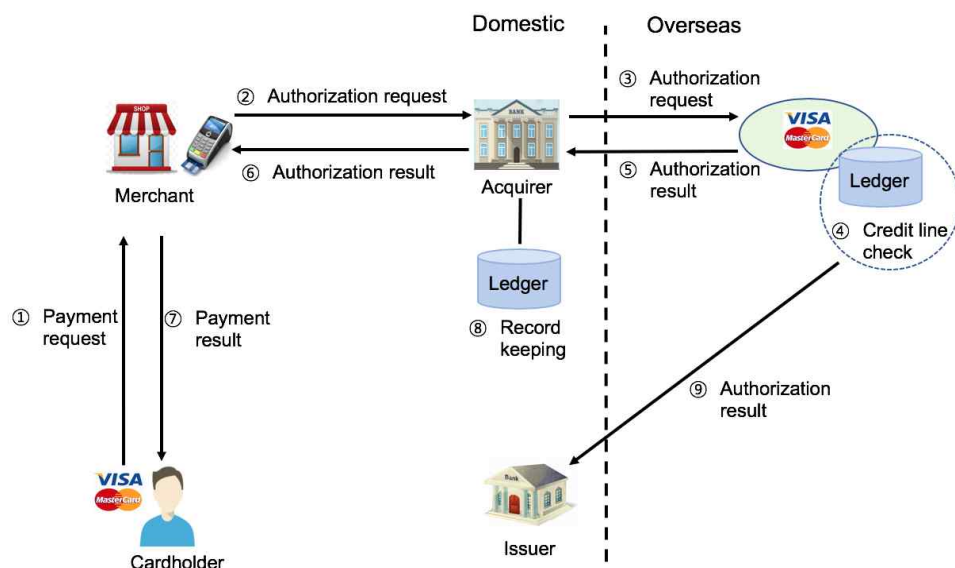
Smart Choice Technologies Ltd (or SCT in short) is a company registered in Nepal and promoted by well-established entrepreneurs established in 2001. SCT has deployed a first-of-its-kind initiative in Nepal creating an integrated shared services network (SCT-Network) for ATMs and POS Terminals, managed through a national switch. At the end of July, 2018, 51 member banks are included in in SCT-Network.

Payment-card network, another key infrastructure of retail payment, relies on international payment networks, mainly Visa, MasterCard and China

UnionPay. The number of debit cards in operation are 5.7 million or account for 56 per cent of non-cash payment instruments, while credit cards account for only 1 per cent. As shown in Figure 2-3, most issuers and acquirers participate in overseas four-party card network, because there is no domestic card network that can switch payment-card transaction messages between multiple domestic issuers and domestic acquirers.¹³ Therefore, every acquirer has to obtain authorization through an overseas card network even though the issuer is a domestic participant. This means every payment-card transaction through card networks is an overseas transaction.

<Figure 2-3>

Domestic Credit Card Transaction Procedure in Nepal



Source: Nepal Rastra Bank

Furthermore, issuers of credit card entrust their authorization processing to

¹³ See the detailed payment process of four party credit card payment system in Appendix 2.

overseas card networks, because they do not have their own credit card authorization system. This is going to be a big challenge when establishing domestic switching networks for credit card transaction in Nepal. The authorization of issuers in credit card transactions is very critical and totally different from that for debit card transactions. In a debit card authorization process, the role of issuers is limited to checking the cardholder's bank account to ensure it has enough balance for the payment. On the other hand, for credit card authorizations, issuers have to keep a special ledger system to manage the credit line and record any change for each cardholder.

Hence, it is necessary to launch a domestic debit-card processing network first, and then to prepare credit-card network with third-party processors for expansion of debit-card network to credit-card network. Those domestic payment-card network will help save costs to overseas card networks and reduce dependence on them.

3. Korea's Payment Systems and Its Development: A Reference Model for Nepal's Payment System Modernization

The payment systems in Korea consist of one LVPS and several RPSs. The Bank of Korea (BOK) introduced BOK-Wire, an RTGS basis LVPS, in 1994 and replaced it by BOK-Wire+, a new system of BOK-Wire, in 2009. Most RPSs are operated by the Korea Financial Tele-communications and Clearings Institute (KFTC).

A. Large-value Payment System

(1) Institutional Framework

A broad range of laws and regulations govern transactions and the settlement thereof, oversight of payment and settlement systems, protection for clearing and settlement agreements. The Bank of Korea Act, the Financial Investment Services and Capital Markets Act and the Electronic Financial Transactions Act, among others, stipulate that the BOK shall play a principle role in payment and settlement systems.

The basic principles for the operation and management of BOK-Wire+ are decided by the BOK's Monetary Policy Board (MPB), BOK's top decision-making body on its monetary policy. The BOK then sets the detailed standards applying to participants in line with the basic principles.

(2) Participation

In order to use BOK-Wire+, a participant institution must maintain a current account with the BOK while also fully satisfying the following requirements: financial soundness, adequate number of staff dedicated to BOK-Wire+ operations, and sufficient expected usage volumes.¹⁴ These requirements are determined by the Governor of the BOK, based on the principles proposed by the BOK's MPB. The BOK annually checks whether member institutions meet these requirements, and those failing to do so are

¹⁴ A minimum of four staffs and 50 transactions per month.

requested to take corrective measures, withdraw from membership or terminate the relevant contracts.

The number of BOK-Wire+ member as of the end of 2017 was 129 (57 banks and 72 non-banks). The 57 member banks were comprised of 19 domestic banks and 38 foreign bank branches in Korea. The 72 non-bank members included 44 financial investment companies (FICs), 13 insurance companies, and 15 other institutions.¹⁵

(3) Type of Transactions

Funds transfer services provided through BOK-Wire+ include general funds transfers,¹⁶ interbank short-term lending/borrowing, third-party funds transfers, the cash legs of delivery-versus-payment (DVP) settlement, the KRW legs of payment-versus-payment (PVP) settlement though the continuous linked settlement (CLS) system and the net settlements of RPSs. BOK-Wire+ is also used for the implementation of BOK monetary policy operations as well as for the collection of treasury funds (taxes, fines, etc) received by financial institutions. And it carries out public and government bond-related activities, including issuances and registrations of rights of pledge, transfers of title, redemptions at maturity and repurchases before maturity.

¹⁵ Korea Federation of Savings Banks, National Agricultural Cooperative Federation, Korea Deposit Insurance Corporation, Korea Exchange, Korea Securities Depository, etc.

¹⁶ The transfer of funds between participants' accounts not connected to any underlying transactions such as securities or foreign exchange.

(4) Operation of System and Settlement Procedures

The online operating hours of BOK-Wire+ are 9:00~17:30 from Monday to Friday. These hours may be extended temporarily if deemed necessary due to error in the BOK-Wire+ system, delays or concentrations of funds settlement, or any other unavoidable circumstances.

(a) Settlement System by Transaction

The BOK-Wire+ settlement procedures are sub-classified into those using the RTGS system and those using the hybrid system with its bilateral and multilateral offsetting features added to the RTGS system as in Table 2-1. Participants hold two types of accounts with the BOK - current accounts and deposit accounts for settlement. The former are used for transactions carried out through the RTGS system, and the latter for those through the hybrid system.

<Table 2-1>

Settlement Systems and Applicable Transactions

Settlement system (settlement account)	Applicable transactions	Settlement mechanism
RTGS system (current account)	CLS funds transfers Designated-time net settlements Collection of Treasury funds Issuance and redemptions of government and public bonds Cash deposits and withdrawals, current account debits, and BOK loans	RTGS
Hybrid system (deposit account for settlement)	General funds transfers (including beneficiary-designated funds transfers) Short-term interbank lending/borrowing DVP settlements(including of BOK repo transactions) Intraday liquidity provision and collection through repo transactions	RTGS, bilateral and multilateral offsetting

Source: The Bank of Korea, "Payment and Settlement Systems in Korea," December, 2016

(b) Types of Payment Instructions

The payment instructions that participants input into the hybrid system of BOK-Wire+ are divided into urgent payment instructions and normal payment instructions. An urgent payment instruction is settled immediately on a one-to-one and gross basis, provided there is a sufficient balance to cover settlement. This type of instruction is used in cases where payment must be made immediately or there is little possibility of simultaneous offsetting. If the balance does not suffice to cover the relevant transaction, the system holds the payment instruction in a queue file until the necessary funds

are deposited.

Should a payment not need to be made urgently, a participant can save liquidity by classifying the payment as a normal payment instruction. In this case, the settlement is not processed immediately, even if the funds in the relevant account are sufficient. Rather, it is settled on a simultaneous bilateral offsetting basis at a time when the instruction of the relevant counterparty is input into the system, or on a multilateral offsetting basis, which occurs every 30 minutes. At 17:05, all normal payments are switched into urgent payments.

(c) Bilateral and Multilateral Settlement

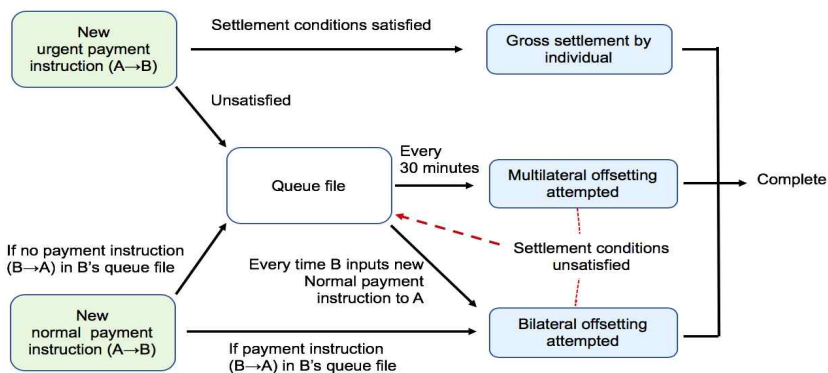
When a new normal payment order is input into the BOK-Wire+ hybrid system, the system retrieves the order of the counterparty from its queue file and attempts to carry out simultaneous bilateral settlement. In the case of simultaneous bilateral settlement, urgent payment instructions are in principle processed ahead of normal payment instructions. However, the normal payment instructions of a participant to which liquidity flows as a result of a simultaneous settlement can be processed prior to urgent payment instructions. If there is a lack of funds or the net payment limit is exceeded as a result of simultaneous bilateral settlement of a normal payment instruction, the payment order is not processed but saved in a queue file. For such files, simultaneous multilateral settlement is attempted every 30 minutes, while payment instructions satisfying the settlement condition requirements, related for example to deposit balances and net payment limits, are processed simultaneously.

(d) Queuing Arrangement

Payment order processing methods differ in the RTGS and the hybrid systems of BOK-Wire+. To heighten funds transfer efficiency, the RTGS system processes payment orders in accordance with a bypass FIFO¹⁷ rule. Under this rule, the system attempts to process the first transfer in a queue, but when this cannot be done due to a lack of funds, the next transfer is instead settled. The hybrid system, on the other hand, allows participants to adjust the orders of their payment instructions in the queue file in accordance with settlement conditions, or to change the types of these instructions. Under this system, participants can change normal into urgent payment orders and vice versa.

<Figure 2-4>

Settlement Mechanism in Hybrid System



Source: The Bank of Korea, "Payment and Settlement Systems in Korea," December, 2016

¹⁷ First in, first out.

(e) Designated-time Transaction System

The large-value funds transfer transactions that financial institutions apply through BOK-Wire+ during the day are in principle processed upon receipt, in accordance with preset procedures. Netted RPS settlements, redemptions of short-term loans with specified maturities and receipts of treasury funds from financial institutions are all processed at specific designated times during the day as shown in Table 2-2.

<Table 2-2>

Designated Settlement Times

Type of transaction		Designated time	Settlement account
Net settlement of RPS		11:00	Current account
Receipt of treasury funds		14:00	
Repayment of short-term loans	Overnight or longer-term loans	11:05	Deposit account for settlement
	Half-day loans (morning)	14:05	
	Half-day loans (afternoon)	16:05	

Source: The Bank of Korea, "Payment and Settlement Systems in Korea," December, 2016

(5) Risk Management

When BOK-Wire was launched in 1994, the BOK adopted the RTGS mechanism to reduce the credit risk involved in settlement. The related laws and regulations has also been amended so as to prevent settlement finality from being impaired and to mitigate any legal risks. The Debtor Rehabilitation and Bankruptcy Act, which came into effect in April 2006,

stipulates bankruptcy procedures shall not affect transactions which are completed through BOK-Wire, thereby ensuring the finality of BOK-Wire settlement.

To facilitate smooth settlement among participants and reduce liquidity risk, the BOK extends intraday overdrafts to participant banks that are temporarily short of settlement funds. Overdrafts are provided only to financial institutions subject to the BOK's minimum reserve requirement, and interest (three-year treasury yield less overnight interbank rate) is charged on overdrafts in amounts exceeding 25% of the equity capital of recipient institutions.

With the launch of BOK-Wire+ in April 2009, the intraday liquidity needs of participants were significantly reduced, and liquidity risk in consequence declined. The new function of BOK-Wire+ has enabled participants to complete intraday settlements with lower liquidity, mitigating settlement delays and gridlock as well as the accompanying systemic risks.

B. Retail Payment Systems

(1) Institutional Framework

Most retail payment systems in Korea are operated by the KFTC. The KFTC is a non-profit organization set up on a joint ownership basis by member banks. The decision-making bodies of the KFTC consist of the General Meeting, the Board of Directors and 13 Steering Committees. The General Meeting, composed of 10 general member banks, is the supreme

decision-making body. The Board of Directors, comprising ten members¹⁸, enacts and revises regulations necessary for operating each RPS and makes decisions on the function and operation of the committees. The Steering Committees establish the details of business procedures, including operational rules and detailed guidelines, for the businesses involved in each RPS.

(2) Participation

A payment service provider can participate in the RPSs of the KFTC in two ways. First, it can become either a general or an associate member of the KFTC, and then participate in any KFTC-operated business. The other way is to become a special participant in one or more specific businesses. Special participants, however, do not have the right to vote and cannot make remarks at KFTC's General Meeting. The BOK and financial institutions under the Banking Act may become general members, associate members or special participants, while other institutions running financial or finance-related businesses can only become special participants with approval of the General Meeting. Special participants include the post office, the federations of non-bank credit institutions, foreign banks and financial investment companies.

(3) Types of Transactions

¹⁸ The Board of Directors is composed of 8 directors appointed by the General Meeting and the president and executive director of the KFTC.

The KFTC provides a wide range of retail payment services: Check Clearing System, Giro System and Interbank Shared Networks that consist of Electronic Banking System (EBS), Interbank Funds Transfer (IFT) System, CD/ATM Network, CMS Systems, Regional Bank Shared System, EFTPOS System, E-commerce Payment Systems.¹⁹

The check clearing services are provided through the Check Clearing System. The Giro System enables companies and public corporations to make large-volume funds transfers. Interbank Shared Networks yield funds to payee immediately and at any time including for the weekend payment.

(4) Operation of the System and Settlement Procedures

As customers request funds transfers by means of a range of payment instruments during the day, the KFTC calculates participants' total intraday transactions in each system and determines their multilateral net settlement obligations. It notifies the BOK and participants of the results at prearranged notification time. The BOK then completes settlement by conducting funds transfers across BOK-Wire+ participants' accounts with the BOK at the designated net settlement times (11:00 AM). The details of the settlement procedures of major RPSs are as below.

(a) Check Clearing System

¹⁹ More explanations are given in the volume 2 of this report: Theoretical Review of Payment and Settlement System and Korea's Development Experience.

Both electronic and physical exchanges of checks and bills were available before October 2010 in Korea. From October 2010, however, the exchange of checks has been carried out only through truncation (electronic information exchange). With this method, banks receiving checks reproduce the images and text information of the checks and send them to the KFTC. Based upon the information received, the KFTC determines participants' balances with each bank and requests net settlement by the BOK on the following business day (D+1).

Where there is an insufficient balance in a payer's account for cashing the check or bill, the payer's bank notifies the payee's bank no later than 14:00 on the following business day. The payee of such a check is then not allowed to withdraw the funds until the issuer deposits sufficient money. When there is no such notification, funds are credited to the payee's account after 14:20 on day D+1. If the issuer of the check for which notification is given fails to deposit the relevant amount in his account by the end of business hours on day D+1, the check is classified as dishonoured and resettled through the following day's check clearing process.

(b) Giro System

Giro services enable institutions to execute large-volume payments and collections, including payments of salaries and pensions and collection of utility bills. The settlement procedures for the Giro System differ depending on whether the giro bill concerned is paper-based or paperless.

In the case of paper-based Giro, the user institution notifies the customer of the required payment using a Giro bill, which the customer then pays at a financial institution branch or through an electronic device. KFTC sums the amount paid to each financial institution and makes a batch transfer of the total amount collected to it, while also providing the details of the payments received. With electronic Giro, meanwhile, the collection and payment requests are processed electronically via either the Internet or file transmission. KFTC calculates financial institutions' net obligations arising from transactions in the Giro System, and sends them to the BOK for net settlement through BOK-Wire+.

(c) Interbank Shared Networks

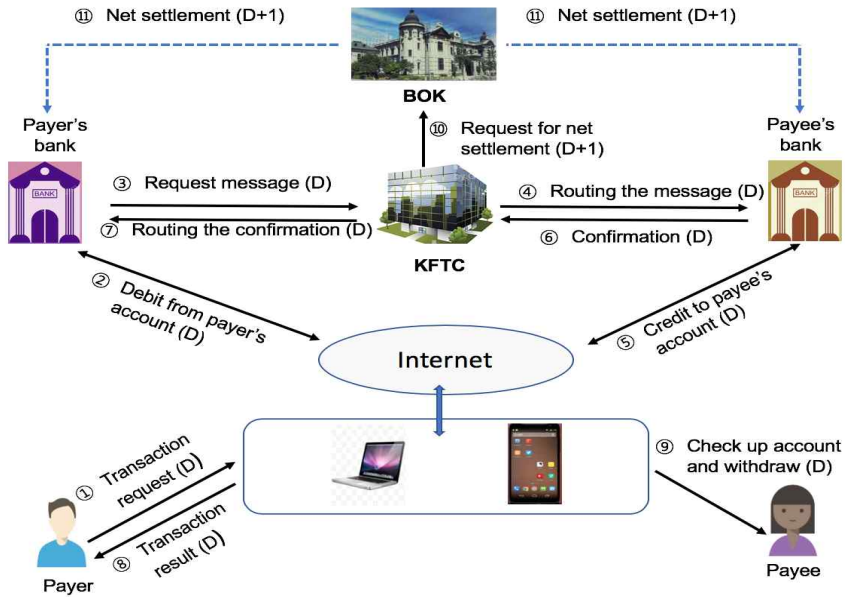
① Electronic Banking System

The EBS is accessible on close to a 24 hours per day/seven days per week (24/7) basis. The typical time between payment initiation and availability of funds to the payee for a successful transaction is 1~2 seconds.

As shown in Figure 2-5, when a customer requests transfer of funds through internet banking, mobile banking or telephone banking services, the details thereof are sent through the EBS to the KFTC and the payee's bank. The relevant funds are then immediately credited to the payee's account, and the interbank net obligations are settled through the BOK on the following business day.

<Figure 2-5>

Transaction through the EBS



Source: The Bank of Korea, "Payment and Settlement Systems in Korea," December, 2016

② CD/ATM Network

The CD/ATM Network is a network system connecting the participating bank's core banking system, so that it enables customers of member banks to conduct some kinds of financial transaction such as funds transfer, cash withdrawal and deposit, and balance inquiry at any ATM terminals of participant bank.

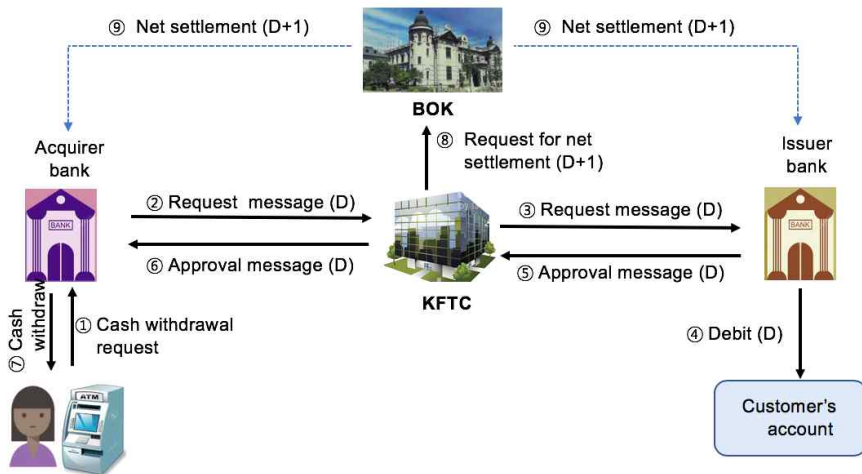
When a customer requests a credit transfer via an ATM, the KFTC and the payee's bank are notified of the details through the ATM Network, and the relevant funds are immediately credited to the payee's account with the bank. The KFTC calculates the net settlement obligations and sends the information

to the BOK for net settlement on the following business day.

When a customer withdraw cash through the ATM of another bank, the details of the withdrawal are sent to the bank with which the customer holds his/her account. On receiving the information, the customer's bank verifies the payment request and sends a payment approval message to the bank to which the ATM belongs. The customer can then immediately withdraw cash through the ATM. The KFTC calculates the interbank net obligations, which are then settled through the BOK on the following business day.

<Figure 2-6>

Cash Withdrawal through the CD/ATM Network



Source: The Bank of Korea, "Payment and Settlement Systems in Korea," December, 2016

Meanwhile, in-house transactions (ATM withdrawals at branches of a customer's home bank) are not routed through the ATM Network, they are processed within the bank.

③ Interbank Funds Transfer System

The IFT System makes customers to transfer funds even when the remitting and beneficiary banks are different. When a customer asks to transfer money at a bank window, the remitting bank dispatches the transfer request message to the switch system of the KFTC, which then routes it to the beneficiary bank in which the beneficiary has a deposit account. Upon receiving the message, the beneficiary bank credits the amount to the beneficiary's account so that the beneficiary can withdraw the funds immediately. The KFTC then calculates the multilateral net obligations of participants, and requests net settlement by the BOK on the following business day.

(d) Credit Card Settlement Systems

When a customer purchases goods or services using a credit card issued by any of the BC Card member banks, the transaction details are sent to the bank that issued the card. If the issuing bank approves the transaction, the goods or services are provided to the customer. The merchant then sends the sales slip to its bank, which will collect the payment from the issuing bank through the clearing system and pay the merchant. The card-issuing bank then sends a bill to the customer through BC Card.

When a customer purchases goods or services using a credit card issued by a non-bank credit card company, the details are sent to that company and the goods or services are provided to the customer upon company approval of the

transaction. After the transaction, the merchant submits the sales slip to the credit card company, which pays the merchant through its bank and sends a bill to the customer.

(5) Risk Management

Funds transferred through some RPSs are immediately credited to the payee's accounts, and the related interbank net obligations are settled at the designated settlement times on the following business day through BOK-Wire+. Therefore, a participant's settlement failure could represent a source of systemic risk if there were no proper settlement risk management frameworks in place.

For this reason, the BOK implemented risk management arrangements for the net settlement systems in September 1997, to ensure the completion of net settlement even in the event of settlement failures of some participants. The arrangements include net debit caps, collateral requirements, and loss-sharing arrangements among participants. In addition, with FICs now able to provide funds transfer services through the RPSs, the BOK has also developed a net settlement agent arrangement to prevent any resulting increase in settlement risk.

(a) Net Debit Caps

A net debit cap is a ceiling set on the permitted amount of a participant's unsettled net obligation, in order to mitigate settlement risk. If a participant's

unsettled net obligation exceeds its net debit cap during the business day, that participant is not allowed to send any additional payment instructions.

The RPSs in which net debit caps are applied include the ATM Network, the IFT System and the EBS, where customers' accounts are credited as soon as payment instructions are submitted, even before settlement of the funds through BOK-Wire+ has taken place.

Each participant can, at its own discretion, determine its net debit cap. However, to prevent participants from setting their caps too high, the BOK uses a participant's cap as the basis for calculating its required collateral amount.

(b) Collateral Requirements

Every RPS participant is required to provide eligible securities as collateral against its possible settlement failure. In the event of a participant's default, the BOK can dispose of the participant's collateral securities or use them as collateral for against BOK lending facilities to complete net settlement.

Securities eligible as collateral are limited to Korean government bonds, government-guaranteed bonds and BOK's Monetary Stabilization Bonds. For transactions subject to net debit caps, the collateral requirement is equivalent to 50% of the cap, and for other transactions it is 50% of the daily average net payment amount cleared during the immediately preceding six-month period. The BOK assesses the market values of the collateral securities provided by participants on a daily basis, and requires participants to provide additional collateral if necessary to maintain collateral value.

(c) Loss-sharing Arrangements

If a defaulting participant's collateral does not suffice to cover a settlement shortfall, all other participants must collectively make up the uncovered position in order to finalize the interbank net settlement. The allotment of participants' shares in this process is calculated based upon the amount of their collateral. Once settlement through loss-sharing among participants has been completed, the defaulting participant must repay the other participants in accordance with their loss-sharing contributions, including interest determined in advance.

(d) Net Settlement Agent Arrangements

FICs and the federations of non-bank credit institutions could cause relatively higher settlement risks than banks, given that they are not required to provide reserves to the BOK and therefore do not have sufficient funds in their BOK current accounts. To mitigate systemic risk, the BOK therefore allows them to carry out net settlement only indirectly, through agent banks. According to the contract between an FIC and its agent bank, the bank guarantees the FIC's obligation even when the FIC fails to make the relevant payment. Potential settlement risks caused by FICs are in this way limited to the agent banks.

C. Development Process

(1) Drive for Financial Informatization Promotion

The payment and settlement systems of Korea had been heavily dependent on paper-based payment instruments for long time. This is attributable to people's traditionally strong preference for cash as a payment instrument and the well-developed bill and cashiers check system. Nevertheless, the use of non-paper based payment instruments has grown steadily since the 1980s with the establishment of Interbank Shared Network Systems such as IFT System and CD/ATM Network. The spread of e-commerce transactions and introduction of internet banking in recent years has been accelerating the movement toward a further diversification of the range of electronic payment and settlement systems. In addition, fin-tech, the digital innovation in the financial sector, has led to the appearance of various types of new payment services. The scope of payment service providers has expanded to include non-financial companies such as SNS platform service providers, mobile telecom companies, and retail companies. Diverse attempts have in addition been exerted to apply new technologies such as blockchain and biometric authentication to the payment and settlement systems.

All these developments are the promoted performance of financial informatization. The popularization of the financial informatization began in the late 1970s, when deposit banks designed their internal on-line networks and office automation systems. The informatization of the financial industry has made more evolution with the changes in economic environment such as the rapid development of information technology (IT), the diversification of

financial consumer desires, and dramatic increase in the payment and settlement volume.

The financial informatization in Korea has been promoted not only by the official promotion organization, the Committee on Financial Informatization Promotion (CFIP), but also by the financial institutions themselves. Most large-scale projects, requiring the mutual cooperation of more than two institutions, have been promoted through the CFIP in accordance with the related acts and regulations.

The first promotion organization, the Committee on Financial Computerization (CFC), was established in September 1984 with the governor of the BOK as its chairman. After that, with a thoroughgoing amendment of the related act on informatization promotion, the promotion organization had been renamed or reorganized to the current CFIP, a private consultative group, in November 2009.

The CFIP performs the business of financial informatization including the selection of mutual business projects for the Financial Informatization Promotion, the connection of the Financial Information Networks with external computer networks, the standardization of work involved in the financial informatization, etc. The CFIP chairman is currently the senior deputy governor of the BOK. Participants is comprised of below 30 members including commercial banks, specialized banks, investment dealers and brokers, insurance companies, the BOK, the Korea Credit Guarantee Fund, the Korea Technology Credit Guarantee Fund, the National Information Society Agency, the KFTC, the Korea Securities Computer Corporation, other institutions which the chairman deems necessary. Administrative

matters are dealt with by its Secretariat, managed by the BOK.

(2) Development of Large-value Payment System

Since the early 1980s, the central banks of developed countries had implemented an RTGS system as the awareness of the need for sound risk management in large-value funds transfer systems grew.

The BOK introduced BOK-Wire, an RTGS basis LVPS, in December 1994 and began to provide a fund transfer service via participant institutions' current accounts with the BOK. In November 1999, the BOK began providing a DVP services for securities settlement by linkage of the securities settlement systems with BOK-Wire. Then, it launched a PVP service for FX transactions, by linking BOK-Wire with the CLS System in December 2004.

In its early days, BOK-Wire processed funds transfers based on its RTGS mechanism. Meanwhile, as the settlement volume surged, the liquidity burdens on financial institutions increased. Therefore, the BOK developed a new system, BOK-Wire+, which would not only use the pre-existing RTGS mechanism but also apply a hybrid settlement mechanism.²⁰ BOK-Wire+ has operated stably since its launch in April 2009.

The BOK continues expanding and improving payment and settlement infrastructures to enhance the safety and efficiency of payment and settlement systems. The BOK has been working to launch the next-generation BOK-Wire+ in 2020.

²⁰ A hybrid settlement mechanism is a payment system which combines the characteristics of an RTGS mechanism and a netting system, by adding bilateral and multilateral offsetting features to the RTGS mechanism.

(3) Development of Retail Payment Systems

In the 1980s, the financial information network was promoted as one of the five nationwide network infrastructures. For the establishment of the financial information network, the CFC was set up in September 1984 under the chairmanship of the BOK. The BOK made plan of establishing an organization to build and operate financial information network in 1985, and the KFTC was established in June 1986 by merging the National Clearing House and the Korea Bank Giro Center based on the plan.

Ever since the establishment of KFTC, the RPSs have developed very remarkably. Korea was one of the earliest adopters of fast retail payment services, which ensure a credit of final funds to the payee immediately. In 1988, the KFTC launched the CD/ATM network to facilitate bank customers' cash withdrawals, funds transfers and information inquiries through its terminals regardless of customers' main banks. While there were some initial restrictions on availability, improved technology has made the network accessible on a 24/7 basis since 2007.

The Electronic Banking System (EBS) in the above section was established in 2001 to overcome the limitations of CD/ATM network by combining an existing Automated Response Service Network with intermediary electronic banking functions such as internet, phone and mobile banking services. By adopting more advanced information technology, end users can access these services anytime and anywhere, and payments are immediately processed on 24/7 basis.

4. Guidance for Nepal's Payment System Modernization

Key infrastructures of national payment system include a large-value interbank settlement system with RTGS mechanism, an interbank retail electronic funds transfers, a payment card processing platform or platforms (i.e. a payments switch), and a robust communications infrastructure. Absence of any of these infrastructure components not only hinders the national payment system in exploiting the potential benefits of modern payment instruments, but also adversely affects financial inclusion. Credit reporting and other data-sharing platforms also play an important role, especially for transaction accounts to become an effective gateway for broader financial services.

From these points of view, the development initiatives by NRB seems to be well planned and strategically prioritised. The NRB is in the process of implementing an RTGS system, and plans to introduce National Payment Switch (NPS). The other important thing for a fast payment are automated clearing house (ACH) and financial messages.

ACH is an electronic clearing system in which payment orders are exchanged among financial institutions, primarily via magnetic media or telecommunications networks, and handled by a data processing center. It is recommended that NCHL should be reformed as the provider of ACH service in Nepal.

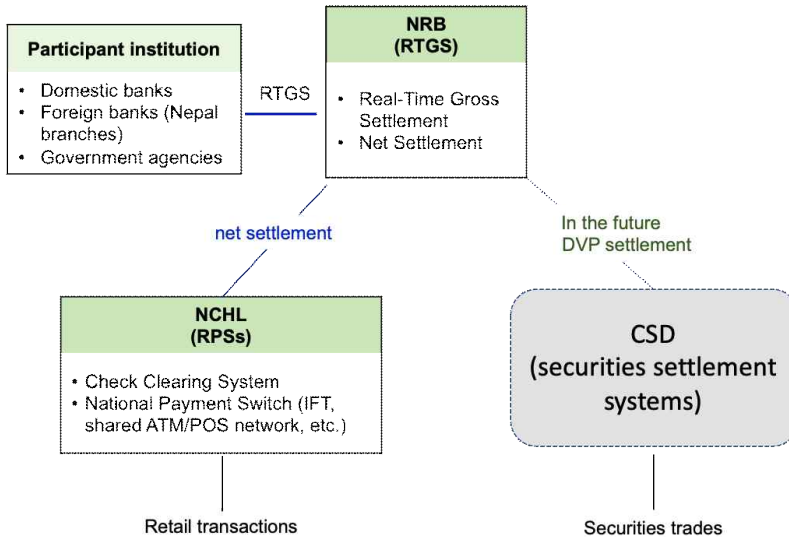
It is envisaged that ISO 8583 message format has been made use of by ATM/EFTPOS switch operators and MFSPs. But, systems are not

interoperable. It implies that interoperability problem may be due to using different versions of the protocol by some banks.²¹ Thus, all the switches would have to be revised to support the ISO 20022, the latest international standard, to allow PSPs to be interconnected. In addition, it is desirable to establish a collaborative system in order to reform retail payment system towards establishing a fast payment and increasing interoperability.

The basic architecture of national payment system in Nepal would be modified to as Figure 2-7 right after the completion of first step modernization.

<Figure 2-7>

Basic Design for Nepal’s National Payment System



A. Inauguration of Organization for Collaboration

²¹ Three versions of ISO 8583 standard exist: 1987, 1993 and 2003.

Financial institutions may be unwilling to introduce the new interoperable payment switch, or to make change to the new system that might reduce their market shares or returns. This would be the case even if they could see some benefit to the system overall. At times, this attitude can create a need for public intervention to facilitate coordinated and cooperative action. Consequently, a challenge in developing effective markets for payment services is finding and then promoting the right balance of cooperation and competitions for each market.

Therefore, the NRB should establish a cooperative and collaborative promotion organization in order to put in place the necessary regulatory and technical backup for introducing the advanced payment systems. The organization should be comprised of all payment stakeholders, and be entrusted with powers of deciding almost everything for the development of the payment systems in Nepal. The CFIP in Korea may be a reference model. The CFIP is comprised of the representatives from almost all financial industry related institutions such as banks, investment dealers and brokers, insurance companies, credit guarantee funds, FMIs. The CFIP has deliberated on the matters related to financial informatization promotion including payment, clearing and settlement system in Korea.

The NRB could derive the cooperation and collaboration of financial institutions on any issue related to payment systems in Nepal through establishing a so-called National Payment Committee.

B. Implementation of RTGS System

The LVPS is in the process of reforming to adopt RTGS system by NRB. Once an RTGS system is implemented, the settlement of large -value interbank transactions and net settlements will be conducted by the RTGS, thus substantially lowering the systemic risk. In the newly introduced RTGS system, transactions are settled across participants' counts held with a central bank on a continuous gross basis. This settlement is immediate, final and irrevocable. In addition, credit risks due to settlement lags are eliminated.

In the light of BOK's operating experience, the NRB's newly implementing RTGS system should settle all the monetary policy transactions and other interbank transactions as well as the large-value and bulk payments of government agencies. Hence, participating institutions should be banks that have current account at the NRB, NCH (ACH service provided), and government agencies at the beginning. Since then, the NRB can expand participants reflecting the demand of the financial markets and the efficiency of the system. Furthermore, once securities clearing and settlement system launched, the RTGS will be expanded to provide DVP services by linkage of the securities settlement system with the RTGS system.

In addition, the followings have to be checked over before the actual operation. Firstly, a rigorous pilot test is required before rollout of the new system. This would allow any technical problems to be identified and resolved before the new system is implemented system-wide. Secondly, the system-wide implementation of the new system may also be staged or sequenced over particular regions or stakeholder groups. Thirdly, liquidity risks in LVPS should also be contained through such a facility as intraday overdraft loan.

C. Enhancements of Retail Payment Infrastructures

The retail payment systems need to be enhanced to make fast retail payment service possible and increase interoperability so that payment services offer speed, convenience, ubiquity and safety. While a retail payment system may or may not be run by a central bank, it is recommendable for private sector to operate RPSs. It is because private sector's flexibility and efficiency enables to respond rapidly to changes of market demands.²² So, it would be better to let the NCHL provide automated clearing house (ACH) services through operating the National Payment Switch (NPS) that is planned to introduce in the near future by NRB. It means that the NCHL becomes to the major operator of retail payment system in Nepal like KFTC in Korea.

The NPS, digital payment platforms, has to include four underlying systems: Real-time Interbank Funds Transfer System, Shared ATM Network, Shared POS System and Mobile Payment System. The NPS system would be the platform. Each system has its own business domain and functions, while they have system modules in common. It would be integrated with the NRB's RTGS system and other systems in banks and other financial institutions through the external interface. Therefore, a new payment service can be constantly added to the NPS system followed by financial markets need.

In addition, it also recommendable to opt a deferred net settlement system, because a deferred net settlement system is more efficient by reducing the

²² In most countries including Korea, RPSs are operated by the private institutions.

number and value of payment, which lowers liquidity burdens on financial institutions. When a deferred net settlement system is opted, settlement risk management arrangement such as a net debit cap, collateral requirements, loss-sharing arrangement should be adopted in order to ensure the completion of net settlement on time.

(1) Real-time Interbank Funds Transfer System

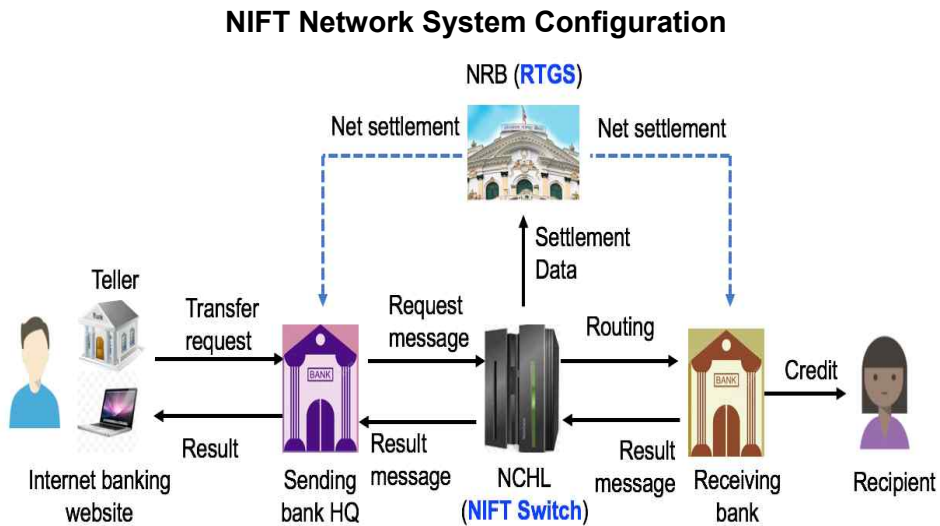
The Nepal's Interbank Funds Transfer (NIFT) system is defined as a network system that connects participating bank's core banking systems, allowing customers of member banks to make funds transfer to the accounts of another bank in real time.

The NIFT system, a core component of Nepal's fast retail payments, should enable customers to make a funds transfer to the accounts of another participating bank through diverse channels such as a bank window, internet banking web site, or mobile. The NIFT network system acts as a switch system in interbanking networks that connect sending banks and receiving banks so that they can exchange messages for real-time funds transfer.

Its process is comprised of payment and settlement as seen in Figure 2-8. The payment process is initiated by a sender who is a customer of the sending bank, and telecommunication through an interbank network. In this network, the NIFT system switches and processes the transaction messages between the sending and receiving bank. If a sender's funds transfer request is routed to the headquarter (HQ) of the sending bank, the system of the bank then generates a request message and send it to the NIFT switch. The NIFT switch

relays the message to the receiving bank. The receiving bank sends back the result message to the NIFT switch, and the message is relayed back to the sending bank.

<Figure 2-8>



The settlement is made between the NIFT system and the RTGS system of NRB. After the payment completed, the NIFT system prepares the data that shows the net obligation of each bank and sends it to the NRB for interbank net settlement. Finally, the NRB settles the net obligation of banks through RTGS system in the current accounts of banks with the NRB.

(2) Shared ATM Network System

The shared ATM network system of Nepal is defined as a system that enables customers with ATM cards to use various financial services such as

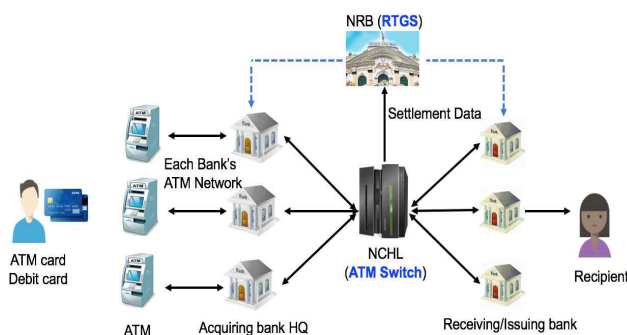
balance inquiry, cash withdrawal and deposit, and funds transfer through any ATM of participating banks.

The shared ATM network plays the role of a switch system in interbank networks that connect acquiring banks and receiving/issuing banks so that they can exchange messages for financial transaction through ATMs. Its process comprises payment and settlement as seen in Figure 2-9.

The payment process is initiated by a cardholder. In this network, the ATM system switches and processes the transaction messages between the acquiring bank and the receiving/issuing bank. When a cardholder requests a financial transaction at an ATM, the banking system of the acquiring bank generates a request message and sends it to the ATM switch through the interbank network. The ATM switch relays the message to the receiving/issuing bank via the network. The receiving/issuing bank sends back the result message to the ATM switch, and the message is relayed back to the acquiring bank.

<Figure 2-9>

Configuration of Shared ATM Network System



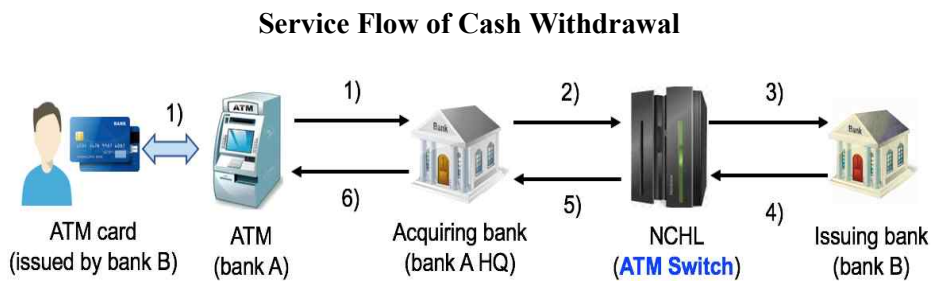
The settlement is made between the ATM switch and relevant bank's

current account in the NRB. After the payment process is completed, the ATM switch calculates the interbank net obligations that shows the net position of each bank and sends it to the RTGS system of NRB for net settlement. Belows are two examples of cash withdrawal and funds transfer service flows are as follows.

① Cash Withdrawal

When a customer needs to withdraw some cash from his/her own account, he/she can withdraw the cash at any ATM of another participating bank (acquiring bank). The acquiring bank that owns the ATM can accommodate the cash withdrawal request through the ATM network system. The service flows are as below in Figure 2-10.

<Figure 2-10>



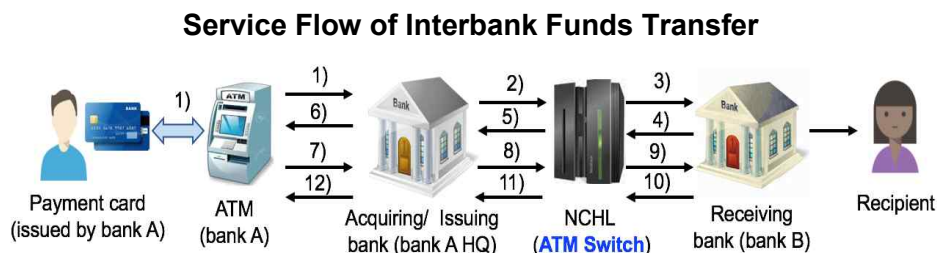
- 1) A cardholder requests cash withdrawal.
- 2) The acquiring bank checks the request information and sends a request message to the ATM switch.
- 3) The ATM switch relays the request message to the issuing bank.
- 4) Bank B verifies the request message, debits the customer's account and returns an approval message to the ATM switch.

- 5) The ATM switch relays the approval message to bank A.
- 6) Bank A gives out the cash to the customer.

② Interbank Funds Transfer

When a customer wants to transfer money to an account in another bank, he/she can use the ATM of the bank that manages the customer's account linked to the ATM card (acquiring bank = issuing bank). The customer's bank can accommodate the funds transfer request at the ATM network. The service function shows are as below in Figure 2-11.

<Figure 2-11>



- 1) A cardholder selects the recipient's bank, and enters recipient's account number and the amount of money.
- 2) The acquiring bank checks the customer's funds availability and sends an inquiry message to the ATM switch for retrieving the recipient's name and checking account validity.
- 3) The ATM switch relays the inquiry message to the receiving bank.
- 4) The receiving bank checks validity of the account and returns the recipient's name to the ATM switch.
- 5) The ATM switch relays the information to bank A.

- 6) Bank A shows the customer the recipient's name and his account balance.
- 7) The customer confirms the transaction.
- 8) Bank A debits the customer's account and sends a transfer instruction to the ATM switch.
- 9) The ATM switch relays the transfer instruction message to the receiving bank.
- 10) The receiving bank credits the recipient's account and returns the result message to the ATM switch.
- 11) The ATM switch relays the result to Bank A.
- 12) Bank A shows the result to the customer and issues a transaction note.

(3) Shared POS System

A shared POS System is a network system connecting member merchants to financial institutions such as banks and card companies to process a transaction by payment card, so that the payment card holders can make a payment at the POS terminal of the member merchants. POS terminals are used by customers to make payments for purchase of goods or services using payment cards such as debit and credit cards. The shared POS system connects all POS networks of individual banks and card companies so that any POS terminal can be used by any customer irrespective of the bank to which he/she belongs as in Figure 2-12.

① Current Payment Card Network System in Nepal

In the payment-card market of Nepal, debit cards in operation are 5.7 million or account for 56 per cent of non-cash payment instruments, while credit cards account for only 1 per cent. Most issuers and acquirers participate in overseas four-party card network²³ such as VISA and MasterCard, because there is no domestic card network that can switch payment-card transaction messages between multiple domestic issuers and domestic acquirers. Therefore, every acquirer has to obtain authorization through an overseas card network even though the issuer is a domestic participant. This means every payment-card transaction through card networks is an overseas transaction.

Furthermore, issuers of credit card entrust their authorization processing to overseas card networks, because they do not have their own credit card authorization system. This is going to be a big challenge when establishing domestic switching networks for credit card transaction in Nepal. The authorization of issuers in credit card transactions is very critical and totally different from that for debit card transactions. In a debit card authorization process, the role of issuers is limited to checking the cardholder's bank account to ensure it has enough balance for the payment. On the other hand, for credit card authorizations, issuers have to keep a special ledger system to manage the credit line and record any changes for each cardholder.

Hence, it is necessary to launch a domestic debit-card processing network first, and then to prepare credit-card network with third-party processors for expansion of debit-card network to credit-card network. Those domestic payment-card network will help save costs to overseas card networks and

²³ See Appendix 3-1: Payment Card Network System

reduce dependence on them.

② Recommendation of Local Card Network Establishment

The shared POS system of Nepal is defined as a local debit card network system that enables customers with debit cards to make a payment for purchasing goods or services at any merchant POS terminal. The shared POS system plays the role of a switch system in an interbank network that connects merchant's banks and issuing banks so that they can exchange messages for debit card transactions through merchant POS terminals. Its process comprises payment and settlement.

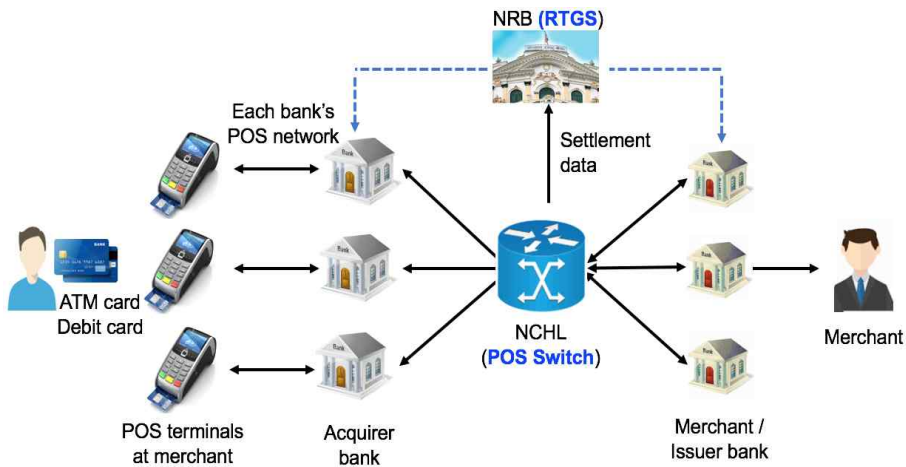
The payment process is initiated by a debit card holder at merchant POS terminal and the payment is processed through the processor²⁴, POS switch, and the interbank network. In this network, the shared POS system switches and processes the transaction messages among the processor, the issuing bank, and the merchant's bank. When a cardholder makes a payment request at a merchant POS terminal, the processor of the merchant generates a request message and sends it to the POS switch system. The POS switch sends the debit request message to the issuing bank via the network. The issuing bank sends back the debit result message to the POS switch, and the message is relayed back to the merchant POS terminal through the processor.

²⁴ The processors provide specialized services that are entrusted by the acquirers and issuers: The acquiring processors' jobs are collecting merchants, distributing and maintaining POS terminals, processing authorization messages, and keeping transaction records. The issuing processors' jobs are collecting customers, embossing and delivering of plastic cards, activating cards, monthly billing, operating call centers, managing disputes and chargebacks, and blocking lost cards.

The settlement process is implemented by telecommunication between the POS switch and banks' current account in the NRB. After the payment process is completed, the POS switch draws up the clearing data that shows the net obligation of each bank and sends it to the NRB's RTGS system for interbank settlement. Next, the NRB settles the net position of the banks through an interbank funds transfer in the current accounts of each bank in the NBC. Finally, the merchant's bank transfers the money to the merchant.

<Figure 2-12>

Network Configuration of Shared POS System in Nepal

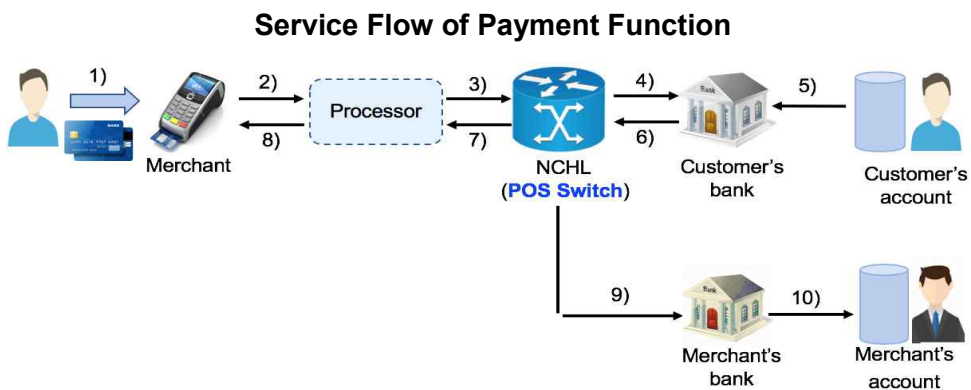


The shared POS network is to be functioned as a common platform used by diverse financial institutions, which shall be connected to NBC's RTGS system. The shared POS system serve three types of function; payment, refund, and account balance inquiry. A merchant POS terminal performs all of these three functions. Among them the function and flows of payment and refund service are described below.

Ⓐ Service Function and Flows of Payment

When a debit card holder wants to make a payment by card at a merchant POS terminal, the customer can request the amount to be debited from his/her own account in the issuing bank. The merchant accommodates the request through the payment function. This service function flow is represented as given below in Figure 2-13.

<Figure 2-13>



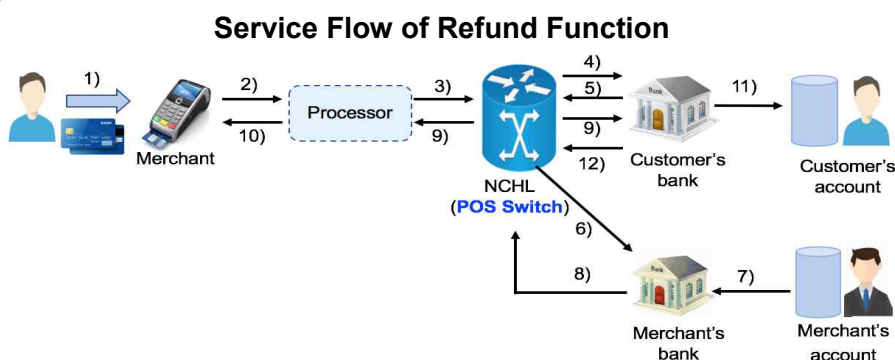
- 1) A customer makes a payment request for the purchase of goods or services at a merchant's POS terminal.
- 2) The merchant inputs the amount of money and sends a request message to the processor for payment authorization.
- 3) The processor checks the request message and relays it to the POS switch.
- 4) The POS switch checks the request information, verifies the merchant's validity, and sends the debit request message to the customer's bank.
- 5) The customer's bank debits the money from the customer's account.

- 6) The customer's bank sends the debit result message to the POS switch.
- 7) The POS switch sends the result message to the processor.
- 8) The processor relays the message to the merchant's POS terminal.
- 9) The POS switch draws up the credit data for each merchant, and sends the data to merchant's bank.
- 10) The merchant's bank credits the total amount of money to the merchant's account.

ⓑ Service Function and Flows of Refund

When a cardholder wants to cancel the payment already debited from the account, the customer can request a refund of the money paid through a chargeback transaction. Then, the merchant can accommodate the request through the refund function. This service function's flows can be represented as follows in Figure 2-14:

<Figure 2-14>



- 1) A customer asks to cancel the purchase and refund the amount at a merchant's POS terminal.
- 2) The merchant inputs information of the original transaction such as date,

transaction number, the amount of money, and sends a refund request message to the processor.

- 3) The processor checks the refund request message and relays it to the POS switch.
- 4) The POS switch checks the refund request information and sends a message requesting verification of the customer's account to the customer's bank.
- 5) The customer's bank sends the result message of the account verification to the POS switch.
- 6) The POS switch sends a message requesting a debit of the amount from the merchant's account to the merchant's bank.
- 7) The merchant's bank debits the amount from the merchant's account.
- 8) The merchant's bank sends the debit result message to the POS switch.
- 9) The POS switch sends the refund result message to the processor and requests the customer's bank to credit the amount to the customer's account at the same time.
- 10) The processor relays the result message to the merchant POS terminal.
- 11) The customer's bank credits the amount to the customer's account.
- 12) The customer's bank sends the credit result message to the POS switch.

(4) Mobile Payment System

Commercial banks offer a variety of banking services through their mobile application called app, and private service providers, such as Paypal and Alipay, are also providing mobile payment and P2P funds transfer services through their mobile account called mobile wallet. Therefore, it is not easy to define the concept of a mobile payment system. Nevertheless, from the

customer's perspective, it can be defined as a system that provides diverse financial services such as mobile payment and funds transfer to customers through mobile devices such as a smartphone.

The Mobile Payment System of Nepal (MPSN) is defined as a system that provides a shared smartphone banking platform for participating banks so that the customers with a smartphone can use diverse banking services.²⁵

The MPSN plays the role of a switch system that connects the customers using a smartphone to each participating bank. It provides not only a single gateway for smartphone users to access banking services of their own banks, but also a common smartphone application shared by participating banks, thus reducing the bank's cost to develop and maintain the apps that can accommodate a variety of operating systems such as Android, iOS, and Blackberry.

A mobile banking transaction request is initiated by a smartphone user on the common banking app, and transferred to the MPSN. Therefore, in this network, unlike other retail payment systems, the MPSN develops and manages the interface for users, and telecommunicates with them directly. The MPSN switches the request messages from each user to the customer's bank. The user's bank executes the requested transaction in its own intra-bank system, or uses an existing interbank system.

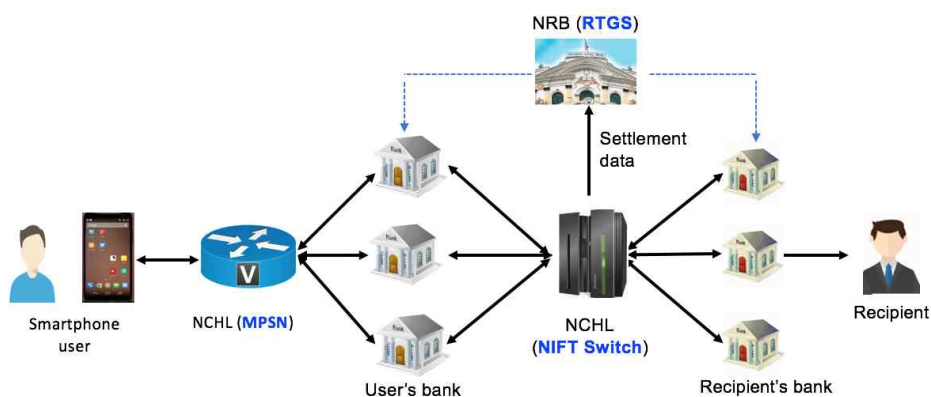
For example, if the user's request of funds transfer is an intra-bank transaction that has to be transferred to another account in the same bank, the

²⁵ The mobile wallet system was excluded as an option for the NRB. The operator of mobile wallet system also plays the role of a mobile money provider that operates the mobile service platform and offers it to diverse businesses and customers as a player in market competition. This may not be a role appropriate for a central bank.

bank can carry out the transaction within its own funds transfer system. However, if it is an interbank transaction that needs to be sent to another bank's account, the bank deals with the transaction by sending an interbank funds transfer request message to the NIFT switch system. After finishing the process for interbank funds transfer in NIFT switch, the bank sends back the result message to the MPSN. Finally, the MPSN sends and shows the result message to the user through the app. Among the services of MPSN, funds transfer's flows are as follows in Figure 2-15.

<Figure 2-15>

Network Configuration of Mobile Payment System of Nepal



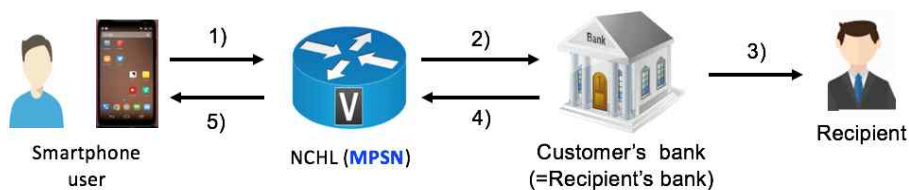
① Intra-bank Funds Transfer Service

When the shared mobile banking app user wants to transfer funds, the customer can make a request to the bank through the MPSN. As the recipient account is in the same bank as the sending account, the MPSN and the bank can accommodate the request through the following intra-bank funds transfer

function as in Figure 2-16.

<Figure 2-16>

Service Flow of Intra-bank Funds Transfer



- 1) A customer activates the app, logs into the shared mobile banking app, and requests a funds transfer between accounts in the same bank using the recipient's registered phone or account number with his authentication information.
- 2) The MPSN relays the request message and the authentication information to the customer's bank.
- 3) The customer's bank verifies the customer's authentication information and checks his accounts. If the money is enough for the requested transaction, the bank debits the amount from the customer's account and credits it to the recipient's account.
- 4) The customer's bank returns the result message to the MPSN.
- 5) The MPSN shows the result to the customer through the app.

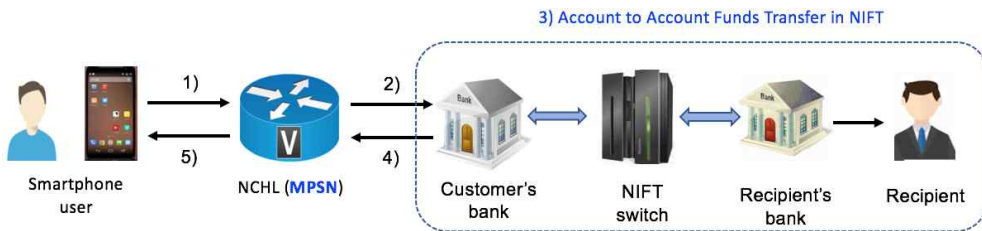
② Inter-bank Funds Transfer Service

When a shared mobile banking app user wants to transfer funds, the customer can make a request to the bank through the MPSN. If the recipient account is in another bank that is different from the bank of the sending

account, the MPSN and the bank can accommodate the request through the inter-bank funds transfer function. The service function flows are as below in Figure 2-17:

<Figure 2-17>

Service Flow of Inter-bank Funds Transfer



- 1) A customer logs into the mobile banking app, and requests a funds transfer from the customer's account to the recipient's account that is in another bank, using the recipient's registered phone or account number.
- 2) The MPSN relays the funds transfer request message and the authentication information to the customer's bank.
- 3) The customer's bank verifies the customer's authentication information, checks the status of the customer's accounts, and carries out the requested transaction through an 'account-to-account funds transfer' function in the NIFT System.
- 4) The customer's bank sends the result message to the MPSN.
- 5) The MPSN shows the result to the customer through the mobile app.

<Appendix 1>

General Information on Existing Fast Payment Implementations In CPMI Countries

Country	Implementation	A/B ¹	Year ²	Payee speed ³	Service operator
Korea	Electronic Banking System	A	2001	1-2 seconds	KFTC
	CD/ATM System	A	2007 ⁴	1-2 seconds	KFTC
South Africa	Real-Time Clearing	A	2006	0-60 seconds	BankservAfrica
UK	Fast Payments Service	B	2008	0-120 seconds	FPSL
China	Internet Banking Payment System	B	2010	0-20 seconds	People's Bank of China
India	Immediate Payment Service	B	2010	0-30 seconds	NPCI
Sweden	BiR/Switch	B	2012	1-2 seconds	Bankgirot
Turkey	BKM Express	B	2013	0-30 seconds	BKM
Italy	Jiffy	B	2014	2-3 seconds	SIA
Singapore	Fast And Secure Transfers	B	2014	App. 15 seconds ⁵	Banking Computer Service Pte
Switzerland	Twint ⁶	B	2015	2-3 seconds	Twint
Mexico	SPEI	A	2015 ⁷	0-60 seconds ⁸	Bank of Mexico

Source: CPMI, "Fast payments-Enhancing the speed and availability of retail payments," November 2016.

Note: 1 A: existing system adapted or upgraded for fast payments; B: newly built system for fast payments. 2 This year refers to the year at which an implementation provided full fast payment functionality, including near-24/7 service availability. 3 Typical time between payment initiation and availability of funds to the payee for a successful transaction. 4 The CD/ATM System has provided near-real-time payments since 1988 with operations on a near-24/7 basis (00:05-23:55) since 2007. 5 This is the estimated timing between initiating and receiving banks for a successful FAST transaction, and not an end-to-end timing from the payee's perspective. 6 At the time of publication, the two providers offering fast payment services in Switzerland - Twint and Paymit - were in a merging process. Post-merger specifications of the new service (expected to be called Twint) had not been published. All references to Twint, thus, reflect the state of the Twint and/or Paymit service as of end-September 2016. 7 The SPEI began conducting near-real-time payments in 2004 with operations on a 21/7 basis for mobile payments since March 2015 and on a 24/7 basis since November 2015. 8 0-15 seconds for mobile payments; 0-60 seconds for other online payments.

<Appendix 2> Payment Card Networks

Payment card networks usually consist of four participants – issuer, acquirer, cardholder, and merchant. Issuers supply the cards and offer a credit line to each customer. Acquirers collect member merchants and distribute POS terminals to them. With the payment-card market becoming bigger, the role of each market participants is becoming more specialized. As a result, most of acquirers and issuers entrust some parts of their jobs to other specialized service providers called third-party processors. The acquirers entrust specialized acquiring processors with various jobs such as collecting merchants, distributing and maintaining POS terminals. The issuers also entrust specialized issuing processors with a large number of jobs such as collecting customers, embossing and delivering the plastic cards, activating the cards, monthly billing.

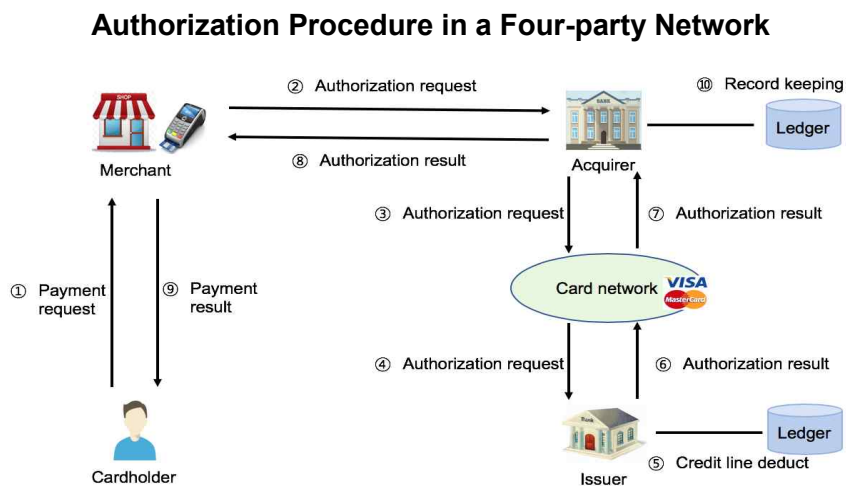
The payment card processing networks can be classified as four-party (or open) and three-party (or closed) network, depending on whether it has a switch that connects acquirer and issuer. If it is a four-party, there is a switch network connecting acquirers to issuers so that they can exchange messages with each other. In case of a three-party network, it does not have any switch and it is difficult to get authorization from other issuers. Four-party networks are widely used all over the world including the US and Europe, while three-party networks are mainly used in Korea and Japan.

1. Four-party Network (USA)

In a four-party network, the participants are the issuer, the acquirer, the cardholder, and the merchant. However, in most cases, there is one more component, the card network such as the VISA and the MasterCard network in USA, which plays role of a switch between multiple acquirers and multiple issuers. Commercial banks are usually focused on issuing, with other institutions specialized in acquiring and providing service to merchants.

In this network, cardholders make a payment at a merchant POS terminal and the merchant requests authorization to the acquirer. The request message is relayed to the issuer of the card through VISA or MasterCard network. Then, the issuer gives authorization to the acquirer through the VISA or MasterCard network and collects the amount of money from the cardholder. Finally, VISA and MasterCard draw up the clearing data and send it to the settlement bank for settlement between the issuer and the acquirer. The acquirer sends the money to the merchant. In a four-party network, the transaction authorization flows are as follows in Figure 2-18:

<Figure 2-18>

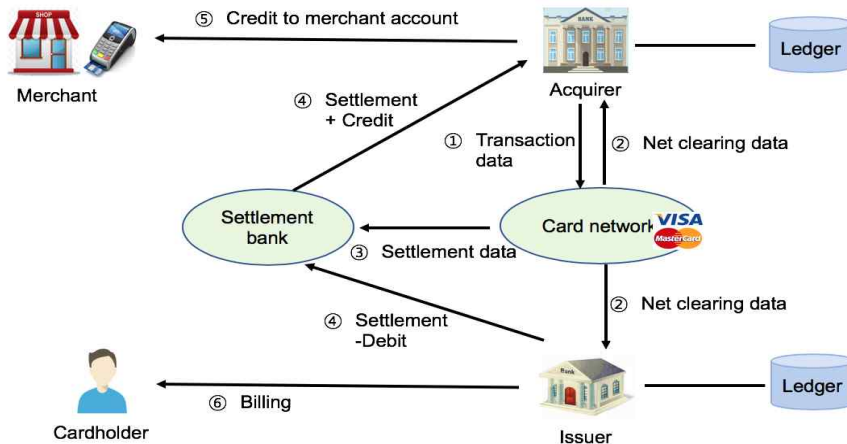


- ① A cardholder makes a payment request at a merchant POS terminal.
- ② The merchant sends the authorization request message to the acquirer.
- ③ The acquirer routes the message to the card network.
- ④ The card network switches the message to the issuer of the card.
- ⑤ The issuer checks the credit line of the cardholder.
- ⑥ If the cardholder has enough credit line balance, an approval message is sent after deducting the credit line of the cardholder. However, if not enough, the authorization is rejected.
- ⑦ The card network sends back the result message to the acquirer.
- ⑧ The acquirer relays the result message to the merchant POS terminal.
- ⑨ The merchant POS terminal gives out the receipt to the cardholder.

Once the authorization is complete, the process of the clearing and settlement begins. When a cardholder makes a purchase at a POS terminal with a payment card, the customer accepts an obligation to pay for the purchase to the issuer of the payment card. The settlement process is aimed at fulfilling this obligation by transferring money from the cardholder to the merchant. In a four-party network, the clearing and settlement flows are as follows in Figure 2-19:

<Figure 2-19>

Clearing and Settlement Procedure in a Four-party Network



- ① The acquirer draws up the transaction data and sends it to the card network.
- ② The card network draws up the clearing data that show the net position of both the acquirer and issuer, and sends it to the acquirer and issuer after deducting relevant fees.
- ③ The card network sends the data to the settlement bank for final settlement.
- ④ The settlement bank settles the net position of both sides; debits the customer's account and credits the merchant's account.
- ⑤ The acquirer transfers the money to the merchant after deducting the merchant's fee for the acquirer.
- ⑥ The issuer collects the money from the customer through monthly billing.

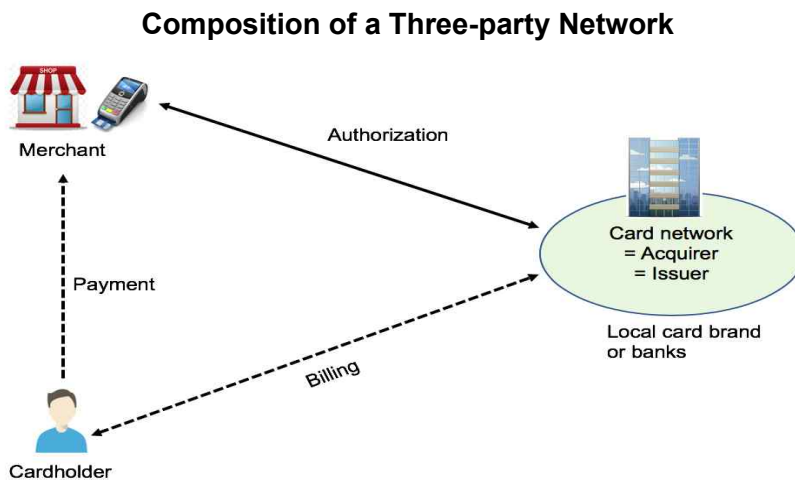
2. Three-party Network (Korea)

Korea and Japan have used a three-party network as shown in Figure 2-20. In

this network, the acquirer and the issuer are the same entity. Therefore, the card network checks the cardholder's credit line, gives authorization to the merchant, and collects the money from the cardholder, because it is the issuer of the card. It also exchanges request and result messages with the merchant POS terminal for authorization and transfers the money to the merchant, because it is the acquirer of the card network. As a result, there is no need for clearing and settlement between issuer and acquirer.

The advantage of this type of network is that card networks can earn larger profits, because they do not have to share the fees with other issuers or acquirers. On the other hand, the disadvantage of this type of network is the waste of resources, because each card network has to operate their own network.

<Figure 2-20>

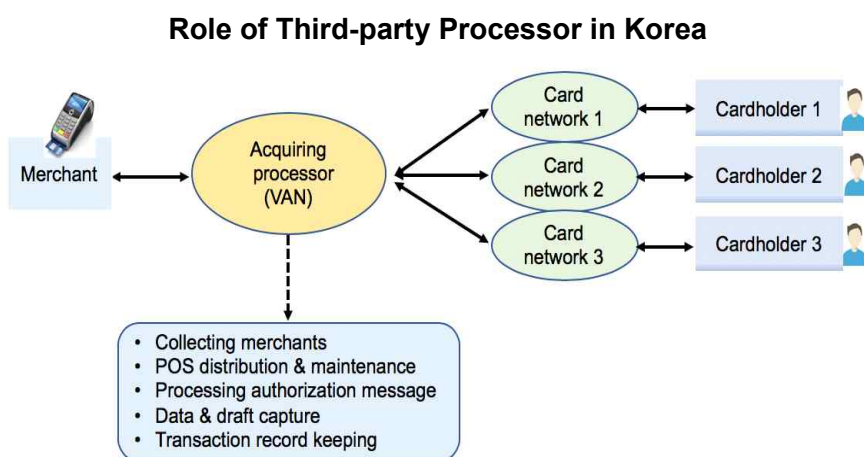


Source: The Bank of Korea, "Payment and Settlement Systems in Korea," December, 2016

Theoretically, a merchant has to connect to multiple card networks one by

one, because each issuer operates its own network. In reality, third-party processors, called value added network (VAN), connect a merchant to multiple card networks and play a critical role in the payment-card market as in Figure 2-21. Like in a four-party network, VANs are also becoming important in three-party network.

<Figure 2-21>



Source: The Bank of Korea, "Payment and Settlement Systems in Korea," December, 2016

Glossary

ACH	automated clearing house
ATM	automated teller machine
BOK	Bank of Korea
CFC	Committee on Financial Computerization
CFIP	Committee on Financial Informatization Promotion
CLS	Continuous Linked Settlement
CPMI	Committee on Payment and Market Infrastructures
CPSS	Committee on Payment and Settlement System (former committee of CPMI)
DVP	delivery-versus-payment
EBS	Electronic Banking System
EFTPOS	electronic funds transfer at point of sale
FIC	financial investment company
FMI	financial market infrastructure
IFT	Interbank Funds Transfer
KFTC	Korea Financial Telecommunications and Clearing Institute
LVPS	large-value payment system
MPB	Monetary Policy Board
MPSN	Mobile Payment System of Nepal
NCHL	Nepal Clearing House Ltd.
NIFT	Nepal's Interbank Funds Transfer
NPS	National Payment Switch
PVP	payment-versus-payment

RPS	retail payment system
PSP	payment service provider
RTGS	real-time gross settlement

III. Development of Supervision and Inspection System on Financial IT and Fin-tech of Nepal

1. Overview of Supervision and Inspection on Financial IT and Fin-tech

A. More Extensive Supervision and Inspection

Currently, most of the financial services in Korea are conducted by automated payment system or by electronic devices connected by online network like other advanced countries. Various channels such as internet, mobile, telephone, CD/ATM are utilized for these transactions. As a result, the risk to having any technical problems such as hacking or system breakdown or consumer protection problems such as voice phishing or other criminal activity is getting more attention. They may destabilize the payment system and eventually reduce substantially the efficiency of national economy. In addition, as new payment methods developed in foreign country such as China's Ali-Pay are used for domestic payment, a new kind of payment risk shows up. Furthermore, the recent development of new technology such as big-data analysis, block chain or clouding computing shown in Figure 3-1 makes it extremely difficult to predict the types of accident in electronic payment or to prevent the accident from occurring.

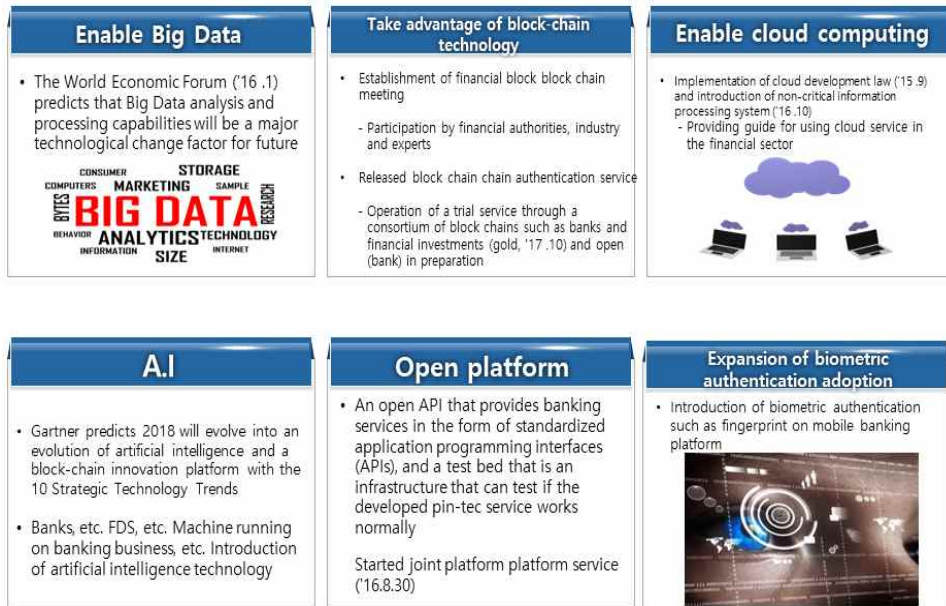
As seen in Figure 3-2 and some examples of accidents or crimes on the electronic finance in the next section, many different kinds of accidents and cyber attacks on the electronic payment system have been made in Korea for

the past few years. If they are not taken care of properly, they may bring substantial damages to the users of electronic payment system or even threaten the efficiency of whole national payment system. For example, if the DDOS attack on KFTC and other financial institutions in Korea, at June, 2017 had been succeeded, then whole national financial system might have broken done.

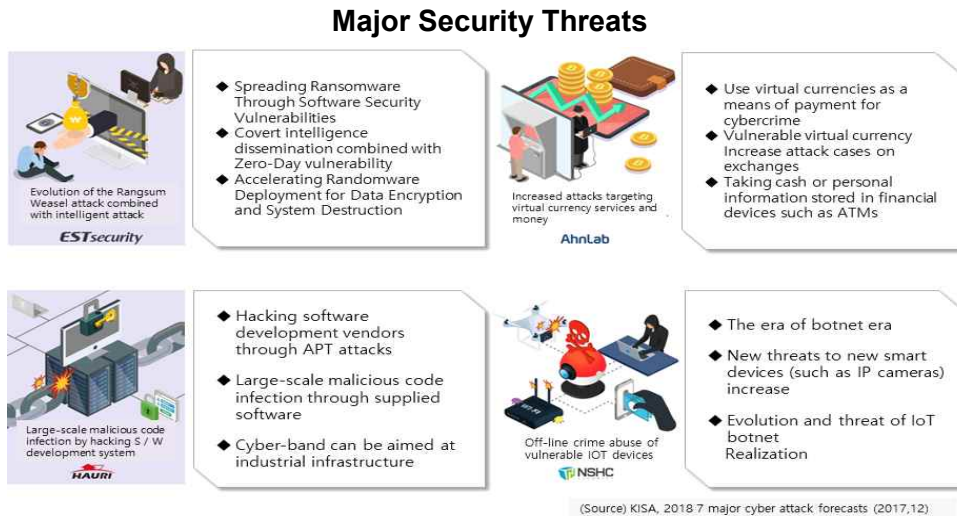
Accordingly, the financial regulatory agencies of Korea such as Financial Services Commission, the Financial Supervisory Service of Korea and the Bank of Korea have to conduct an intensive supervision and inspections on financial institutions' IT systems to ensure their safeties and to prevent damage to users.

<Figure 3-1>

Recent Changes in Financial IT Environment



<Figure 3-2>



B. Major Accidents and Disabilities

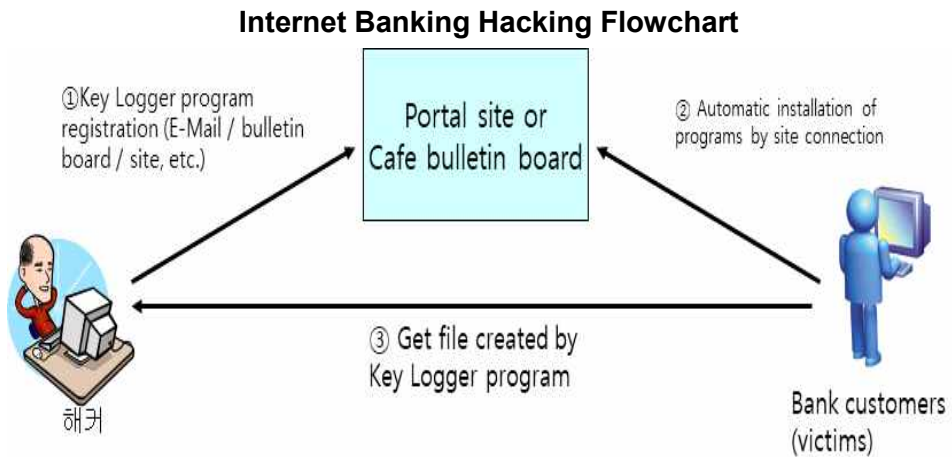
(1) Hacking on Internet banking

Hacking to internet banking mainly uses a method of uploading a post with a backdoor hacking program on the homepage of the financial institutions or sending a hacking program by e-mail to the users as seen in Figure 3-3. It tries to take the authorized certificate, security card and password required for accessing the account information of the customer.

According to one of the media reports in Korea, a bank hacking program called banking Trojans infiltrated into 59,117 internet banking users as early as in 2008. Although it eventually failed to bring any large financial accident, it gave very strong lessons to both general public and workers on financial institutions. More recently, an hacking on Bangladesh bank through SWIFT

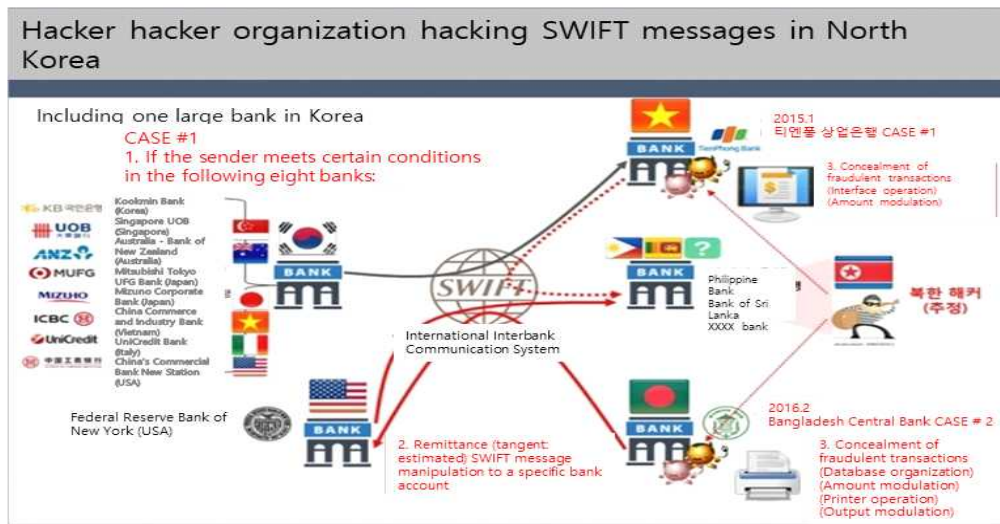
message in March 2017 brought serious damage on the credibility on the financial system as seen in Figure 3-4.

<Figure 3-3>



<Figure 3-4>

Major IT and Security Incidents - SWIFT case

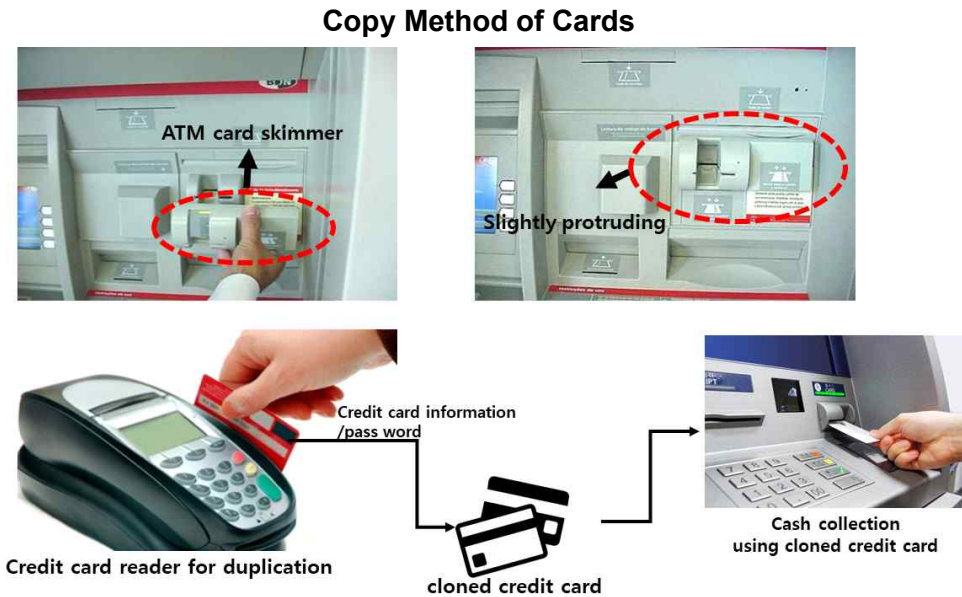


Source: Issue Market Lab

(2) Card Cloning and Skimming

Card Skimming or card cloning means that criminal uses a card skimming device to fraudulently copy bank customer details stored on the magnetic strip (brown/black strip at the back) on a debit or credit card as seen in Figure 3-5. It intended to takes the money from the account or illegally to use that card. As a method of copying a card, a variety of methods such as a method of attaching a copying device to a CD device and a method of using a card type replicator are used.

<Figure 3-5>



In Korea, two card cloning accidents occurred in April, 2003 and February, 2007. In April 2003, the criminal purchased five cash dispense (CD) machine

and cut off the cable connecting five CD units and the main body and connected them to his notebook where the hacking program was installed as seen in Figure 3-5. He installed his CDs in the center of crowded city. He extracted the card information of the customers and copied 495 cards from 14 banks. The card was used to withdraw 56 million won from five accounts of three banks. Another accident occurred in February, 2007, when 460 card information was leaked and three cards were copied, resulting in financial damage of 79 million won.

(3) Voice Phishing

The number of people suffering from voice phishing has sharply risen for the past years. Korean National Police Agency announced that its number rose from 17,040 in 2016 to 23,259 in 2017 and its financial damage did from ₩146.8 bil KWN to ₩247.0 billion KWN for the same period.

According to the National Police Agency, 1,6338 cases of voice phishing damage were reported from January to June 2018, and 179.6 billion won of financial damages happened. The number of case and damage amount has increased by 54% and 71% since the same period last year (10,626 cases, ₩1.51 billion KWN in the last year).

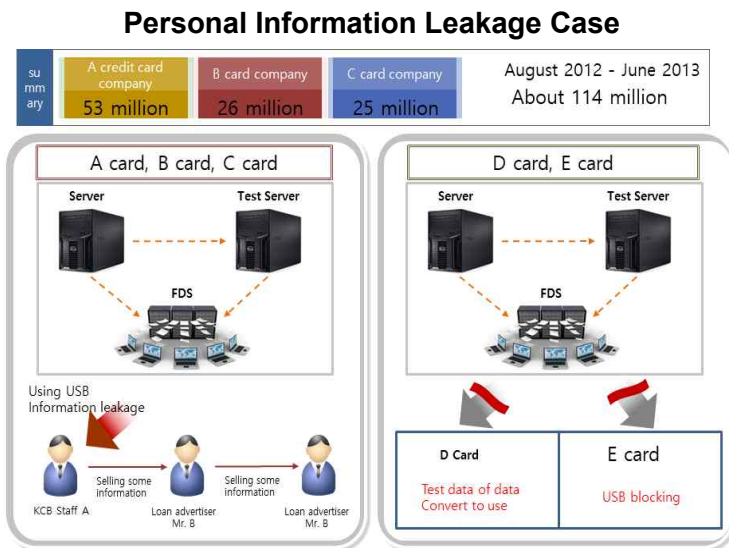
(4) Information Leakage

Leakage of personal information can bring not only a personal and social damage caused by privacy infringement but also a financial damages because

it can be used by voice phishing and internet banking hacking.

As seen in Figure 3-6, about 114 million personal information was leaked in 2014 and as a result, it became a big social issues. It happened while some Korean credit card companies were developing the new system with external consignment. One of the computer specialists who worked with the major credit card companies as a consultant downloaded the personal information of the clients of those card companies from their main computer and stored them in his PC. Since this leaked information was not circulated, any direct financial damage was not made to these card companies. However, they had to spend several hundred billion KWN to repair their reputation and to change their system.

<Figure 3-6>

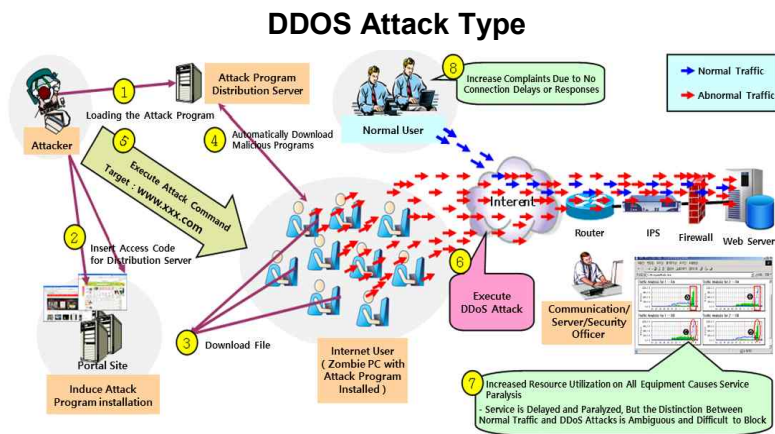


(5) System Paralysis

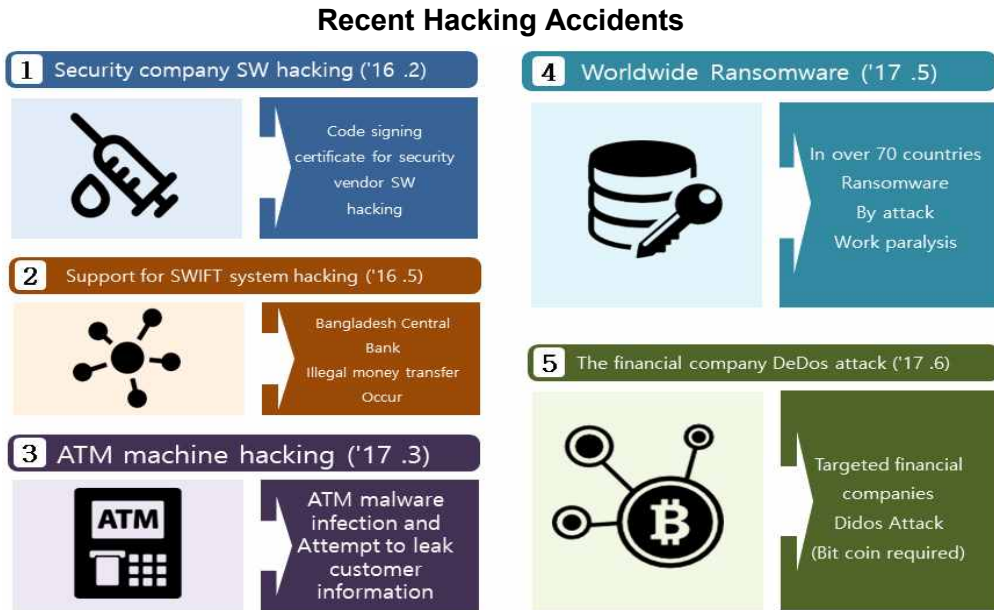
Generally, there are two ways to paralyze the computer system and their network such as denial-of-service (DDoS) attacks and ransomware attacks. DDoS attack make the incoming traffic flooding to the victim from many different sources to paralyze the system as seen Figure 3-7. Potentially, hundreds of thousands or more individual computers are used. Ransomware attack threatens to publish the victim's data or perpetually block access to it unless a ransom is paid.

One of the important examples of the DDoS attacks in Korea is that on KRTC and three local banks of Fishery bank, Dague Bank and Cheonbuk Bank in June, 2017. It was known that Armada Collective, one of international hacking groups, initiated this attack. Although it was well-manged by the staffs of these financial institutions and it did not make a large damage on these financial institutions, it gave an important lesson that at any time, this kind of cyber attack could be made in any time and all financial institutions should prepare for it. More system paralyzing attacks are shown in Figure 3-8.

<Figure 3-7>



<Figure 3-8>



2. Financial IT and Fin-tech Related Laws

A. Electronic Financial Transaction Law

(1) Legislation of Electronic Financial Transactions Act

While the Electronic Financial Transactions Act (EFT) regulating the electronic payment and transaction in Korea was enacted in January, 2007, Korean government initiated its legislation as early as October, 2002. The enactment was suspended for several years due to the problems such as different opinions from the experts on the law or the political debate in the national assembly. Even the experts did not agree with the elements and

contents included the act and politicians in the national assembly had difficulty to understand its contents.

When an crime of illegal withdrawals through the hacking on the internet banking occurred in 2005, the government tried to re-enact it and politician began to understand its importance. Therefore, it set up a joint working group with academics and prepared its legislation more actively. In the end, it passed the extraordinary parliamentary session on April 6, 2006 and finally, the government enacted the Electronic Financial Transactions Act (EFT) in January 2007, which contained the criteria for compensation and punishment in the event of an accident.

In the early 2000s, electronic transactions such as internet banking and online stock trading rapidly spread and a consensus emerged that a law governing the electronic financial transaction should be enacted. As of the end of June, 2004, the number of bank transfer by internet banking accounted for 25.7% of the total number of bank transfers, while that of bank tellers did for 31.3%. Online stock transactions accounted for around 60% of the total stock transactions too. The rapid expansion of e-commerce has increased the possibility of accidents on electronic financial transactions.

At that time, electronic financial transactions were partially regulated by several laws related on financial activities such as the civil law, commercial law, banking law, and specialized credit finance business law. As a result, the following several problems showed up. First, it was difficult to clarify the legal problems derived from the characteristics of electronic transaction of non-paper and non-face-to-face transactions. For example, there is no clear answer who is responsible if any person received financial loss by hacking of

his bank account. Second, the lack of the legal infrastructure to regulate payments has become an impediment to the development of e-commerce. Third, finance and telecommunication are converging, but the range of financial services that non-financial institutions such as telecommunication companies can provide is unclear and there is no supervision mechanism for it. Fourth, although ICT outsourcing of financial institutions is increasing due to its development, there is insufficient regulation for supervising its outsource and for securing safety of the outsourced system. In the end, it was necessary to facilitate through the legalization the development of the electronic financial industry including electronic payment industry.

The legislative enactment process was as follows. Since the late 1990s, when e-commerce was expanding and new payment instrument called 'electronic money' emerged, and the National Assembly (Democratic Party) tried to pass legislation on electronic payments at the end of 2001. However, a more systematic legislative process, which was needed for electronic financial transactions including electronic payment settlement, had been suggested in connection with the financial policy and institution. At the end of 2001, the Ministry of Information and Communication, the Bank of Korea, the Financial Supervisory Service, and the Korea Institute of Finance organized a working group with the Ministry of Finance and Economy. On August 25, 2003, the Electronic Financial Transactions Act was drafted and submitted to the National Assembly, but the bill was automatically rejected while it was pending in the judicial panel, as the 16th National Assembly was dissolved. And it was pushed to re-submission in 2004.

Since electronic financial transactions essentially belong to financial

transactions, legislation has been enacted focusing on maintaining the consistency of traditional financial transactions and discipline while considering the characteristics of the electronic transactions such as non-face-to-face transaction and non-paper transaction. So, only minimum discipline was included for maintaining the security of the financial system, and for protecting financial consumers.

It was noted that the new act did not constrain the market conditions or business models of financial institutions in order to cope flexibly with the rapid development of electronic financial technology. While the law also provided a large frame of discipline, details and technical matters were stipulated in the subordinate statutes such as the Enforcement Decree and Enforcement Regulations.

The outline of the enactment is as follows. First, it clarifies the basic elements and procedures of electronic financial transactions and establishes financial transaction related systems for the new electronic payment means. Second, in order to clarify the accountability when electronic financial accidents occur, it provides that financial institutions and electronic financial providers have to bear the responsibility for the damages of electronic accidents caused by modifying or hacking of access devices. Third, in order to promote the sound development of the electronic financial industry, the scope of work of those who run electronic financial business as non-financial institutions (electronic financial service providers) is articulated and the legal basis is provided for supervision and inspection of electronic financial service providers. Fourth, the security of electronic financial transactions and the protection of users are strengthened by reflecting on other electronic

characteristics.

(2) Major Contents of Electronic Financial Transactions Law

The electronic financial transaction law is made of two major parts such as the law on electronic financial transaction and law on electronic financial business. The part of the law on electronic financial transaction provides for the rights and obligations of electronic financial transaction parties, rules for electronic payment transactions to secure the safety of electronic financial transactions, and protection of users. The part on electronic financial business includes licensing and registration of electronic financial businesses. It is the first time in the world that the basic principles of the law related to electronic financial transactions and business are enacted as an electronic financial transaction law.

Electronic financial transactions means transactions in which a financial institution or an electronic financial provider provides financial products and services through electronic devices and users utilize it in an automated manner without directly facing or communicating with employees of a financial company or an electronic financial provider. Types of financial products and services are limited to the case where a financial company or an electronic financial service provider provides goods or services related to the financing of a fund by placing importance on the concept of "finance", and all financial products and services provided by a financial company or an electronic financial service provider (Broad sense). This scope of electronic financial services is reasonable when considering the popularization,

diversification and protection of users of electronic financial transactions. (Eg, credit information inquiry, transaction history inquiry is electronic financial service). They are classified as several forms as indicated in Table 3-1.

<Table 3-1>

Types of Electronic Financial Transactions

Division	possible Company type	Capital requirements	etc.
Electronic money issuance and management	Corporation	Capital 5 billion or more	Subject to permission
Electronic Funds Transfer	A partnership company Joint venture company Corporation Co., Ltd.	Capital 3 billion or more	To register
Issuance and management of debit payment instruments		Capital 2 billion or more	
Issuing and managing pre-paid electronic payment instruments		Capital 2 billion or more	
Issuing and managing pre-paid electronic payment instruments	A partnership company Joint venture company Corporation Co., Ltd. Satan (foundation) corporation	More than 1 billion in capital	
Electronic payment settlement business (PG) escrow		More than 1 billion in capital	
Electronic bill payment business (EBPP)		Capital 500 million or more	
Electronic bond registration and management		Capital 3 billion or more	

The non-face-to-face judgment should be based on the point of time of the transaction instruction, and the fact that face-to-face with a financial

company or an electronic financier at the preparation stage does not affect the non-face judgement.

"Employees of a financial institution or an electronic financial service provider" shall be limited to those who are in employment relationship with a financial company or an electronic financial service provider.

The requirements of 'automatic' are not required in the preparatory phase of electronic financial transactions like the non-face-to-face requirements, and are required throughout the transaction instruction phase and the transaction processing phase in the transaction phase.

Users are largely divided into individuals, corporations, etc., and merchants according to the Act are included in the category of users.

For all electronic financial transactions, the Electronic Financial Transactions Act shall apply except as otherwise provided in other laws and regulations (Article 3).

In the event of damages to the user due to intentional negligence of the electronic financial supporter, the liability of the first damages shall be borne by the financial institution (Article 11 of the Act). You need to be careful.

Electronic banking transactions through BOK-Wire (BOK-Wire member ↔ BOK), electronic financing transactions through financial settlement network (bank joint network member ↔ KFTC), securities computation (Base 21) (Article 3 of the Act, Article 5 of the Enforcement Decree of the Act).

In addition, Korean Federation of Community Credit Cooperatives (KFCC) and Post Office are excluded from the subject of electronic financial supervision and inspection only because their supervisory agencies are

different from other financial institution such as commercial or financial companies.²⁶

After the enactment of the Electronic Financial Transactions Act, there has been a big change on the part of the supervision and inspection right of electronic financial services and information technology (IT) sector of financial companies. According to Electronic Financial Transactions Act (Article 39), supervision and inspection of 'electronic financial service providers' as well as financial companies are conducted through the system of the Enforcement Decree of the same Act, 'Electronic Financial Supervision Regulations' and 'Enforcement Rules'.

(4) Main Provisions of Electronic Financial Transactions Act

A financial institution or an electronic financial institution shall compensate the user for damages caused by "an accident occurring in the process of modifying, contracting, or electronically transmitting transaction instructions".

The accidents in the act include (1) accidents caused by forgery or alteration of access media, (2) accidents occurred during electronic transmission or processing of contracts or transaction orders.

Electronic devices for electronic financial transactions or the use of access media acquired by fraudulent or other illegal methods in the information communication network pursuant to Article 2, Paragraph 1, Item 1 of the Act on the Promotion of Information and Communication Network Utilization

²⁶ Korean Federation of Community Credit Cooperatives (KFCC) is supervised by Ministry of Public Administration and Security and Post Office is by Ministry of Knowledge Economy.

and Information Protection, etc. accident

Notwithstanding the provisions of Paragraph (1), a financial institution or an electronic financial institution may cause the user to bear all or part of the liability in any of the following cases: <Amended in May 22, 2013>

In case of accident or serious mistake of the user in the event of the accident, the user may conclude a contract with the user in advance to assume that all or part of the responsibility may be borne by the user. In the event of damage to a user who is a corporation (excluding a small business under Article 2 (2) of the Framework Act on Small and Medium Enterprises), a financial institution or an electronic financial institution shall establish a security procedure in order to prevent accidents, If you have fulfilled the required full cautions

Recently, financial institutions have been liable for damages caused by Internet banking hacking, cash card debit, bank VAN CD cash withdrawal, online transaction network problems (hurdles) and other hacking.

The scope of the intention (the enforcement decree Article 8) of the intention of the user is as follows: (1) Third-party rental of access media, provided for the purpose of delegating use or assignment or collateral, (2) When the access medium is leaked, exposed or left unauthorized to use the third party access medium.

A financial company that conducts electronic financial affairs. An electronic financial institution must either subscribe to insurance (deductible) or earn reserves to fulfill its liability for damages.

B. Privacy Protection Acts

(1) Legislation on the Privacy Protection Act

The Personal Information Protection law is to protect the confidentiality of privacy from the collection, disclosure, misuse, or abuse of personal information. Personal information includes all things with which a relevant person can be easily identified by combining them with other information even if he or she cannot be identified with the individual information. More specifically, personal information means information such as a name, an ID number, and the like with which an individual can be identified.²⁷ The law was created to promote the rights and interests of people and to realize the dignity and value of an individual.

The law on the protection of personal information in Korea began with the "Guidelines for the Protection of Personal Information Handled by Computers" established in May 1991 by the Prime Ministerial Directive, and the Law on the Protection of Personal Information of Public Organizations enacted in 1995. It was mainly designed for the information security of public institutions. Since the interest in the protection of personal information has increased, personal information protection has been extended to private institutions as well as public institutions

²⁷ Recorded information about an identifiable individual may include his or her (1) name, address, email address, phone number, (2) race, nationality, ethnicity, origin, color, religious or political beliefs or associations, (3) age, sex, sexual orientation, marital status, family status, (4) identifying number, code, symbol, (5) finger prints, blood type, inherited characteristics, (6) health care history including information on physical/mental disability, (7) educational, financial, criminal, employment history, (8) others' opinion about the individual, and (9) personal views except those about other individuals.

In Korea, laws related to the protection of personal information include the Law on the Use and Protection of Credit Information. It was enacted in 1995 to protect the confidentiality of credit information from misuse and abuse.²⁸ This law was designed to control a credit information company or the credit information concentration agency in the process of collecting and analyzing personal credit information because the privacy problems may be serious. According to this law, credit information concentration agencies cannot collect or investigate information that is not related to credit information such as personal political thoughts or religious beliefs, personal credit information, or information prohibited by other laws. In addition, when each financial institution intends to provide credit information of related individuals to a credit information company, it should obtain consent from the individual in writing or in an electronic document with an authorized digital signature.

(2) Concept and Types of Personal Information

According to the Personal Information Protection Act, 'personal information' is information about a living individual, which can be used to identify an individual through name, resident registration number, and image, and can be easily combined with other information. In other words, the information that can be recognized by a particular individual is defined comprehensively as information that can be recognized by combining it with other information. As a comprehensive concept of the law is recognized, several other code or number such as RFID identification codes, smartphone

²⁸ The Law on the Use and Protection of Credit Information was completely amended in 2014.

terminal numbers, and biometric information are included in the category of personal information. The concept of personal information is continuously expanding in accordance with the development of social environment, industrial development and technology as seen in Table 3-2.

Major personal information on the financial sectors includes an account information (account number, balance, interest rate, etc.) and loan information (loan account, interest rate, amount, etc.) in Table 3-3. Credit card information (card number, card password, expiration date, etc.) or real estate information may be included as well.

<Table 3-2>

Changes in Concept of Personal Information

Division	Past	Now
Concept	Information such as name, resident registration number video, etc. that can identify an individual	Even if you can not identify an individual by itself
Value recognition	Incidental information that arises from the operation of the business, which is costly to manage	Fundamentals of monetization such as financial transactions, customer management, e-commerce
Scope of damage	Personal privacy exposure	Leading to monetary damages and cyberbullying, including phishing, identity theft, and financial fraud

<Table 3-3>

Examples of Classification of Personal Information of Financial Companies

Type	Personal information item
Identification information	Resident registration number, driver's license number, foreigner's number, passport number
Basic Information	Name, address, phone number, email address, cell phone number, birthday, etc.
Financial Information	Account information (account number, balance, interest rate, etc.), loan information (loan account, interest rate, amount, etc.)
Credit Information	Credit card information (card number, card password, expiration date, etc.), real estate information, etc.
Other information	Loan balances, overdue information, credit rating, deferred payment, current status, etc.

(3) Cases of Personal Information Infringement

Several incidents on the personal information infringement as below in Korea as well as in the other countries. One of the notorious examples is the data medical leakage accident occurred in Singapore in July, 2018. About 1.5 million personal information on medical records including that of prime minister Lee Hsien Loong was leaked out by hacking attack. Still it was now known who did it and why he did it. There was a rumor that the hacker tries to take the information of prime minister.

The second important example it the personal information leakage accident on Facebook in 2018. As more than 87 million user's personal information of Facebook has been revealed, it has been proved that personal information on

anybody can be misused. It shows that a simple business mistake might bring a substantial impact on the society regardless of the user's will. Facebook has provided collected members information to 60 major smartphone manufacturers around the world, including Samsung Electronics, Apple and Amazon, and this information sharing has lasted more than 10 years. As such, Facebook is reported to have neglected the leakage of third parties of user information.

Some of the examples of the personal information leakage are shown in Table 3-4. One of the most important ones is the one in three major credit card companies in Korea happened in January, 2014. More than 80 million personal information were leaked.²⁹

According to the analysis on the types of personal information leakage done by National Internet Development Agency of Korea, they were mostly leaked out to the operator 's office alone as seen Figure 3-9. Then it was followed by the cases provided to the third parties without the consent of the individual, and the cases collected indiscriminately for the purpose of telemarketing. Surprisingly, ID and password theft occurred at a relatively low rate. As a result, insider misconduct is more likely to be caused by mismanagement than hacking with high technology.

²⁹ It is explained more in the B. Major Accidents and Disabilities of this chapter.

<Table 3-4>

Recent Cases of Leakage of Personal Information

Period	Occurrence Company	Cause of Occurrence	Damage Scale	Leakage information	Sanctions,, etc.
March 2010	25 Companies including Shinsegaemall	Hacking	20 million	Resident Registration Number, ID, Password	Panalties based on ther Level of Leakage by Company
August 2011	Samsung Card	Internal Outflow	800,000	2 Digits in front of Resident Registration Number, etc.	Warning of Institutional and Expelling Employees
July 2012	KT	Hacking	8.7 million cases	Resident Registration Number, Phone Number, Rate System, etc.	Penalty, A Corrective Oeder
January 2011	3 Credit Card Companies (KB,Lotte,NH Card)	Subcontractor Leakage	87 million cases	Resident Registration Number, Credit Card Nunber, Payment account, etc.	A Three-month Suspension, A Fine of Six Million Won for Each Company
March 2014	KT	Hacking	11.7 million cases	Resident Registration Number, Usim Card Number	A Fine of Seventy Million Won, 15 Million Won, A Corrective Order

Source: Korea Internet & Security Agency

<Figure 3-9>

Personal Information Infringement Type

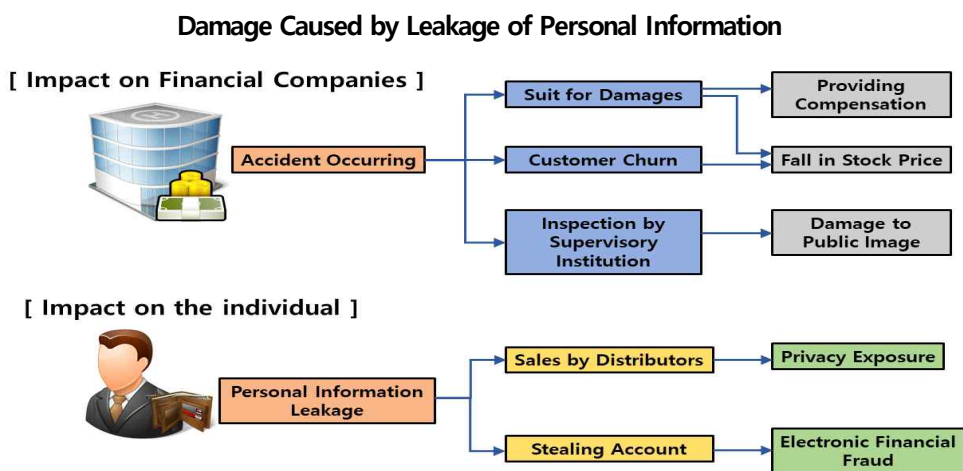


Note: data is at the year of 2014.

Source: National Internet Development Agency of Korea

What will happen if a personal information infringement occurs? Figure 3-10 gives the answer for it. First, for financial companies, it may lead to a boycott of consumer groups, collective damages by many victims, punishment of employees due to the supervision period inspection, decrease in revenues due to the departure of customers, and a drop in share prices. In addition, corporate reputation and image become ineffective. Due to the nature of financial business based on trust, once damaged images become difficult to overcome for many years. Secondly, personal suffering is caused not only by psychological damage but also by exposure to privacy due to impersonation, monetary damage by voice phishing, and social network services. Third, in the country side, repetitive infringement of personal information leads to a decline in e-government reliability and national brand, and direct or indirect damage, such as declining competitiveness of IT industry export.

<Figure 3-10>



(4) Protection of Personal Information

There are four channels to protect the personal information and prevent the leakage such as ① Collecting personal information, ② Use of personal information, ③ Providing personal information and Destruction of personal information.

The highest percentage of reported personal information infringement is "collect without consent". In addition to the information collected directly from customers in the case of financial companies, information (financial transaction details, etc.) generated during the business process is included in the collection of personal information. Therefore, if you want to generate unnecessary information for a contract or transaction with a customer, you must obtain the consent of the customer. In order to prevent the unauthorized collection of personal information, personal information collected by the financial company should be divided into the information necessary for the contract and the information selectable, and should be operated to collect at least the necessary information.

Personal information collected by a financial company should be classified into common essential information, essential information for each product, and optional information as seen in Table 3-5.

<Table 3-5>

Essential Information and Optional Information Classification

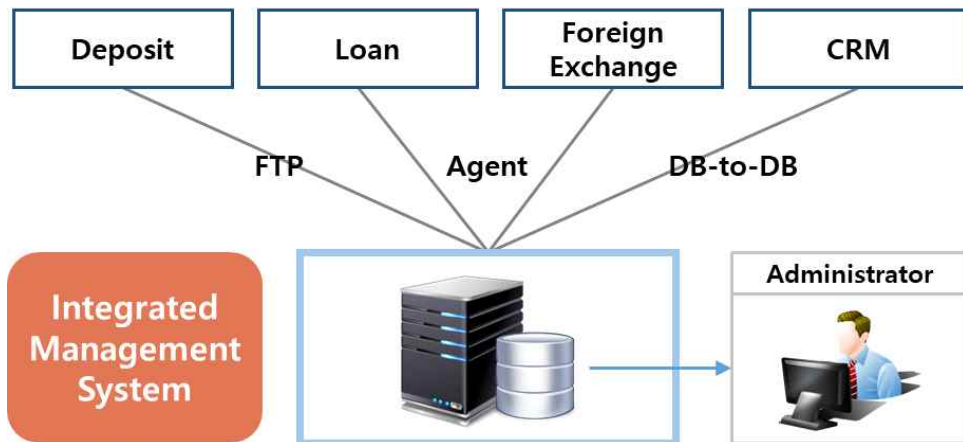
Division	Main Content
Common essential information	<ul style="list-style-type: none">- minimum personal information required to set up and maintain financial transactions with customers- Name, unique identification information, address, contact, occupation, nationality
By product Required information	<ul style="list-style-type: none">- This information is essential for the concluding and implementation of individual products. Collect only for customers who use the product (related to the requirements for enrollment)- Classify essential information according to product, but if there is not essential information by product, conclude contract with only essential essential information
Optional Information	<ul style="list-style-type: none">- information that is not essential to the contract but which affects the terms of the transaction- Information you need to provide additional benefits such as free injury insurance

According to the Comprehensive Measures to Prevent the Recurrence of Personal Information Leakage in the Financial Sector (March, 2014), it is foreseen to strengthen the storage method for the resident registration number, which is the core of personal information. Financial real name law, credit information law, and so on. In the case of a copy of ID card, it is imaged at the branch terminal and registered in the server through the BPR system. Therefore, the control should be strengthened so as to encrypt the image stored in the server as well as the ID image stored in the PC. In the case of loan applicants, it is necessary to review the establishment of a mobile sales support system using smart pads in accordance with the principle of not keeping a copy of identification card.

The method of transmitting the log file recorded in the personal information processing system to the integrated log management system generally utilizes the FTP method, the Agent method, and the DB-to-DB method, which are operated in a daily batch mode as in the Figure 3-11. Agent method has the advantage of monitoring the state of the raw log file by the integrated log management system and processing the refinement process to convert it to the integrated log format in the individual system although it affects the cost and the server performance of the agent purchase have. If it is necessary to check real-time information such as unauthorized viewing of personal information in real time, a real-time system using a big data processing platform can be constructed.

<Figure 3-11>

Personal Information Integrated Log Management System



If any financial institution like to provide personal information to the outside, prior agreement is required. When providing personal information to

an external party, it is necessary to distinguish first whether the personality is entrusted to a business or a third party. Because business consignment and third party provision differ in character and management responsibilities as seen in Figure 3-12, legal and security measures must be applied according to their nature. The business entrustment provides personal information to the entrusted company for the purpose of business of the personal information processor (financial company), and the entrustor (financial company) is responsible for the management responsibility and the liability for damages. Third party provision is to provide information for the benefit of third parties who receive personal information, and the responsibility of management and liability for damages shall be borne by the person (third party) who receives personal information.

<Figure 3-12>

The Distinction between Business Consignment and the Third Party Provision

	Business consignment	Third Party Provision
Definition	Providing personal information to the trustee for the business purpose of the manager of personal information	Providing personal information to third party other than the manager of personal information for the benefit of third party or business purposes
Obligation	<ul style="list-style-type: none"> · Duty of notice : When providing personal information due to direct marketing business entrustment · Duty of open : Consignment information (consignment contents, trustee) disclosure 	<ul style="list-style-type: none"> · Duty of notice : Notice about offering to third party · Duty of open : Acquisition of information object consent for offering to third party ※ Consent items (5 types) : recipients, items, purpose, period of retention and use, right to reject
Example	<ul style="list-style-type: none"> · Agent service for Contracting(Telemarketing etc) · Agent service for Management(delivery of merchandise, AS etc) · Consignment service of Computer management(System, Database development etc) 	<ul style="list-style-type: none"> · Email promotion for offering financial services · Telemarketing for insurance product introduction

Source: Korea Internet & Security Agency

The contractor must establish personal information protection measures from the planning stage so that they can comply with the management level required by the regulations as in Table 3-6. In the stage of consignment management planning, the scope and period of the personal information to be consigned should be determined, and the security management items to be complied with by the consigning organization should be set in the contract and the responsibility should be set. In addition, it is necessary to regularly check the actual status of the consignment through the homepage until the end of the consignment period.

<Table 3-6>

Business Consignment and Responsibility of Third Party

division	Main Content
Consignor's Responsibilities and Responsibilities	<ul style="list-style-type: none"> - Contents of the work when the personal information processing business is commissioned, disclosure of the trustee - Educate fiduciaries on a regular basis to ensure that personal information is not lost, stolen, leaked, tampered or tampered with - Regularly supervise whether the trustee handles personal information securely. - In the event of a claim for damages, the fiduciary shall Considered as an employee
Trustee Responsibilities and Responsibilities	<ul style="list-style-type: none"> - Exceeded the entrusted business scope use of personal information and can not provide third party - Obligations of the person handling personal information

Source: Korea Internet & Security Agency

Personal information should be destroyed without delay (within 5 days) when the retention period has elapsed or when it becomes unnecessary to

achieve the purpose of processing personal information. In the case of financial institutions, even if the transaction is terminated, the related statute sets a certain period of retention period. If the retention period is unclear in the statute, the procedure can be implemented so that it is destroyed by consent or request of the customer. If the statutory limit is unclear or the consent of the information subject is not available, it shall be destroyed when the purpose of processing the personal information is completely achieved. At this time, the point at which the processing purpose is fully achieved can be set as the "transaction end date".

The timing of personal information destruction can be determined according to the statutory preservation period, the consent of the customer, and the attainment of the processing purpose.³⁰ Depending on whether the information storage medium is paper or electronic data, the destruction time may vary. In the case of paper documents, the paper must be destroyed according to the retention period set by each financial institution. In the case of the server, the personal (credit) information of the information subject should be deleted within 5 years from the transaction end date. You can keep it after you take action. Other media, such as PC and USB, should be destroyed as soon as the purpose of using the information is achieved.

In the case of personal information destruction, it must be destroyed in a way that can not be restored in accordance with Article 15 of the Enforcement Decree of the Personal Information Protection Act. In the case of an electronic file, it must be permanently deleted in a way that can not be

³⁰ For examples, Electronic Commerce Law indicates Statutory Data Retention Period as below: three years for Consumer Dispute Settlement Records, five years for Fee Settlement and Contract and withdrawal.

restored. Other physical forms such as storage media may be destroyed by incineration, melting and so on. Table 3-7 gives several ways of destruction of data and information.

<Table 3-7>

Destruction Method

Division		How to destroy
Paper document		When the personal information processing department destroys documents (output, printed materials, etc.) containing personal information, it is physically destroyed so as not to be identified by means of crushing, incineration, melting etc.
Electronic file	server	In principle, the deletion of personal information held by computer is forbidden, and after deletion, it can be destroyed or separated so that it can not be searched in related table
	PC	The data stored in the PC using the information processing request or system should be encrypted using an encryption program and deleted after the purpose of use is achieved
	Electronic device (Other storage medium)	Use 'Low level format' for hard disk, USB memory, external hard disk, CD etc

Source: Guidelines for preventing the recurrence of banknote personal information leakage

C. Other laws

(1) Resident Registration Act

One of the most important things to being required to have a safe and secure electronic financial transactions is to verify the identity of the users. In

Korea, the most basic information for identification is the resident registration number. Of course, there is a claim that this information is not very helpful because it has been hacked a lot and so it can be bought in the dark internet. It is important, however, to have one resident registration number and only one for each person so that the most basic identity verification can begin with this number. For example, if an individual has two resident numbers A and B, in some cases A, and in some cases B, then the identity cannot be verified if we do not know that A and B are the numbers of the same person.

In other words, it is necessary to have a legal infrastructure to verify each person's identity throughout the nation. In Korea, the Resident Registration Act is the legal basis for the national identification number system. The card, which has a unique number written on it for each person, is given to all Koreans living in Korea according to this law.

These numbers began to be granted on November 21, 1968, with the issuance of resident registration cards for the purpose of identifying spies easily. The origin of the current resident registration number emerged after the enactment of the Resident Registration Act in 1962³¹. At the time, however, it was implemented in a form of a citizen card or province inhabitant card, and was not implemented properly and so dual registration was possible. The Resident Registration Act was revised in 1968 to assign restrict registration to one and only one registration number and one number

³¹ During the Japanese colonial rule, the legal grounds existed in the form of the Chosun Temporary Resident Ordinance and Regulations (Article 32, 1942.9.26), and there was a law called Chosun Temporary Resident Ordinance after the establishment of the Government of the Republic of Korea which was replaced by the current law.

only for each resident. Dual registrations were prohibited and resident registration numbers were issued to citizens over 18 years old, and city or province inhabitant cards were officially abolished.³²

(2) Act on Real Name Financial Transactions and Confidentiality Guarantees

Regarding to financial transactions, the Act on Financial Real Name Transactions and Confidentiality Guarantees or simply the Financial Real Name Act is one of the most basic legal infrastructures for identity verification. It disallows trade through either a pseudonym or a borrowed name. For example, it is illegal to register your property in the name of one's friend or relative, and to buy or to sell the property under such name. In other words, financial transactions must be done in the name of the beneficial owner. If anyone registered his property in the name of his associate and he/she claims that property is his or her property, that property will legally become the property of his associate according to the law. It is difficult to achieve the purpose of identity verification in financial transactions if financial transactions can be made in borrowed names. This law makes identity verification in financial transactions more effective.

³² On January 21, 1968, a group of 12 North Korean Special Forces personnel raided the Blue House (Korean White House) to kill President Park Chung Hee. In response, the Resident Registration Act was revised in 1968. The second amendment in 1970 imposed mandatory issuance and enacted the use of resident registration cards for identification purposes.

(3) Act on Reporting and Using Specified Financial Transaction Information

The Act on Reporting and Using Specified Financial Transaction Information or simply the Anti-Money Laundering Act is useful to strengthen the identity verification based on the financial real name act. Money laundering means disguising the property acquired by illegitimate methods as if it were obtained lawfully. The Anti-Money Laundering Act makes financial institutions report to the government in case that money laundering is suspected. If there is any suspicion that financial assets are traded in a borrowed name, not in the name of the beneficial owner, the institution should report to the government. If it is confirmed as a transaction under the borrowed name, the government may take legal action. Therefore, anti-money laundering laws can be an additional part of the infrastructure for identity verification.

(4) The Electronic Signature Law

The Digital Signature Act was enacted in 1999 to set out the basics of digital signatures. An "electronic signature" is an electronic form of information attached to or logically associated with an electronic document to indicate that the signer himself or herself has signed the electronic document. That is, if the related electronic document has a public electronic signature, it has legal effect similar to the signature on a paper document. The official certificate was introduced in accordance with the Act and was used in various

financial transactions.

3. Korea's Financial IT and Fin-tech Supervision and Inspection System

A. Financial IT and Fin-tech Supervision and Inspection system

(1) Financial Supervisory System in Korea

Korea's financial supervisory system almost completely changed after the 1997 financial crisis. Table 3-8 shows the basic structure of financial supervisory system prior to the 1997 financial crisis. It tells that before the crisis, it was composed of the four different supervisory agencies of which each supervised only assigned financial institutions on it such as banks, securities companies, insurance and non-bank financial institutions. Major agencies were the supervisory authority of the Bank of Korea, the Securities Supervisory Agency, the Supervisory Authority of the Insurance and the Ministry of Finance and Economy.

Korean government reformed this separate supervisory system into a one integenerated system with consolidating financial supervisory authorities across all financial sectors after the 1997 financial crisis. It aimed to cope with the changes of financial environments such as liberalization, deregulation and globalization of the financial industry since the 1997 financial crisis and to overcome the crisis rather quickly.

<Table 3-8>**Financial Supervision System Prior to the 1997 Financial Crisis**

Division		Supervisory authority	Inspection agency	Inspection right agency
Banks	Commercial Banks	Bank Supervisor	Bank Supervisor	
	Specialty Banks	Ministry of Finance and Economy	Auditorium	Bank Supervisor
Securities Companies	Securities Company	Securities Supervisor	Securities Supervisor	
	Investment Trust Stock Exchange	Ministry of Finance and Economy	Ministry of Finance and Economy	Securities Supervisor
Insurance Companies	Insurer	Insurance Supervisor	Insurance Supervisor	
	Reinsurer	Ministry of Finance and Economy	Ministry of Finance and Economy	Insurance Supervisor
Other	Credit Guarantee Fund	Ministry of Finance and Economy	Auditorium	Bank Supervisor

The new integrated supervisory system is made of two major institutions such as the Financial Supervisory Service (FSC) and the Financial Supervisory Service (FSS).

The Financial Services Commission (FSC) in Korea shall establish and amend laws and regulations related to the supervision of financial institutions. This Commission consists of a total of nine members including the chairperson, the vice-chairperson, the vice-minister of the Ministry of

Finance and Economy, the vice-governor of the Bank of Korea, accounting experts, legal professionals, and representatives from the business world.

The Financial Supervisory Service (FSS) is a private non-profit corporation to operate as Korea's fully integrated supervisory authority under the Act on the Establishment of Financial Supervisory Organizations in 1999. The FSS conducts prudential supervision of banks, nonbank financial companies, financial investment services providers, and insurance companies in order to ensure they comply with certain safety and soundness guidelines, standards, requirements, and safeguards. In addition, the FSS performs capital market supervision, consumer protection, and other supervision and enforcement activities as delegated or charged by the FSC. The structure on financial supervisory system in Korea are described in Figure 3-13.

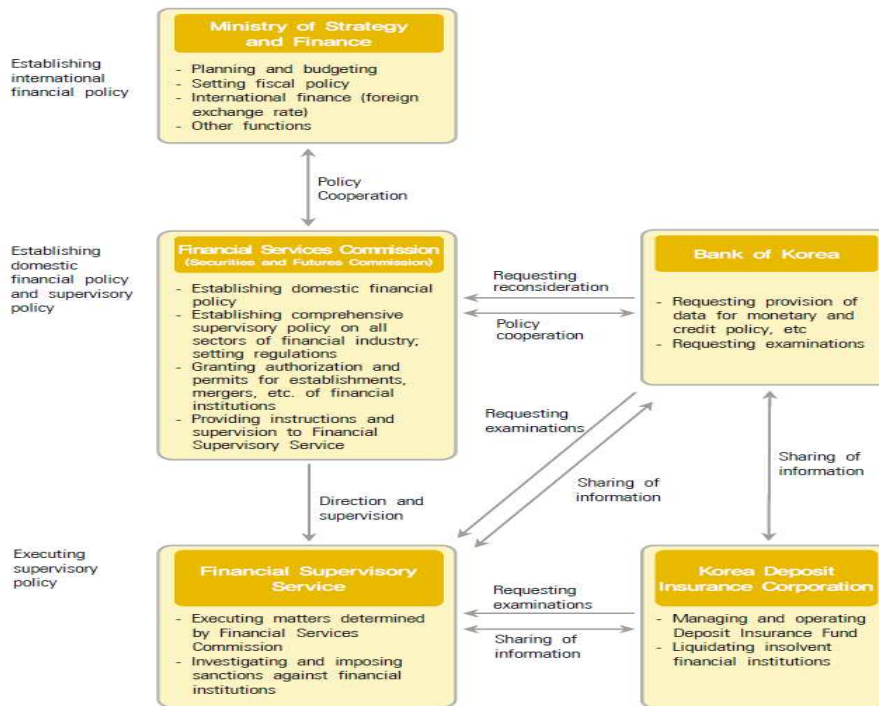
There are several other organization responsible for financial supervision. The Ministry of Strategy and Finance is participating in the Financial Services Commission as an ex officio member to reflect the opinions and stance of the government because the role of the financial sector in carrying out the national economic policy is very large.

The Bank of Korea is a specialized corporation established by the Bank of Korea Act with the aim of contributing to the sound development of the national economy by establishing efficient monetary policy as a central bank in Korea and stabilizing prices through enforcement. In the Bank of Korea, the Monetary Policy Committee (MPC) has been established as a body to vote on monetary policy. If it is deemed necessary to carry out the monetary credit policy, the MPC may request from the Financial Supervisory Service to inspect the financial institution or require the personnel of the Bank of Korea

to jointly participate in the examination of the financial institution by the Financial Supervisory Service. In addition, the vice chairman of the Bank of Korea participates as an ex officio member in the Financial Services Commission in order to enable the organic linkage between monetary policy and the financial supervision policy.

<Figure 3-13>

Financial Supervisory System in Korea



Source: The Bank of Korea, *Payment and Settlement System in Korea*, 2016

The Korea Deposit Insurance Corporation is a non-profit corporation established to efficiently operate the deposit insurance system in order to

protect depositors and maintain the safety of the financial system in the event of insolvency of financial institutions. The Korea Deposit Insurance Corporation may ask the Financial Services Commission or the Financial Supervisory Service to inspect the subordinated financial institutions or a member of the Korea Deposit Insurance Corporation may jointly participate in the inspections of the Financial Supervisory Service. The president of the Korea Deposit Insurance Corporation is an ex officio member of the Financial Services Commission and the vice chairman of the Financial Services Commission participates as an ex officio member of the Deposit Insurance Committee.

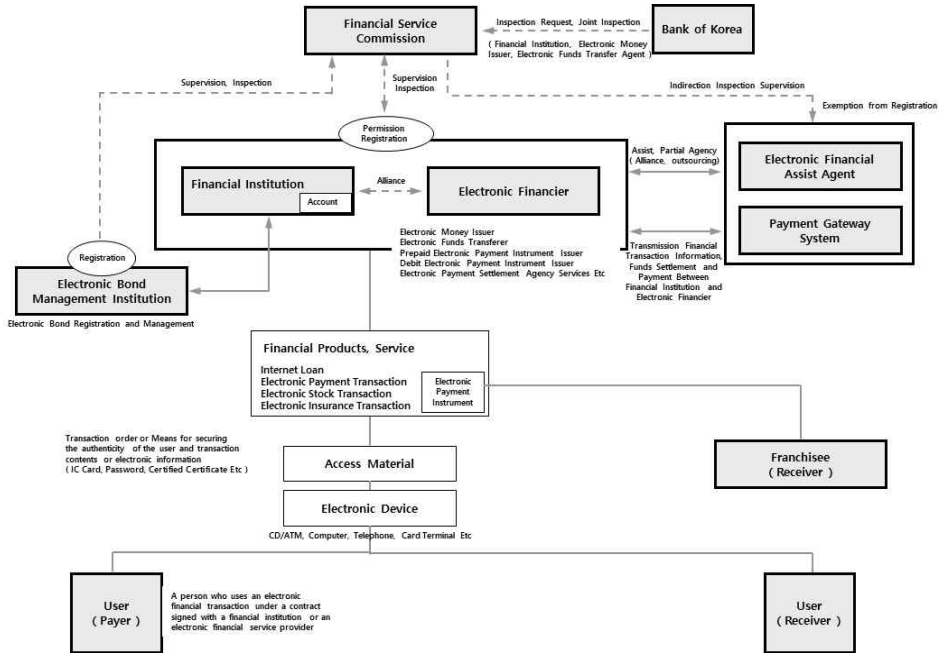
In addition, the Korea Asset Management Corporation, the Ministry of Science and ICT and the Fair Trade Commission are also very important to regulate the electronic payment and finance.

(2) Financial IT and Fin-tech Supervision and Inspection System

Financial IT and fin-tech supervision and inspection activity belongs to the one of the activities conducted by the Financial Supervisory Service (FSS). As seen in Figure 3-14, FSS mainly supervises and inspects the ICT system of financial institutions and fin-tech companies. Sometimes, it may be conducted with staffs of the Bank of Korea.

<Figure 3-14>

Financial IT and Fin-tech Supervision and Inspection System



B. Manual for Supervision and Inspection on Financial ICT and FinTec

(1) Importance of the Evaluation of ICT Sector

The evaluation on financial companies' ICT sector complements the assessment of general business management status (CAMEL-R, etc.). It evaluates the IT fields extensively which are the core functions of each financial company's business by a comprehensive and unified method. Furthermore, it enhances the safety and soundness of financial companies by securing the safety and soundness of the ICT sector.

Currently, the main tasks of financial companies are being handled by computerized systems. As the demand for customers' financial services increases and competition among financial companies deepens, Internet banking, smart phone banking, phone banking, firm banking, cyber trading, In recent years, non-face-to-face transactions with customers have increased through advanced electronic financial services such as electronic devices and electronic wallets. In the trend of expanding investment in the IT sector, the safety and soundness of the IT sector is directly linked to the financial performance and external credibility of the financial company.

In the past, most ICT related accidents of financial companies were caused by simple mismanipulation on the terminal of the branch staffs. However, in recent years, leakage of customer information or electronic financial transactions by third parties are the major types of accidents. In particular, accidents in the new financial channels such as mobile banking, phone banking accidents, and cyber trading is increasing. Therefore, systematic evaluation of the strengths and weaknesses of ICT sector and professional supervision and inspection on ICT sector are required to prevent ICT related accidents in advance. Furthermore, the proportion of IT investments in the total budget of financial companies has been increasing substantially.

We have developed a checklist for assessing the actual condition of the IT sector so that the expertise and specificity of the IT sector can be reflected in real terms, reflecting at least 20% of the risk management category.

(2) Basic Operation Direction on ICT evaluation

To assess the actual condition of the ICT sector, an independent evaluation system is introduced. This system evaluates the IT sector separately from the general business inspection.

Inspection on the IT sector is operated as "sector inspection" and the actual status evaluation level of the IT sector is evaluated by the evaluation standard of the IT sector according to the expertise and specificity of the IT area.

The inspection and evaluation on the actual practice of the IT sector is assessed to the financial institutions with high IT risks and to the financial institutions with concentrated computer networks and high reliance on IT sector. Major financial institutes with high IT risks are made of (1) Banks: domestic commercial banks, local banks, specialized banks, (2) Security companies: domestic securities companies, domestic futures companies, domestic subordinated companies, (3) Insurance: domestic life insurance, domestic non-life insurance and (4) Other financial institutions: Credit Card Companies, Comprehensive Financial Companies, Credit Finance Companies with assets over 2 trillion KWN and Mutual Savings Banks.

Financial institutions with concentrated computer networks includes (1) securities transaction related one such as Korea Exchange, Korea Securities Depository, and Korea Securities Finance Corporation and (2) insurance related one of Insurance Development Institute, (3) other ones such as Federation of Mutual Savings Banks and National Association of Credit Cooperatives.

Several associations are also included such as Korea Financial Investment Association, Life Insurance Association, Non-life Insurance Association, Korea Fire Insurance Association, Credit Finance Association and finally

(3) Evaluation Items

The evaluation on ICT sector is made of five categories such as (1) ICT audit, (2) ICT management, (3) system development, introduction and maintenance, (4) IT service provision and support, and (5) IT security and information protection as seen Table 3-9. Based on this classification, comprehensive evaluation is carried out. A total of 25 evaluation items are set for the above five fields, but all of them are evaluated based on the scale factor in the nature of IT business.

The evaluation items are made of 'evaluation item' and 'detailed evaluation item' for each of the five evaluation fields and 'check items for detailed evaluation items' as auxiliary items for the detailed evaluation items are made. When actually assess and evaluate the ICT system of a financial system, the number of supplementary items such as its types (bank, non-banking, insurance, securities) and its size (large, medium and small) are taken care of.

<Table 3-9>

25 Evaluation Items

Evaluation Section	Number of evaluation items	Number of detailed evaluation items
IT audit	3	10
IT Management	6	20
System development, introduction and maintenance	4	11
IT service delivery and support	7	28
IT security and information protection	5	17
Total	25	86

Since most of the core business of financial companies is computerized and most transactions are processed by ICT system, the safety and soundness of the ICT sector has a great influence on the safety and soundness of the whole business of the financial company. Therefore, it is important to establish an appropriate internal control system for the ICT sector and to check periodically whether these internal control systems are properly operated to by independent auditing organizations. That is why inspection on IT audit become the first categories of ICT evaluation.

Inspection on IT audit is designed to check whether financial institutions establish appropriate internal control systems for the entire IT sector, such as IT management, system development and maintenance, IT service provision and support, IT security and information protection, internal auditors of the audit department and the IT department to ensure the safety and soundness of the IT sector of the financial company. It also evaluate whether it has a periodically checking compliance with the control system and whether the control system is appropriate. It also check whether the existing inspection plan has been properly established and whether the appropriate experts are available to do this. In addition, it also examines that previously audited points are amended or not.

The second category on the evaluation is ICT management. The main inspection items include whether the management strategy for IT and payment system is properly established, and whether the organization, manpower, and budget is allocated appropriately. Also, it confirms whether emergency measures against ICT system failures are properly established.

If the cost of ICT maintenance is very high and ICT business activities are not conducted in accordance with the management strategy of the financial company, it will lose its competitiveness over other. In addition, the paralysis of the ICT system may bring its business interruption and external credibility and finally business outcome. So the management strategy is very important to determine the outcome of the overall business activities of the financial institutions.

The third one is an evaluation on the system development and maintenance. Its main screening items is to check whether it has an appropriate institutional framework and personnel for its development and maintenance of ICT system. It also checks whether the internal checking system for each staffs has been established and manual for each job and work are made well. It evaluate whether the program and data are properly controlled.

It aims each financial company to establish its own efficient internal control system to take care of the changes of ICT environments. The ICT system and programs should be constantly changed or maintained due to changes in financial environment. Therefore, it is very important to establish organization and manpower management, guidelines and procedures for system development, introduction, and maintenance, focusing on compliance status, actual implementation status, system documentation, establishment of internal control system, safety measures in system integration, etc.

The fourth category is the ICT service delivery and support. The main checking items include the adequacy of the organization and personnel involved in the operation, control of access to the computer room, control of batch operations, network management, and emergency response capability.

It aims to evaluate whether the daily operation of the pre-established computer system is properly conducted. It try to take care of the risk of errors or accidents depending on the operating personnel or operating environment of the system.

The final one is to evaluate the ICT security and information protection sector. Its main inspection items include the number of personnel to carry out IT security and information protection. It also checks whether security related equipment and programs are properly installed and operated. Also, it confirm whether it is possible to respond promptly in case of an accident, and whether the victimization procedure is established effectively. It focus on the evaluation of the overall IT security and information protection.

(4) Assessment Methods

The assessment of the actual condition of the IT sector of individual financial companies is made by an absolute valuation method. In each stage, such as detailed evaluation, sectoral evaluation, and comprehensive evaluation, 1st grade (excellent), 2nd grade (good) 4 grades (vulnerable), 5 grades (risk) as seen in Table 3-10. Evaluation of actual condition of IT sector ana overall evaluation grade are evaluated as five grades, fifteen steps (+, 0, -) like the management status evaluation system.

The inspection officer evaluates the evaluation scores of the five sections by arithmetic average (sum of the evaluation grades up to the first decimal place of each division and rounded off to the second decimal place by dividing by five). The final overall rating is determined by taking care of

several other elements the overall IT operation skill, the mindset of the management staffs on ICT sector, and the inspection direction of the Financial Supervisory Service although.

For example, one of the commercial bank take this scores: IT audit (2.3), IT management (3.6), system development, introduction and maintenance (2.8), IT service provision and support (4.4), IT security and information protection (3.4). Then the provisional comprehensive evaluation score is determined as 3.3: $(2.3 + 3.6 + 2.8 + 4.4 + 3.4) / 5 = 3.3$. Therefore, it will be rated as 3 (moderate).

Any weight is not assigned to the evaluation items and sub-evaluation items for each sector. However, the head of the inspection team may reflect the business type and its IT risk to evaluate the grades of each sector and final overall rating.

Each overall evaluation rating means as follows: The Level 1 means the operational status is sound throughout the IT sector. There is some extraction, but the degree can be resolved in the usual way. Level 2 means that the system is fundamentally sound, but with some weaknesses that can be solved in computer operations. Level 3 dose it contains various vulnerabilities that require immediate corrective action. Manageability and staffing levels are likely to cause operational problems. Level 4 does severe vulnerability could potentially jeopardize computing itself in the future. It is not likely that the computer processing itself will be stopped, but it is likely to be dangerous. Level 5 means that vulnerabilities are so severe that normal computing can not be done.

<Table 3-10>**Comprehensive Evaluation Criteria (5 grades, 15 grades)**

Comprehensive division (grade 5, 15 steps)		Arithmetic mean
1st grade (excellent)	+ step	1.0
	0 step	1.1 ~ 1.2
	- step	1.3 ~ 1.4
2nd grade (good)	+ step	1.5 ~ 1.8
	0 step	1.9 ~ 2.1
	- step	2.2 ~ 2.4
3th grade (moderate)	+ step	2.5 ~ 2.8
	0 step	2.9 ~ 3.1
	- step	3.2 ~ 3.4
4th grade (vulnerable)	+ step	3.5 ~ 3.8
	0 step	3.9 ~ 4.1
	- step	4.2 ~ 4.4
5th grade (vulnerable)	+ step	4.5 ~ 4.6
	0 step	4.7 ~ 4.8
	- step	4.9 ~ 5.0

The evaluation and inspection results are utilized later. For example, financial institutions assigned a grade rating of one are waived of the future inspection for the actual condition of the IT sector or the period and the scope of the next inspection are reduced. For financial companies with a rating of grade two, the inspection period will be reduced in the future assessment of the IT sector, and only a sectoral inspection focused on vulnerable sectors will be conducted.

Financial companies with a total evaluation of grade three should make its own improvement plans for vulnerable sectors in the ICT division and

inspection team should check them in the next inspection and evaluation. Those with a rating of 4 may submit a letter of commitment if necessary and its evaluation result should be involved into the evaluation level of general business management status and consequently, the evaluation result on general business status should not be above the grade level of two. Furthermore, the inspection period is extended and examined at the time of evaluation of the status of IT sector in the future

For financial institutions with a level of five, immediate action should be implemented to improve the specific vulnerable sector or the entire ICT system. In addition, ICT evaluation team may request to downgrade the evaluation level of general business management. It may ask to make a Memorandum of Understanding on the plan for the improvement on the ICT system. The evaluation grade on the status of the general business management for these financial institutions should be above the grade two.

4. Guidance for the Supervision and Inspection on Nepal e-banking and Fin-tech Service

The organization structure of financial supervisory agency may be different from country to country around the world. For example, one integrated supervisory agency may take care of whole financial system and institutions like Korea or several separate agencies may do the different area of financial industries in different ways. For example, United States, Japan, and some European countries maintain the separate supervisory system. Each one has

pro and cons.

For example, integrated supervisory organizations may be relatively easy to build and implement the national financial policies. It can relatively easily harmonize the interest of stake holders of financial market and industry. However, it may take large amount of management cost to take care of the employee and system. There may be less expertise for detailed and precise supervision on each financial sector.

Regardless of whether the supervisory body is separate or integrated, the following items should be considered for the same preparations for payment settlement and electronic financing:

A. Organization Structure and Capacity Building

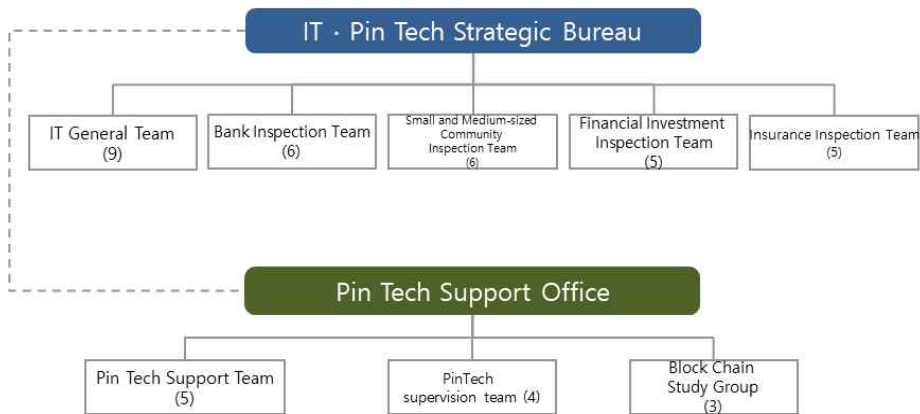
Professional organizations should be established to have an effective supervision and inspection of electronic payment system and its ICT system. In these days, financial institutions and ICT companies are introducing new payment instruments based a newly developed technology. So it is quite obvious that very professional human resource should be required to examine and to supervise these new payment instruments and systems. It should be reminded that professional manpower can not be made by a short period of training and as a result very active long-term trainings are required for the staffs in the agency.

In order to prepare for the changing financial environment and hacking attacks, it is effective to have a separate ICT specialized department from the general supervision and inspection one. As seen the Figure 3-15, financial

supervisory agency of Korea had a separate division for IT and fin-tech inspection and supervision. They are made of two divisions and eight teams such as (1) IT general team, (2) Bank inspection team, (3) SM community inspection team, (4) Financial Investment Inspection team (5) Insurance inspection team, (6) fin-tech support team, (7) fin-tech supervision team and (8) Block chain study group.

<Figure 3-15>

Organization for Korea's IT and Fin-tech Supervision and Inspection



Note: number in () show the number of staffs of each team or division.

B. Establishment and Supplement of Laws and Regulations

Electronic finance and fin-tech service and payment systems are too complicated to understand them easily. At the same time, their service forms change very quickly within a very short time. It is because they are outcomes of the collaboration between financial industry and ICT industry, which depend on the most advanced technologies. As a result, it is very difficult to legislate appropriate laws at the right time or to develop good supervisory

systems for it.

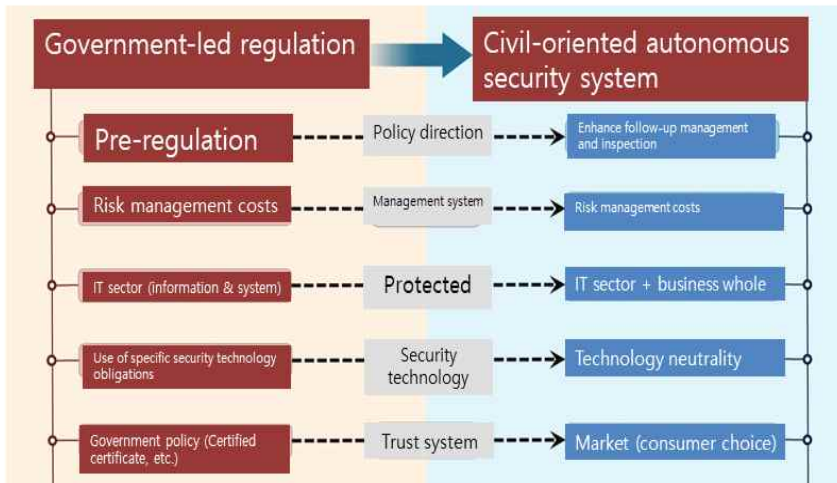
However, it is also true that if appropriate laws and regulations are not equipped, they will be exposed to various accidents and risks causing very substantial problems on the system. It may reduce the efficiency of the payment system or may break down the whole national economy. Therefore, it is necessary to prepare for the legislation of a new law or regulation or to revise current laws and regulation in advance.

For these reasons, it is very important to build an autonomous system emphasizing the role of the private sector when to make and apply a law or regulation. For example, as seen in Figure 3-16, the security system private sector oriented by a private sector may be more useful to cope with the rapidly changing environment rather than government-led one. In this case, good cooperation among private sector and supervisory agency is the key to the success. Figure 3-17 shows the current financial security cooperation system of Korea. It is built on the organic cooperation of four parties such as supervisory authority, financial information protection agency, private financial companies and their associations

<Figure 3-16>

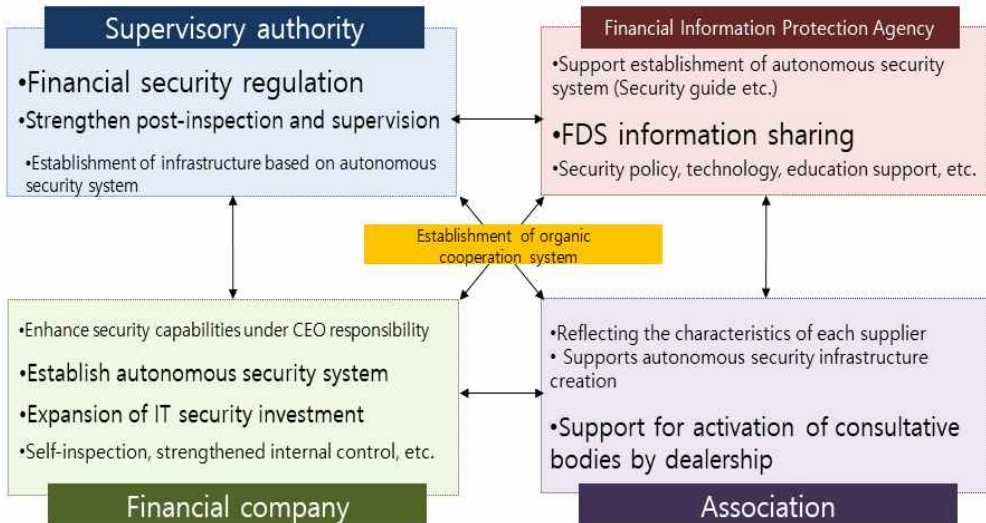
Establishment of Autonomous Security System Centered on the Private Sector

Pre-regulation → Post-stabilization



<Figure 3-17>

Establishment of Financial Security Cooperation System



C. Support for the Development of Fin-tech

The development of fin-tech changes the business model and types of payment and settlement system. As new ICT technology is developed and applied to payment and financial sector, the new payment services are introduced. Although all these services do not survive eventually, some of them make change on the payment system. For example, a mobile payment which was just introduced a few years ago became one of the most popular payment instruments among young people today. Then it is necessary for a supervisory agency to build up new way of supervision applicable to this new system. Furthermore, it is necessary for it to prepare for entry of new payment service and exit of old one and for a new way of supervision in advance.

For this purpose, it is required for a supervisory agency to check newly developed technology in the area of fin-tech. As shown in Figure 3-18, it should understand several important topics such as blockchain, biometrics or big data analysis at this time.

It is also an important issue how much a supervisory agency to engage in the payment industry. Fin-tech belongs to the one of the major industries which leads the national economy in the future. For example, some payment instruments based upon the blockchain technology are expected to make an great impact on the way where the payment service are done. As a result, its development should be supported by the government. At this time, excessive regulation will limit the development of new industries. It may require the financial and non-financial support from the supervisory agency. Therefore, a

very fine tuning policy and strategy should be implemented where appropriate regulation and support are provided at the same time. To maintain a good balance between supervision and support is very difficult for any supervisory agency to do. To do it, it should keep watching the developments and changes of the payment service market.

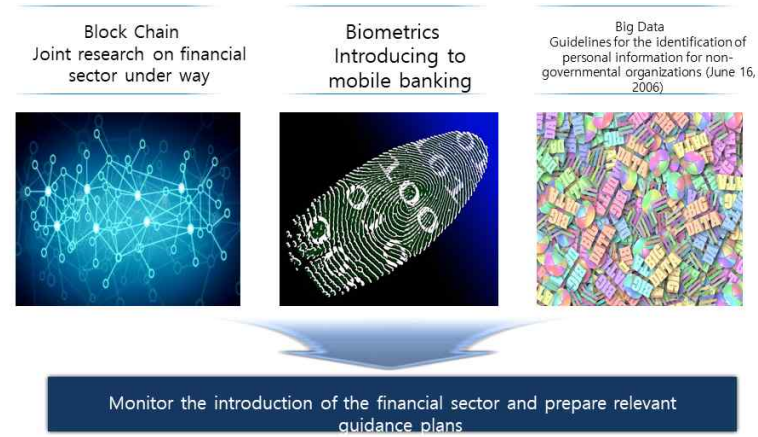
<Figure 3-18>

Fin-tech Innovation Continues



<Figure 3-19>

Preparation for New IT Technology Supervision Plan



D. Improvement of Information Protection

Securing the stability of electronic payment system and preventing any incidents from happening on electronic payment system such as hacking or cyber terrorism is very important for the successful management of the national economy. Its risk and impact on the economy is so great that any small event may destroy all payment and trade systems in a matter of minutes.

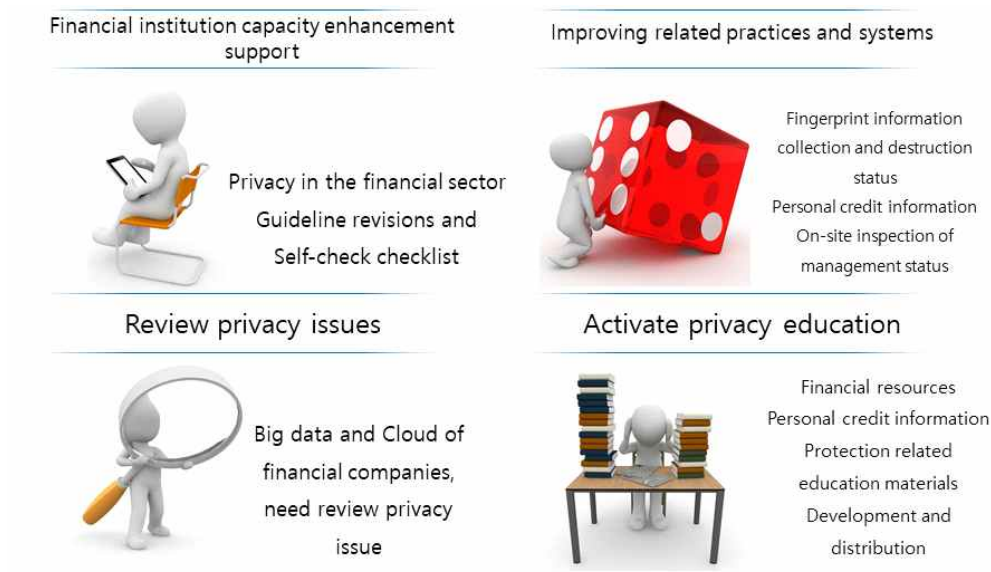
According to experience of Korea explained in the first section of this chapter, most of cyber attacks have not been successful. However, there are some cases when these attacks were successful. It is only when attacked financial companies or ICT companies did not prepare well for them. As a result, if any financial companies or ICT companies failed to defend the attack, they had to spend large amount of money to control the damage. For example, if any event such as the hacking, cyber terrorism, and personal information leakage accidents happens, then they have to establish the countermeasure and to pay the financial compensation for the consumer who may have been damaged from this accident. Therefore, well preparation for the attack is the most important way to reduce the cost. it is necessary to establish policies and protection system to prevent such risks in advance.

Figure 3-20 shows four elements to prepare for the protection of personal informations. The first one is to build the capacity of staffs and management teams of financial companies. The legislation of a guide line or the self-checklist for protection of privacy and personal information can be some of the most important elements for it. The second one is to improve the

conventional business practice. The way of collecting the private information such as finger print or personal credit information and storing them should be checked whether it satisfy the modern criteria. The third is to take care of the big data issue. As more data are accumulated and stored, more risk will be made to reveal personal information to the public. Even though financial companies did not directly reveal private information on a consumer, he may be identified by big data analysis and consequently be damaged by it. The final one is to have an adequate trainings system and program for the staffs. Regular and irregular trainings on this issue should be given to the workers and high ranked officials. Making the guide book on the protecting privacy or personal information can be another way to do it.

<Figure 3-20>

Elements Included in Personal Information Protection Plan



IV. A Proposal for Development of Fin-tech, Cashless Society and Electronic Payment System in Nepal

1. Fin-tech and Electronic Payment System in Nepal

A. Recent Development

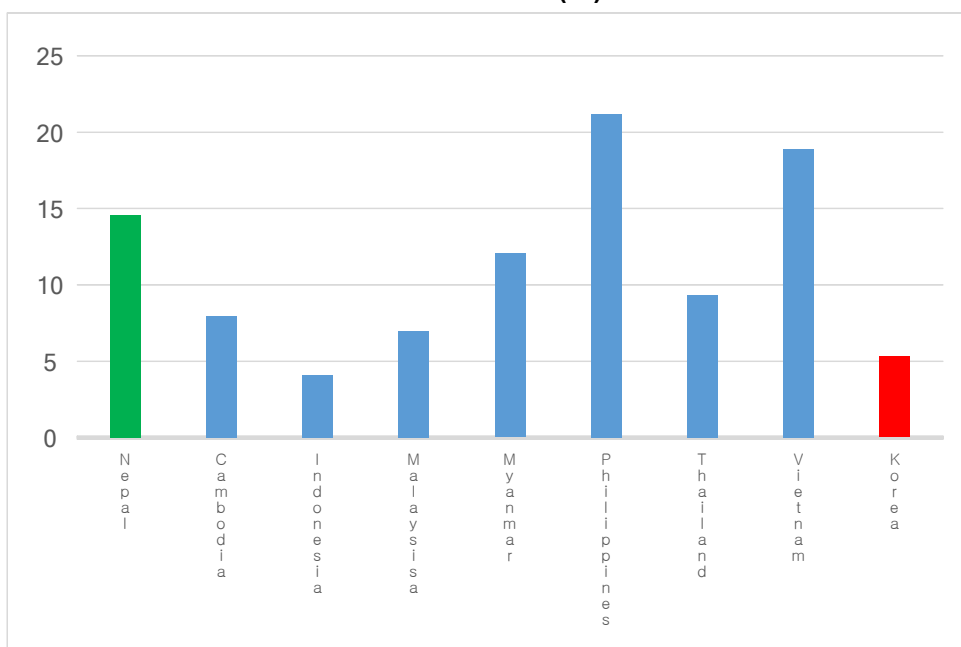
Nepal is a cash-centric society with only a few retail electronic payment instruments used. People do not use frequently offline electronic financial service or fin-tech service in their everyday life. As seen in Figure 4-1, the ratio of currency in circulation over GDP recorded 14.6 percent, second highest one among the neighboring nine countries of South Asia and Southeast Asia.

It is very difficult to see people in Nepal use their cards or other electronic devices in their everyday trades. Most debit cards are only playing as an ATM card rather than as a direct paying instrument although as many as 5.7 million debit cards have been issued at the end of 2017. Only 94,716 credit card have been issued and only a few numbers of POS are installed in the capital city of Kathmandu or other major cities of Pokhara or Biratnagar. As a result, the number of usage of credit card is very limited. Other recently developed offline retail electronic payment instruments utilizing the mobile device are not popularly used yet. For example, QR (Quick Response) payment, which was quite successfully launched in China and other

developing countries, was just introduced by one of the leading banks.³³

<Figure 4-1>

The Ratio of Currency Circulation over GDP in 2016 of Nepal and Other Countries (%)



Source: ADB, *Key Statistics*, 2018

In online payment market, the similar story can be given. Although several financial institutions have been providing some electronic financial services

³³ Nabil Bank, one of the leading banks in Nepal launched the QR payment in February, 2018. It takes the ‘Union Pay International QR Code Acquiring service’ provided by Union Pay in China. As a result, Customers with Union Pay International cards will be able to use the QR code payment system for the first time in Nepal. (<http://kathmandupost.ekantipur.com/news/2018-02-12/nabil-bank-launches-qr-code-payment.html>) Q-pay Pvt Ltd, one of the payment ICT companies introduced the mobile wallet to apply QR payment in April, 2017. (<http://www.qpay.com.np/revised-reward-bonus/>) More explanation on the payment process of QR payment is explained in appendix B.

or basic fin-tech services to the public, their usages are very limited. For example, internet banking service was introduced as early as in 2004 by Kumari bank, one of the leading banks in Nepal and afterwards, several basic electronic bill payment service such as account transfer or bill payment was introduced. However, the registered number of users of internet banking service reaches only to 842,431 people, 2.9 percent of total population at the end of 2017.

Mobile banking service was introduced by Laxmi bank in 2004 and afterwards, several mobile banking applications for the smart phone were done by other banks. Currently, 3.5 million people or 12.0 percent of total population are using mobile banking. In addition, other simple mobile payment services such as M-Nepal, SCT Moto, e-Sewa and IME pay are provided several financial and non-financial institutions.³⁴ They simply enable registered member to make wire-transfer similar to online bank transfer service by mobile device. Despite of all these recent developments of online payment market, still their usages are very limited.

The several electronic payment networks linking the financial institutions are operating to some extents. For example, three ATM networks connecting several major banks such as NEPS (Nepal Electronic Payment System Ltd.), NPN (Nepal Payment Network) or STC (Smart Choice Technologies) have already established.³⁵ Nepal Clearing House has been cleared checks by Electronic Cheque Clearing (NCHL-ECC) system applying an image-based, cost-effective, MICR cheque processing and settlement solution since

³⁴ These mobile payment systems are explained in detail in Chapter II.

³⁵ Detailed explanations on NEPS (Nepal Electronic Payment System Ltd.), NPN (Nepal Payment Network) or STC (Smart Choice Technologies) are provided in Chapter II.

October, 2012. It has also managed the retail interbank payment network (NCHL-IPS) since August, 2016.³⁶ Real time gross settlement system (RTGS) is scheduled to be built by Nepal Rastra Bank no later than the fall of 2019.

B. Evaluation on payment system of Nepal

Based upon the examination on the usages of electronic payment service in the above section, we may say that electronic payment service are not widely used in Nepal. There are several reasons why they do not use electronic payment instruments as frequently as expected. First, people in Nepal are not used to the banking service at all. Many of them do not access the banking service at all. The number of bank account of 1,000 adult recorded only 796 in 2017, which was lower than other middle income developing countries of Thailand or India. As seen in Figure 4-2, Figure 4-3 and Figure 4-4, the numbers of bank branches of commercial banks and ATM per 100,000 adults of Nepal in 2017 were lower than those of other developing countries.

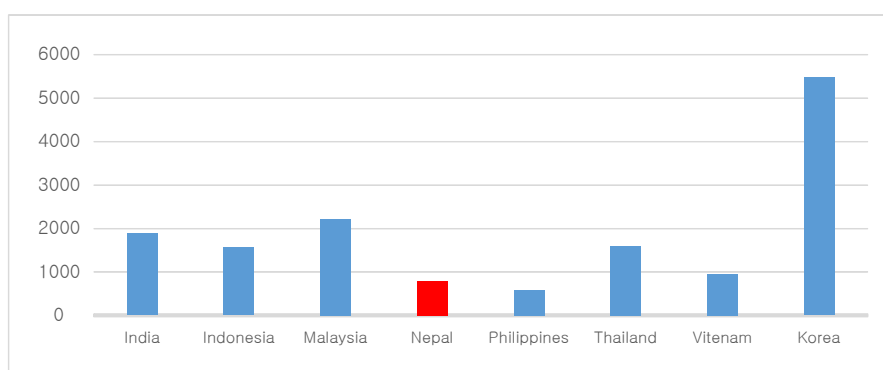
Second, very little offline payment hardware infrastructure for electronic payment service is installed. Wired network is very limited established and as a result, the size of internet users is small and internet speed is very slow. Electronic payment service belongs to a system good, which is only operational when appropriate infrastructure are equipped with. For example, for a debit card system to work, a buyer should have a debit card and the

³⁶ More detailed explanation on Electronic Cheque Clearing (NCHL-ECC) system and retail interbank payment network (NCHL-IPS) are in Chapter II.

merchant should be equipped with POS terminal directly connected with the credit card company or the bank. Furthermore, this network should work very smoothly and seamlessly. In this respect, Nepal is not in a good environment for a conventional offline electronic payment service to be used nationally.

<Figure 4-2>

The Number of Bank Accounts per 1,000 Adults of Nepal and Other Countries

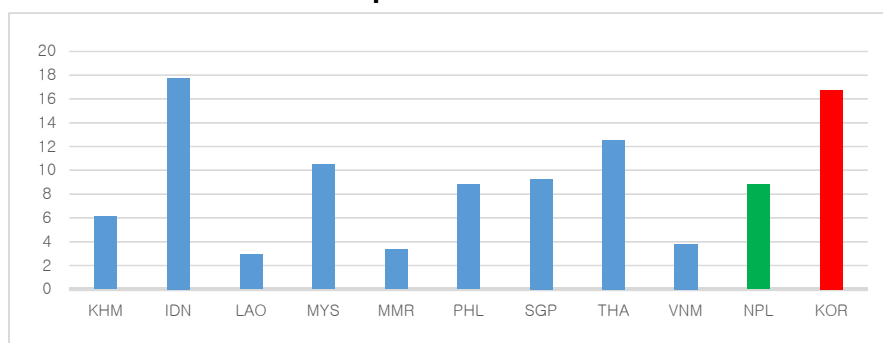


Source: IMF, Financial Access Survey, June, 2018

<http://data.imf.org/?sk=E5DCAB7E-A5CA-4892-A6EA-598B5463A34C>

<Figure 4-3>

The Number of Bank Branches of Commercial Banks per 100,000 Adults of Nepal and Other Countries

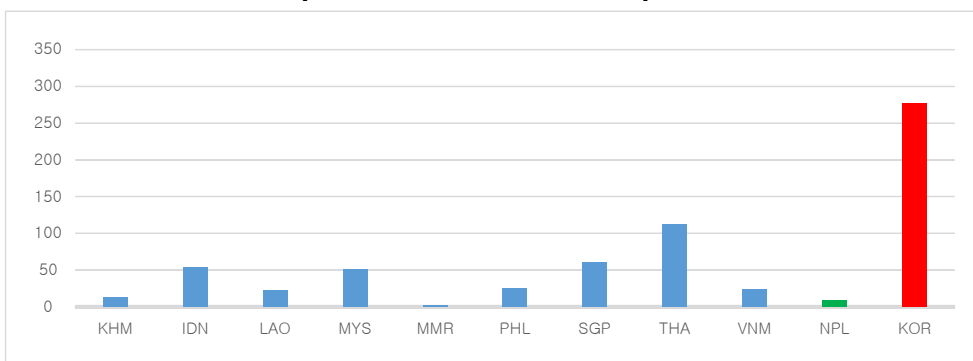


Source: IMF, Financial Access Survey, June, 2018

<http://data.imf.org/?sk=E5DCAB7E-A5CA-4892-A6EA-598B5463A34C>

<Figure 4-4>

The Number of ATM per 100,000 Adults of Nepal and Other Countries



Source: IMF, Financial Access Survey, June, 2018
<http://data.imf.org/?sk=E5DCAB7E-A5CA-4892-A6EA-598B5463A34C>

Third, there is not much incentive to make both payer and payee to use electronic payment system in their offline business. Traditionally, payment service users have used the cash for their everyday transactions. As a result, without receiving any reasonable benefit, they will not change their payment habits. Furthermore, merchant who is afraid of revealing their real sale amount or revenue may be object to this new electronic payment instrument.³⁷

Fourth, users of electronic payment system may not be well informed of their new electronic payment system and do not have a strong confidence on the system. Cash transaction is very safe transaction method because both payer and payee clearly see the transactions by themselves. But monetary transaction through the electronic payment network is not observable and as a result, both parties may be very skeptical on the successful implementation of

³⁷ In one store we visited, PSO terminal was equipped with but the merchant said that his machine was broken. He did not want to reveal his sales to the card company or tax office.

the transaction. So strong confidence on the system should be made on the both payer and payee.

As a result, it will be very difficult to make people to use offline electronic payment instruments within a relatively short time in Nepal.

Online electronic payment instruments have also not been widely used as well despite of recent fast development. Several reasons can be given to explain it as below. As shown in Figure 4-5 and Figure 4-6, internet penetration ratio and broadband subscription rate of Nepal are very low and as a result, most people cannot access the internet based electronic payment services. Most widely used payment method on e-commerce is cash-on-delivery. In addition, electronic commerce is still at the very early stage of development. The number of online shopping malls and their sales are relatively very small.³⁸ Less credibility for online transactions and underdevelopment of logistic system prevent people from utilizing online shopping mall to purchase products. Without large activity of electronic commerce, electronic payment cannot be successfully adapted. In conclusion,

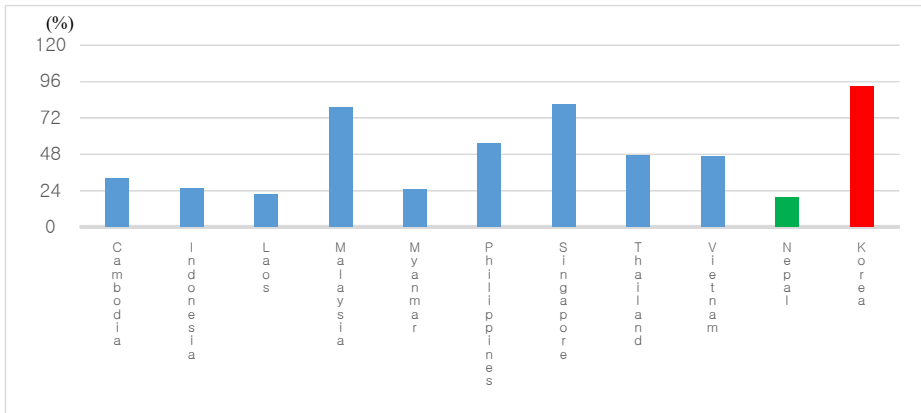
³⁸ There are some online shopping malls such as Clothes Nepal, Nepbay, Sasto Deal, Metro Shopping Daraz etc in Nepal. NepBay, started in 2007 as an online directory of products and shops in Kathmandu Valley, eventually transformed itself into an online mall and finally into the people's marketplace of Nepal. When NepBay introduced "Cash On Delivery" service in 2013, it was the first time customers in Nepal were able to place orders online and receive goods directly into their doorstep. After the success of "Cash On Delivery" service in year 2014 and 2015, Nepal saw an amazing uprising in ecommerce entrepreneurship which resulted in mushrooming of online shops and delivery service across the country. Sasto Deal, originated from local venture company in 2011, is one of the major e-commerce platform in Nepal, (sastodeal.com) Daraz, one of the multinational online shopping malls in South Asian covering Pakistan, Bangladesh, Sri Lanka and Myanmar, launched its service in Nepal in July 2016. Daraz takes more than 5 million consumers in the region.

there are only limited amount of demand for online payment for online transactions.

Despite of all these discouraging facts, there are some positive signs for the success of the electronic payment system. Wireless phone penetration rate of Nepal exceeds 100% and that more than 70% of mobile phone users in urban areas are using smart phone as shown in Figure 4-7. Therefore, the payment service utilizing the mobile device will be used in the near future.

<Figure 4-5>

The Internet User Ratio of Nepal and Other Countries



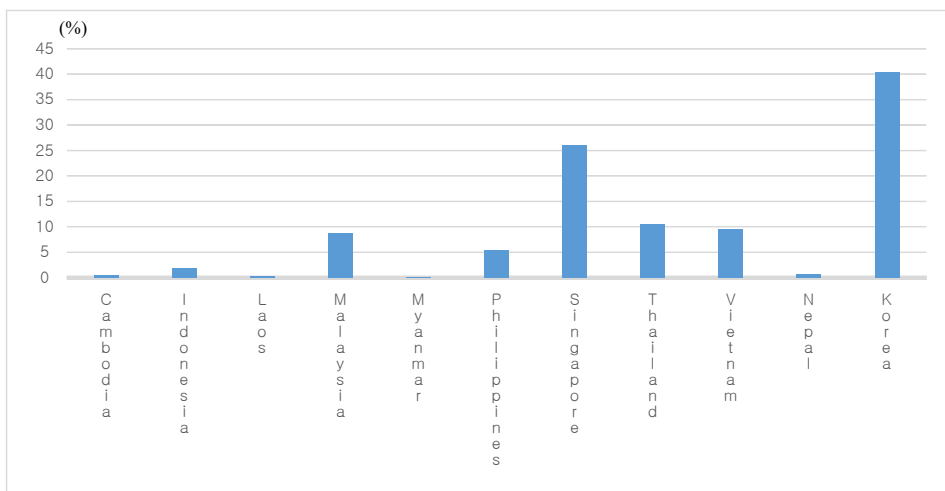
Note: at the year of 2016.

Source: ITU, Statistics, <https://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx>

At the same time, it is expected that the demand for electronic payment will expand very quickly once infrastructure for electronic commerce is equipped. Soon or later, more people will utilize the e-commerce and m-commerce and then they will eventually use the e-payment or m-payment.

<Figure 4-6>

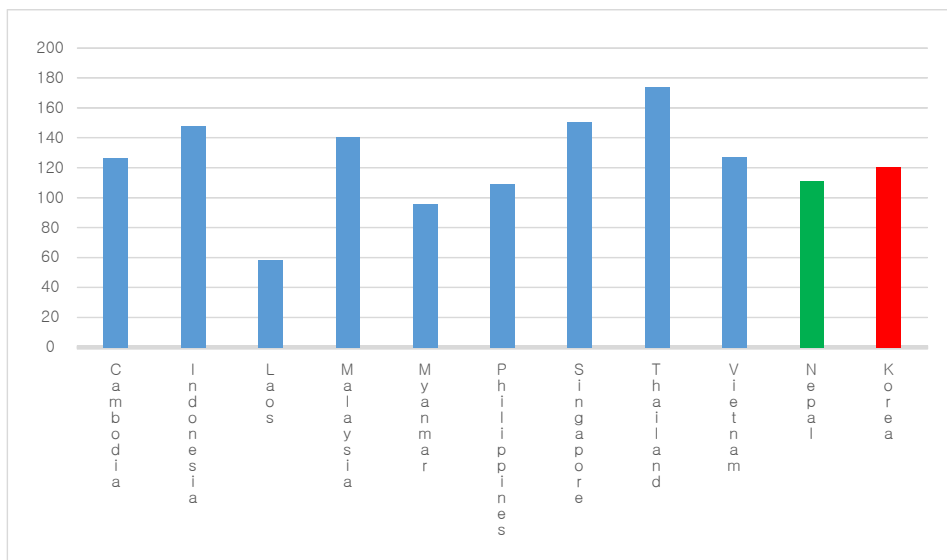
The Fixed-broadband Subscription Ratio of Nepal and Other Countries



Source: ITU, Statistics, <https://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx>

<Figure 4-7>

Mobile-Cellular Telephone Subscriptions per 100 People



Source: ITU, Statistics, <https://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx>

2. Development of Korea's Electronic Payment System

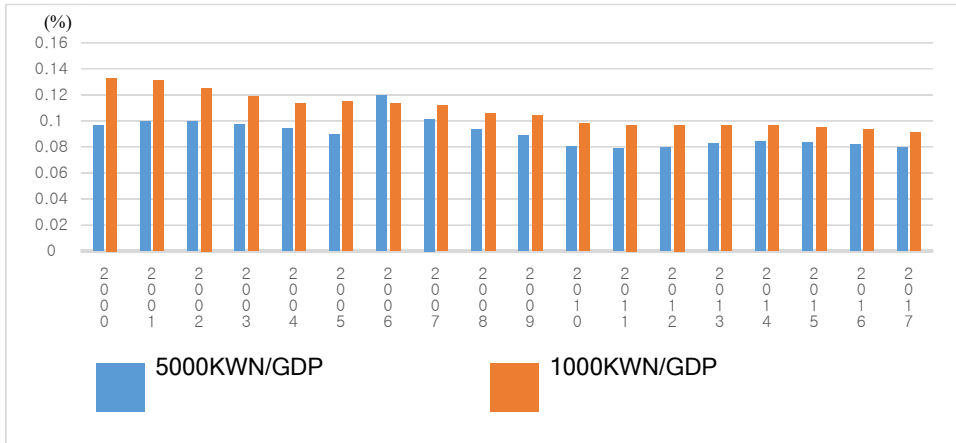
A. Development Story of Electronic Payment System of Korea

As of 2018, Korea has almost reached to a cashless society. As seen in various statistics of Figure 4-8 and Figure 4-9, the usage of small valued cash has been substantially reduced for the past two decades. The ratio of currency of 1,000 KWN value over GDP and the ratio of 5,000 KWN value over GDP fell from 0.133 to 0.091 and from 0.096 to 0.079 from 2000 to 2017.³⁹ At the same time, the composition ratio of currency of 1,000 KWN value over GDP and the ratio of 5,000 KWN value of total currency circulation substantially fell. The ratios of currencies of 1,000 KWN value and of 5,000 KWN value over the total currency issued fell from 3.4 percent and 2.9 percent in 2000 to 1.5 percent and 1.3 percent in 2017, respectively. On the contrary, the ratio of 50,000 KWN value over the total currency increased from 28.0 to 82.1 percent for the same period. It seems that the role of currency or cash changed from a payment instrument to a store of value.

³⁹ The 1,000 KWN is approximately equivalent to the 0.9 USD at the end of 2017.

<Figure 4-8>

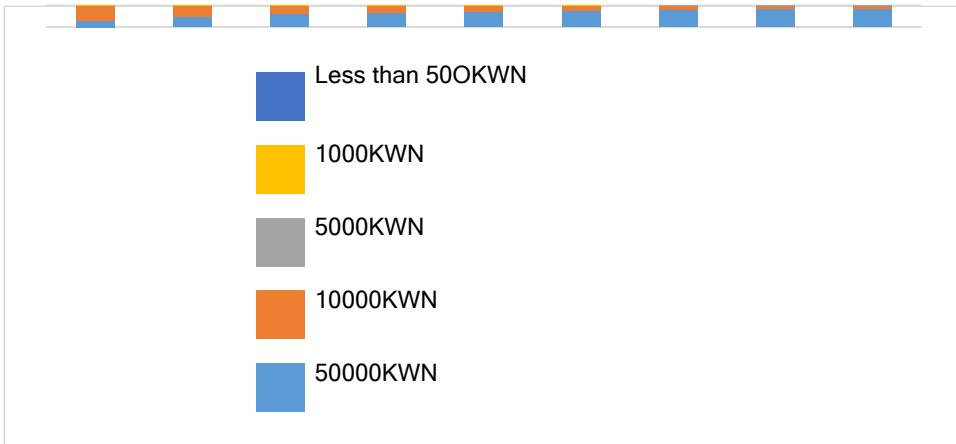
The Ratio of Value of Small Valued Cash over GDP



Source: Bank of Korea, The Bank of Korea Statistics Database,
<https://www.bok.or.kr/portal/main/main.do>

<Figure 4-9>

The Composition of Value of Currency Issued by Amount



Source: The Bank of Korea Statistics Database,
<https://www.bok.or.kr/portal/main/main.do>

Electronic payment system started to be used effectively in the early 2000s. At that time, in offline payment market, credit card usage promotion policy was very actively promoted. For example, Korean government made merchant mandatorily accept the credit payment by law. If he refused the payer to use credit card, then he was regarded as a criminal. Use of electronic payment as an online payment has also expanded at that time.

There are several reasons for it. First, the digital infrastructure had been greatly expanded. PC distribution and connection of its network had been substantially improved at that time. As seen Figure 4-10 and Figure 4-11, fixed-broadband subscriptions ratio and internet user ratio of Korea have substantially increased.

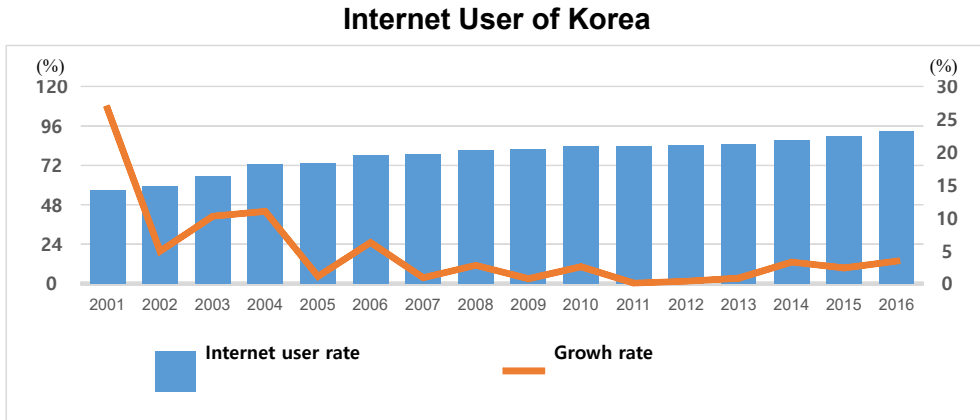
<Figure 4-10>

Fixed-broadband Subscriptions of Korea



Source: ITU, Statistics, <https://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx>

<Figure 4-11>



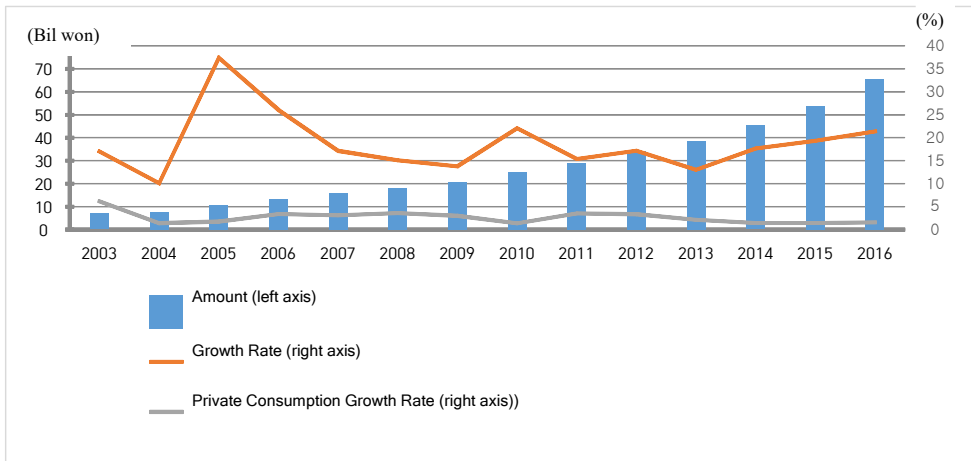
Source: ITU, Statistics, <https://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx>

Second, expansion of online shopping raised the demand for online payment. So people had to use online payment instruments to take advantage this online business. As commercial banks actively introduced internet banking service to the people, people get confidence on the system. As seen in Figure 4-12, the sale of online shopping increased less than 10 trillion KWN in 2003 to 66 trillion KWN in 2016 and its annual average growth rate for these 13 years reached to as high as 20 percent.

Third, people are used to the online business and get quite amount of confidence on it. Not only large companies but also small merchant, even many individuals make their own internet website and use them as a propaganda. As a result, as seen in Figure 4-13, the number of Korean domain has very continuously increased in Korea from 517,354 in 2000 to 1,090,131 in 2016. It means that there is one Korean domain for each twenty persons in 2016.

<Figure 4-12>

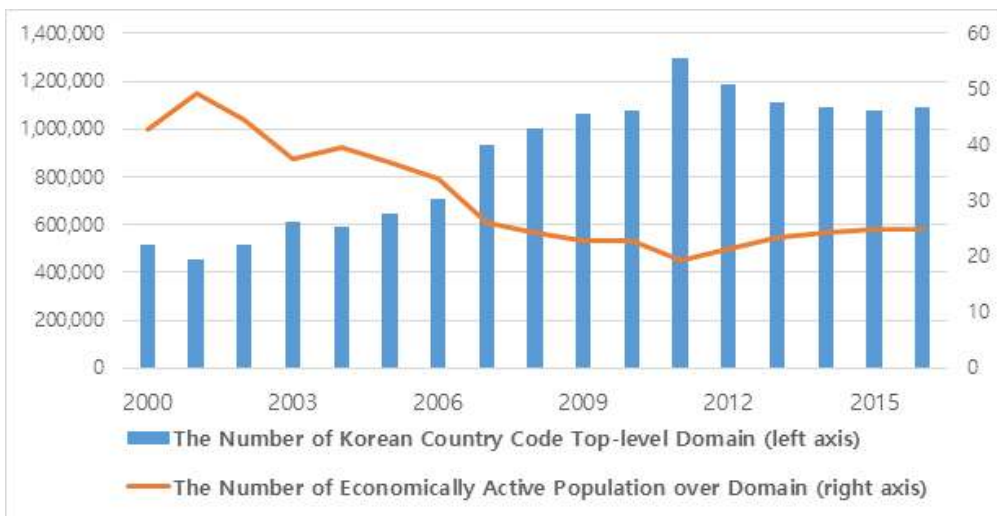
The Sales of Online Shopping Mall in Korea



Source: Korea Statistics

<Figure 4-13>

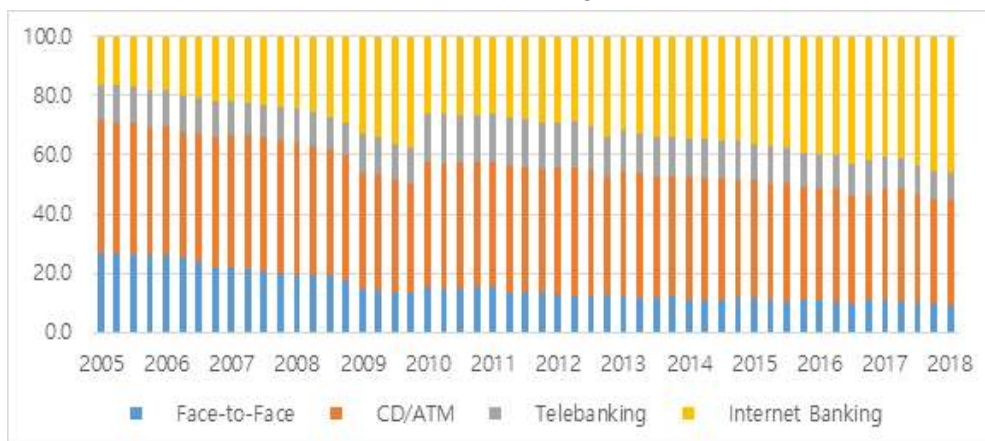
The Number of Korean Domain



Source: Korea Statistics

<Figure 4-14>

Bank Wired Transfer by Channel (%)

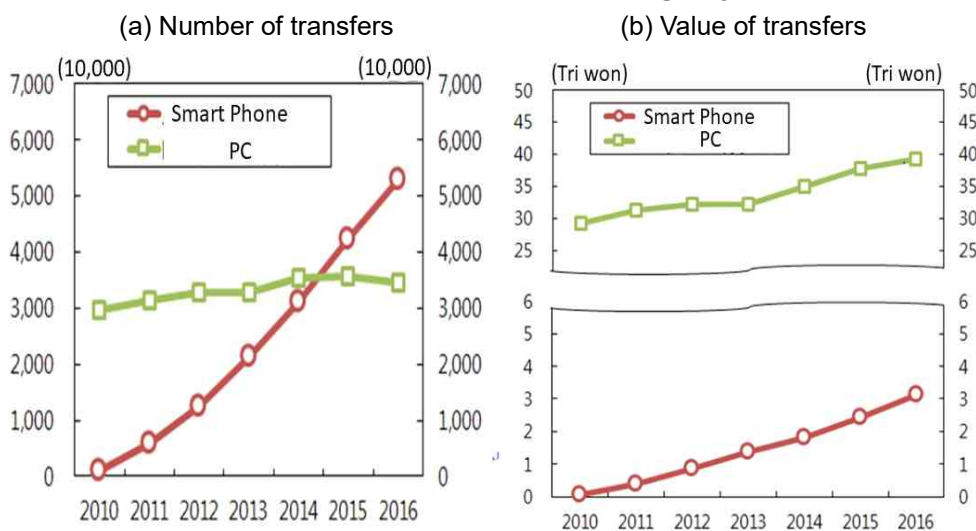


Source: The Bank of Korea Statistics Database,
<https://www.bok.or.kr/portal/main/main.do>

Fourth, mobile payment is more commonly used in a small payment rather than in a large payment. Figure 4-15 shows the numbers and the values of bank wire transfer done by using PCs and smart phones in 2016. When smart phone banking was introduced in 2010, its usage for bank transfers was very limited but later it continuously increased very fast. In 2014, the number of transactions of bank transfers by mobile banking payments including smart phone banking payment passed that of PC based internet bank payments although still the value of the transactions by mobile banking payment is still far less than that of PC based internet bank payments. It tells that the average amount of payment by mobile bank is relatively very small.

<Figure 4-15>

Development of the Mobile Banking Payment



Source: The Bank of Korea, Economic Statistics Website, Ecos.bok.or.kr

One of the interesting things happened at that time in the electronic payment market is that a very fierce competition and complementation between financial institutions and ICT companies showed up in Korea. New payment services have continuously emerged by ICT companies, which has in turn made financial institutions to improve their services. For example, with the advent of bus cards, financial institutions have become more active in recognizing the importance and success of card payments in early 2000s. As telecommunication company launched the mobile payment services, commercial banks became aware of the importance of mobile banking.

B. Major E-payment Development Policies

Korean government and supervisory agency made several major e-payment

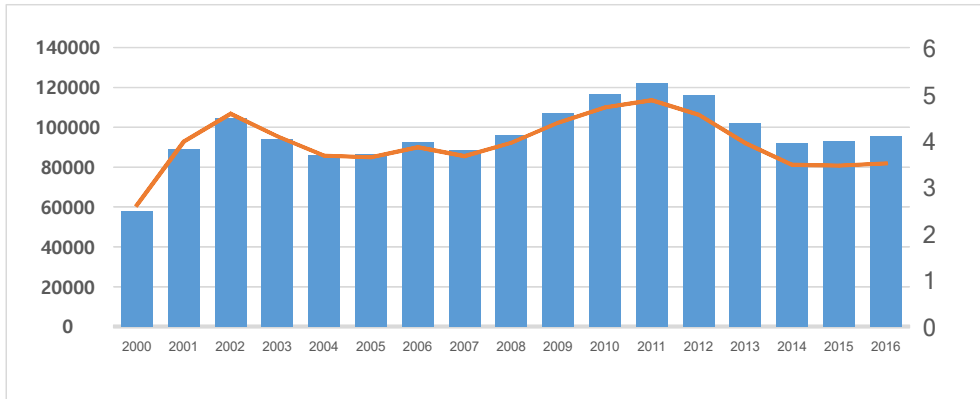
promotion policies when electronic payment service was introduced in early 2000s.

First, Korean government launched a very active card payment promotion policy. It enacted the Law to make all stores or merchant to accept credit cards mandatorily. As a result, the use of offline electronic payment systems using credit has exploded within a few years. As seen in Figure 4-16, the number of credit card issued had increased from 42 million to 104.8 million from 1998 to 2002. At the same time, the value of card usage also increased 63.6 million KWN to 623.1 trillion KWN for the same period as in Figure 4-17. Three reasons were given to explain why Korean government actively promoted the card usage at a large scale at that time. It was used as one of the macroeconomic policy instruments to promote the private consumption. After restructuring the financial industry to overcome the financial crisis of 1997 and 1998, Korean government took a very large scale economic stimulus package and credit card promotion policy was included in it. It thought that if a certain amount of credit is given to the card users, the consumer expenditure can be promoted. In addition, it thought that it could help to collect more tax from the small businessmen and merchants. The more payments were done by card, the more the sale of the small merchant or the income of self-employed workers were exposed and as a result, the government can improve the tax justice imposition, who had been problem for a long time in Korea. Korean government used the carrot to the cred users to promote credit card usage. When people using credit card payment in Korea, they could take advantage of the beneficiary of the tax deduction of income.⁴⁰ Finally, there is not much technical problem to implement this

policy. Credit card service had been already known to the public in Korean and a necessary national network had been already installed at that time. As a result, people could have a confidence in the card payment system.

<Figure 4-16>

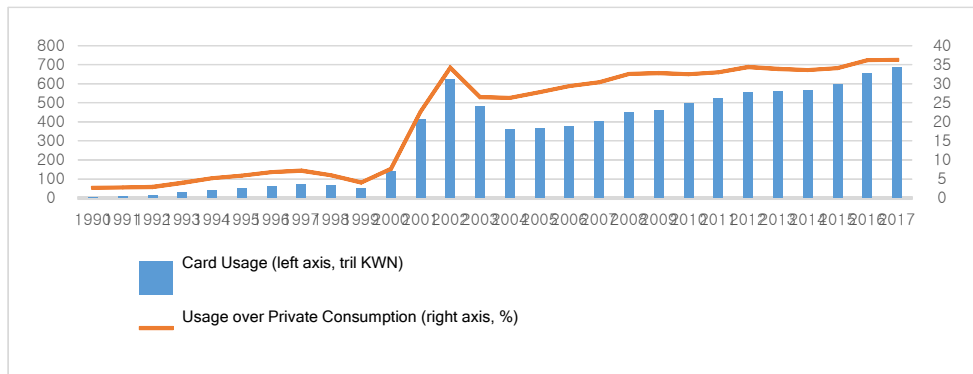
The Number of Credit Card Issued



Source: The Credit Finance Association of Korea, Quarterly Credit Card, various issues

<Figure 4-17>

The Number of Credit Card Usage



Source: The Credit Finance Association of Korea, Quarterly Credit Card, various issues

⁴⁰ The credit card company added the amount of usage for each card and for each person at the end of the year and gave the information to the card holders. Then they reported that information to the tax office to deducts his taxable income by a certain amount made by law. Also, since it was postpaid, I was able to check their payment status.

Second, it succeeded to improve the interoperability of the POS devices and cards. Before 2000, a certain POS device accepted credit card issued by a one credit card company. For example, the POS device installed for Bank A in a certain store accepted only the card issued by Bank A while other POS device for Bank B did accepted only the card by Bank B. Therefore, many stores had to have two or three or even more POS devices and customers had to ask to the merchants whether the store accepted their cards or not if they liked to their use card. The merchant had to post the name of the cards in the doors of the stories. Korean government solve this problem to make every story to accept any card in 2000. Afterwards, card holders could use their cards in any stores without any problem. It was not an easy work to make all POS device and cards interoperable. It requires coordination among multiple stakeholders, the support of policy-makers, commercially viable business models and technological solutions.⁴¹ Korean government, in particular, the national committee on payment system, had strongly pushed it because it strongly believed that without achieving interoperability of cards and POS terminals, it is almost impossible to extend the card usage across the nation. For example, some credit card companies, in particular which already succeeded in establishing a certain level of their own network, very strongly opposed to it. They complained that they already had spent large amount of investment on it.

⁴¹ According to Global Payment Systems Survey (GPSS) conducted by World Bank in 2015, interoperability of POS terminal and cards remains a concern in most developing countries. Their average interoperability reaches to only a half while that of high income countries does to 70%.

Third, Korean government had been able to take care of the side effect caused by the rapid expansion of the electronic payment system. Several issues have raised when electronic payment service and electronic banking and financial services were popular. For example, hacking and other illegal transaction may destabilize the user's confidence of the electronic payment system. Korean government or financial supervisory agencies such as The Bank of Korea, Financial Supervisory Service and Financial Supervisory Commission took several actions on it. They enacted relevant laws such as electronic financial transaction law, digital signature law or personal protection law to secure the stability of payment and settlement system and to protect the users as shown in Table 4-1.

<Table 4-1>

Major Laws on E-commerce and E-payment

Act	Institution
Electronic Financial Transactions Act	January 1, 2007, Financial Services Commission
Personal Information Protection Act	March 29, 2011, Ministry of the Interior and Safety
Use and Protection of Credit Information Act	January 5, 1995, Financial Services Commission
Act on the Promotion of Information and Communications Network Utilization and Information Protection, etc	May 12, 1986, Ministry of Science and ICT
Act on Real Name Financial Transactions and Guarantee of Secrecy	December 31, 1997, Financial Services Commission
Digital Signature Act	February, 5, 1999, Ministry of Science and ICT
Act on the Protection of Information and Communication Infrastructure	April 21, 2015, Ministry of Science and ICT

In addition, their supervision and monitoring on the electronic payment system has been quite successful. They kept watching very closely the development of the payment market and system. They were quite successful in giving the signal to the market that they are aware of the market development, that payment system was under their control or that they were ready to take any required action if needed. Finally, they initiated many research and studies on the topic, so that they actually build their capacity to take care of the system. At the same time, they provided relevant statistics on electronic payment and reports on these topics.⁴² For example, The Bank of Korea made an annual conference on electronic payment and settlement every year since 2004 to check the recent development of payment system.⁴³

C. Implications of Korea's Development Experience

As shown in the above sections, Korea have experienced a rapid and active development process of retail electronic payment system since late 1990s. From these, several important implications can be derived as below.

First, the use of credit cards soared with a very strong government promotion policy but, it eventually brought the credit card crisis. Both card

⁴² In particular, The Bank of Korea reported the number of internet banking users and usages, basic statistics on electronic bills, statistics on electronic payment service usage including payment gate, electronic prepaid payment, electronic bill payment and credit cards. These statistics are available on the BOK statistics database website <http://ecos.bok.or.kr/>.

⁴³ The Bank of Korea published Annual Report on the Payment and Settlement Systems since 2000. At the same time, it published many academic and practical research papers and book on payment and settlement system.

issuance and card usage has increased substantially in a very short time as seen in Figure 4-16 and Figure 4-17. In addition, people used their card to get small amount loans from card company. Although it might be a small money to each card holders, the aggregate sum rose very rapidly because so many people utilized them at the same time. Eventually, one of the largest credit card company almost fell into default and many people had a financial trouble.⁴⁴ As seen in Figure 4-16, for the first time, the number of credit card issued decreased from 104.8 million in 2002 to 82.9 million in 2005.

Second, competition between plastic cards and mobile cards was made relatively late. It is only recent years that people in Korea are using mobile payment service by applying their mobile phones. Several reasons can be shown as below. For example, the fierce competition between ICT companies and financial institutions prevented telecommunication company from successful launch of the mobile payment service. As early as 2005, the telecommunication companies of Korea developed a very convenient mobile payment technology and they tried to expand it to the payment market. Unfortunately, financial institutions strongly blocked the telecommunication companies to enter the payment industry. The lack of cooperation between telecommunication companies and the financial institutions are another reason. Both parties did not want to pay a huge infrastructure cost to be spent on the system installation. For the new mobile payment to be successful, the new POS terminal used for mobile payment should be installed and somebody had

⁴⁴ The LG card, the largest credit card company, fell into a near bankruptcy in January, 2004 because of consumers falling behind on their debt payments. It has received large amount of financial assistance from its parent company of LG group. Finally, it was merged into Shinhan card company in 2007.

to pay for it. Another reason was that there was not much incentive for the people to use the mobile payment service. Already, they were used to the plastic card payment. Therefore, once they took their plastic cards from their wallets, then they could pay any payment. It may be asked what is the difference if payer pays their bill by card or by phone. At that time, mobile phone was not a smart phone, so the role of mobile phone is relatively very small than that of today. Service of movie watching or music listening by using mobile phone was not provided yet at that time. In conclusion, mobile phone users did not have enough incentives to use their phones as new payment instruments.

Third, Korea's QR payment was developed very early, but its actual market activation has been done far later than other developing countries such as China.⁴⁵ People in Korea were not attracted to the newly introduced QR payments because most of them already had plastic cards in their wallets and they had used them in most place conveniently for a long time. Transforming from paying by the plastic card payment to paying by QR payment did not give much additional convenience to the people.

⁴⁵ QR code - "Quick Response" bar code - was originally introduced to track products in warehouses since 1994. It was designed to replace traditional 1D bar codes just representing numbers, which can be looked up in a database and translated into something meaningful. It is known that in 2014, Tencent, Chinese technology company, introduced a new feature on its messaging application called 'WeChat' to allow its users to make payments. However, Korean telecommunication company named Korea Telecommunication launched 'MOCA' mobile wallet in February, 2013 with cooperation with a small ICT company named Hares Infotech. The MOCA mobile wallet enable users to pay the bill at the offline by QR code. It was awarded as winner of the 2013 Innovator Award in the Innovation Project 2013 jointly hosted by Harvard University and PYMNTs.com in 2013.

Fourth, it is very important to have a good cooperation among the related institutions and agencies to raise the usage of the electronic payment service. It may include several types of cooperation such as those between financial institutions and ICT institutions, those between financial supervisory agencies and ICT supervisory agencies, and those between financial institutions and supervisory agencies. For example, to successfully activate the mobile payment, the active cooperation between financial institutions and ICT institutions and those between financial supervisory agencies and ICT supervisory agencies are very important. It is far more effective that more than one financial institutions make the promotions at the same time because sometime large or national scale promotion utilizing mass communication take too much costs. It also helped to make people have trust on the new payment system. Or a very good cooperation between credit card company and banks and financial supervisory agency should be made to launch the credit card payment service successfully,

Fifth, killer application contributed greatly to activation of payment instruments in Korea. One of the good example was a bus card or transit card in Korea. It was very inconvenient to pay the public transit (bus, subway) fare by cash and introduction of bus card raised the convenience of both payer and payee and as a result, it become a killer application soon. The value of its each transaction was very small and both drivers and cashier should carry many small coins and exchanges. In addition, it took many time for each transaction. When using a contactless card-typed transit card, they realized soon its convenience and fastness to pay the fare. So carrying a card and paying the fare by it made people understand the process easily and at the

same time, it could assure the card company to make both end at the earlier time of business. With the secured income, the card company can be able to try other payment methods or other payment business model.

Sixth, standardization and interoperability among payment instruments and networks are very important when several regional authorities or different institutions launched the similar system. Once several systems are used in payment market, it will take lot of effort to make them interoperable together. One of good examples is a local bus card system in Korea. The bus cards related to the collection of traffic charges had been introduced by regional operators as early as 1996 in Korea. As the regional bus operators and financial institutions recognized the benefit of the bus card, they began to launch their own bus cards. As a result, as many as 11 regional payment cards had been utilized in Korea. At last, Ministry of Land and Transportation developed the standard types for the traffic cards in 2007 and made the bus card operators to comply to it. It is from 2014 that these cards became integrated into interoperable ones. It should be reminded that it took large amount of times and efforts to persuade bus card related companies and organizations.

3. Building Nepal's E-payment and Fin-tech Promotion Plan

A. What Should Be Included in E-finance Activation Plan

When central bank or financial regulatory agency tries to implement the

e-payment or fin-tech promotion policy, it should take care of three major elements as follows: ① what kinds of electronic payment service should be activated and promoted, ② which financial institute will provide an electronic payment service, and ③ what kinds of policy instruments should be implemented.

To find the answers of the first two questions, available electronic payment instruments and services for the regulatory agency to choose are examined when implementing the promotion policy. Table 4-2 shows discussion on payment service types, payment service technology and service providers. According to it, electronic payment service can be classified by time of payment and by the types of payment instruments of the users and payment service providers. By time of payment, it can be divided into credit payment service, direct debit payment service and prepaid payment service. By the type of payment instruments of the users and payment service providers, it is classified into card based payment service, bank account based service and the third party based service.

To find the answer for the third question, ways for a central bank or regulatory agency to promote the payment service are examined below. It can directly make people use a certain payment instruments or directly assist private financial institutions or ICT companies to expand their service. For example, Korean government made all merchants to accept the credit card mandatorily by legislating a law. As a result, its usage increased very rapidly. It may give some benefits to the users of the newly introduced payment service. Korean government gave some income tax incentives for the users of the credit card when it was promoted. Or indirectly, it may help its promotion

by raising the credibility of the service and system. For example, it can give a certificate for the safety of the newly electronic payment service or it may improve the interoperability of electronic payment service by establishing their standards.

<Table 4-2>

Major Electronic Payment Instruments

	Offline Payment			Online Payment		
	Credit	Direct Debit	Prepaid	Credit	Direct Debit	Prepaid
Card-types Payment Instruments	Plastic card and RF, NFC, QR code in Mobile device linked to card account			PC and Mobile device linked to card account		
Bank Account Based Payment Instruments	-	Mobile Banking	-	-	Internet Banking Mobile Banking	-
Third party Payment Instruments	QR payment in Alipay and Paypal	TOSS, M-pesa. QR payment in Alipay	Bus card and subway card in mobile sim card	Alipay and Paypal	M-pesa, TOSS Cacao, Pay etc	-

Based upon the above framework, the answers for the three questions may be given below. The selection on payment services, their providing agencies or policy instruments is determined by many elements such as payment related laws and regulations, current payment systems and payment tradition etc.

These decisions should be made under the following principles. First, it

should minimize costs of the promotion and second, it should make the newly introduced payment service comply with current payment and settlement infrastructure as much as possible. The new one should be compatible with the current payment eco-system. Third, fair competition should be made between payment services providers. It is highly possibly that imperfect competition may exist in the payment market because most payment services have been provided by commercial banks. As a result, any small ICT company trying to launch a new service has to overcome the unfair market conditions. Fair competition is very important to secure technology development in this field. Fourth, it is very important that all agencies within the eco-system of payment service should be able to get some benefits when implementing a new policy. For example, commercial banks that currently provide major payment services should be benefited when a new payment instrument is introduced. If not, commercial banks may not cooperate with the promotion of the new payment service and then it may fail. An ICT company should get some pies, too when a new one is introduced. We should remember that it is not a commercial bank but an ICT company to develop a new payment instrument. If it does not get any major return, it will never participate into this process. We may say that a good cooperation between ICT companies and financial institutions are very important. The users should have some benefits when using a new payment service. If they do not have them, then it cannot be successfully launched.

Finally, several other basic decisions should be made for central bank or financial regulatory agency. For example, it should decide how much central bank or financial supervisory agency intervenes in the electronic payment

services market. Obviously, the market failure happens in the electronic payment service market because it is a public goods and information goods. At the same time, the economies of scale effect work in that market. As a result, it is quite natural that central bank or financial regulatory agency is actively engaged in the market. In particular, tight supervision on the payment service to secure the stability or security should be taken by them. However, most electronic payment services are provided by the private institutions or private companies and consequently, any promotion policy of central bank or supervisory agency is closely related with their business performance. Will the central bank promote any specific payment service directly or wait until an individual bank or private company drive in the market? If any electronic payment service is provided by the central bank or government agency, there may be an argument on unfair competition between the government agency and private financial institutions. In such case, a clear reason and criteria to distinct for the public service and private service should be provided. For example, the individual services are provided by each financial institution while the network for these service is decided by the public institution. However, they should keep in mind that some payment service provider may not be under their control. For example, if it be provided by an ICT company, it may be difficult for the central bank or financial supervisory agency to exercise its supervisory authority over it. In most country, their supervisory activities cover only the financial institutions. To take care of this problem, they may have to make a new law or regulation or closely work with other government agency such as Ministry of Telecommunication.

B. Activation of the E-payment and Fin-tech Service

(1) Setting the Goal and Target of the Fin-tech Activation Policy

It is not debatable that one of the important long-term goals of the central bank is to build the sound and efficient payment system and possible to reach to the cashless society. But it is always debatable on what the central bank has to do today and tomorrow for it. Therefore, short-term and intermediate targets should be also set. For example, it may be necessary to set specific targets such as cash usage ratio over GDP, the number of card issued or the usage of internet banking service etc.

(2) Main Contents of Fin-tech Promotion Policy

(a) Selection of Core Payment Service

Based on the above principles and review of the development experience of electronic finance and fin-tech of Korea, it should be checked what kinds of payment instruments and services are more feasible and which one NRB should focus on promotion in Nepal in the future.

First, NRB should decide which payment instrument among offline payment instruments or online payment instruments it will focus on the promotion in the near future. It is unlikely that the electronic commerce will expand rapidly in the foreseeable future. As a result, the demand for the

online payment service will not increase accordingly. So this report recommend that NRB needs to focus on offline payment services as a core payment service to promote in the near future.

Second, in the offline settlement service, it will be very difficult to introduce a plastic card-type payment method in the near future. As explaining the above section, card-type payment service usually works only when appropriate infrastructure devices are equipped. Currently, the number of credit card issuance and installed POS equipments in Nepal are relatively very small yet. It will be too costly for Nepal commercial bank or central bank to install these equipments in the near future.

Third, bank-centric payment services will take time if it is to be utilized across the nation. While most urban residents already have their own bank accounts, local ones do not. As a result, bank-centric payment services can be successfully launched only in the urban area. On the contrary, it may be very difficult to expand them in the rural area or across the nation.

Fourth, NRB is recommended to take active promotion policy on the payment service utilizing personal mobile devices. Currently, mobile phone penetration of Nepal is so high that it is very efficient to utilize those devices and networks. For example, it is estimated that more than 70 percent of mobile phones used in Nepal are smart phones. Without any large amount of infrastructure installing costs, the payment service can be provided if mobile devices are used. In particular, if NRB likes to extend the payment service across the nation, it should focus on mobile based payment service.

(b) Selecting of the Strategy for Activating Mobile Payment Services

If NRB takes the mobile payment service activation policy, it should make a more detailed specific strategy. Table 4-3 shows three activation models for NRB to consider such as ① M-Pesa model, ② Alipay model and ③ Korean model. They are different from with each other in many ways as shown in the Table 4-3.

The M-Pesa model is originated from a mobile phone-based money transfer service call M-Pesa launched in 2007 by Vodafone for Safaricom and Vodacom, the largest mobile network operators in Kenya and Tanzania.⁴⁶ Afterwards, it extended its service boundary into other financial service of microfinance. M-Pesa allows users to deposit, withdraw, transfer money and pay for goods and services (Lipa na M-Pesa) easily with a mobile device. In addition, it expanded its service from local online money transfer market to offline payment service market across the country. The major service agency is not a financial institution but telephone companies covering a nationwide mobile telephone network.⁴⁷ At that time, the Banking Act of Kenya did not give any legal basis to regulate products offered by non-bank institutions by which M-Pesa was provided. The killer-application was a domestic remittance service by which the urban worker sent his salary to the home in

⁴⁶ M stands for mobile and pesa means money in Swahili. M-pesa has expanded to Afghanistan, South Africa, India afterwards and to Romania and to Albania in 2014.

⁴⁷ The bank has actually made a disturbance for the telephone company to launce this service at the early stage of development. In December 2008, a group of banks reportedly lobbied the Kenyan finance minister to audit M-Pesa, in an effort to at least slow the growth of the service. This ploy failed, as the audit found that the service was robust. ("Mobile Cash Transfers Pose Threat to Banks". Philanthropy Action.com. 26 February 2009.)

rural area. Mostly not smart phones but feature phones was used. Offline payment utilizing telephone number was introduced later.

The Ali-Pay model began as online payment service used for payment in the online shopping mall run by Alibaba in China and later was extended to the offline payment service market. Alibaba, the largest online shopping malls in China, had a trouble collecting money from a shopper when promoting the online shopping late 2000s. So, it built its own new third-party mobile and online payment platform linked the financial institutions in China to online and local Chinese businesses. The Alipay smart phone application also provides more divers features such as credit card bills payment, bank account managements, P2P transfer, prepay mobile phone top-up, bus and train ticket purchase, food order, ride hailing, insurance selection, digital identification document storage. Alipay also allows online check-out on most Chinese-based websites such as Taobao and Tmall. It adopted QR code payment for local in-store payments.⁴⁸

Korean model is a little different from above two models in terms of role of telecommunication company and financial institutions. As seen in above chapter, various wired online and offline electronic payment services are already very actively used in Korea. For example, many people in Korea

⁴⁸ If QR payment is selected as a main payment instrument to promote, still more things should be determined. For example, there is a decision as to whether (1) the personal mobile device scans the store's QR code, and (2) whether the store's scanner scans the individual's QR code. In the former case, mobile device owner should operate his device while in the latter case, the merchant should operate the device. QR payment is not really such a complicated technology and it is already widely used in several Asian countries including China and Singapore and already some Nepalese electronic payment service companies are also providing it. And there is a high possibility that additional development costs will not occur.

already used his card for his small amount payment for long times and financial institutions recognize the importance of the electronic and mobile payment system. So banks and credit card companies began to apply their payment service through the mobile communication devices. So mobile phones are simply used as payment device substituting the plastic card which already most people carry.

Based upon the above comparison analysis, it would be difficult for NRB to take the mobile payment development model of Korea or China in the near future. First of all, the financial and ICT infrastructures of Nepal are different from those of Korea and China. For example, many people in Korea have a bank account, which is different from the people of Nepal. For the AliPay models to be launched successful, e-commerce should actively work. Therefore, M-pesa model may be more applicable to Nepal. In addition, looking at both the domestic remittance market and the international remittance market and their relationships, the mobile payment looks reasonable to promote.

<Table 4-3>

Types of Major Mobile Payment Services

	M-Pesa Model	Ali-Pay step model	Korean Model
Birth	Vodafone and Safaricom in 2007 in Kenya	Launched by Alibaba in 2004 and in 2015 rebranded by Ant Financial Services Group in China.	Most card companies and banks in early 2000s
Supplying Agency	Telecommunication companies with a nationwide network. (The bank has actually made a disturbance.)	Alibaba, an online shopping mall with a nationwide commodity trading network.	Banks and credit card companies (mobile devices are merely means of information transmission)
Killer-application	Domestic remittance	Online payment used on the online shopping mall of Alibaba	Small amount offline payment
Offline payment method	2G and smart phone	QR Payment	Smartphone

(c) Selection of Activation Payment Service and Killer-application

Nepal has a large land area with a widely spread population. As a result, it may take too much cost to implement a nationwide service activation policy. It would be desirable to take regional program centered on Kathmandu and other big cities at first rather than to expand it to a nationwide one. In particular, it will be easy to install the required infrastructures required for

payment settlement service in large cities. In addition, more people will accept the new payment service in the large city rather than those of remote area.

With the selection of geographical area to launch a promotion policy, killer application should be selected too. As seen in Table 4-3, each development model has its own killer application. Neither mobile payment service designed for an online shopping mall payment nor for the payment service replacing existing plastic card payment cannot be a killer application in Nepal as explained in the above section. The paying by plastic card or purchasing by online shopping mall is not popular yet and is not expected to be popular in the near future in Nepal as seen the above section.

It is possible that the demand for the online remittance payment service from people in urban area to family in local one or that from oversea workers to domestic family will rise very much. In such case, the electronic remittance payment or electronic bill payment should be promoted at first before new other payment service is introduced. As indicated in the above section, currently, mobile banking and some third-party mobile payment are introduced already in Nepal. It is highly recommended that those services are successfully utilized in the near future.

(d) Collaboration Among Various Organizations

The good collaboration among various institutions should be made for the success of the launch of the electronic payment service. First, it is necessary for financial institutions to cooperation with each other if they like to take

advantage the economies of scale effect and network effect. It may be difficult for any payment service to be successfully launched if individual financial institution independently promotes different kinds of new payment service. Furthermore, to have an interoperability of the several payment instrument and network, the cooperation among financial institutions should be made in advance. In this case, the role of government or regulatory agency is very important as a coordinator.

Second, electronic payment service is only possibly introduced when ICT technology is combined into a financial industry. So smooth cooperation between financial institutions and ICT institutions is essential for this service to successfully to be developed and launched. ICT companies with new technology is used to develop a new service while the financial institutions already have good contact points with customers by way of financial account. The good cooperation between these agencies enable new payment service to be introduced into a large number of customers within a short time.

Third, good technical cooperation between the central bank and the government agency in charge of ICT development helps to secure both technical stability and financial stability of payment system. While technical stability is secured by the ICT regulatory agency, the financial stability should be by the financial supervisory agencies. Furthermore, the ICT regulatory agency may lead the standardization of the technology to improve an efficiency of the national payment system.

Fourth, active cooperation between financial institutions and their regulatory agencies helps to improve the software infrastructure of payment system. The financial institutions actually provide the electronic payment

service while the regulatory agency only indirectly helps these service to be launched successfully. As a result, it is also important to send a signal to the market that the central bank will not hinder the development of electronic payment services.

(e) Building Hardware Infrastructure

Installing an appropriate infrastructure is very important when to launch a new payment service because electronic payment service is only applicable when a required infrastructure is equipped with. Usually, main question is to how to finance its cost. For example, to have a hardware system for adopting credit card or debit card within a short time brings too much burden on the individual financial institutions of developing country like Nepal. Even government may have difficulty for it. As a result, this report recommends to promote the QR code payment system, which costs relatively less infrastructure building cost. Even in this case, still there is a question on who is going to pay this QR code payment installation cost. As indicated in above, the install cost on network may be borne by a telecommunication company. However, there is a cost to issue the QR code to the merchants and to teach the merchant to manage the system.

(f) Change and Legislation of Laws, Regulations and Improvement of Capacity of Regulators

It is necessary to establish appropriate laws and regulations related to

electronic payments before new electronic payment instrument are widely used. Currently, there is only a few necessary laws related with electronic payment system in Nepal. As a result, a law such as Electronic Payment Law in US or Electronic Financial Transaction Law in Korea should be prepared in advance. At the same time, it is also necessary to establish or improve other laws related with consumer protection, personal information protection and digital signature in electronic financial transactions as shown in Table 4-1.

It is also important to improve the capacity of financial supervisory agency. The fin-tech is a new concept and payment instrument of fin-tech is a newly developed one. So, it is highly possible for the unexpected accidents or for the case which the existing law and regulation cannot be applied directly to happens. In these cases, the good capacity of the regulator is very important to make an appropriate decision. Only well-informed and well-educated regulator may be able to solve it with less cost. For these purposes, it is necessary for the regulators of e-payment and e-finance to have good training or education before.

(g) Advertisement and Promotion

To get a strong trust and reliability from a public is very important for the successful launch of the electronic payment service. Therefore, it is desirable to carry out a large scale promotion program when launching a new service. At that time, it should be carried out by the reliable and trustful institutions, too. It is very difficult for small and medium ICT companies to succeed in this business because of its low reputation. Even large bank or

telecommunication company had difficulty to promote its new payment instruments. The promotion by the central bank or the government agency in charge of ICT and the related services can also be considered to take care of it.

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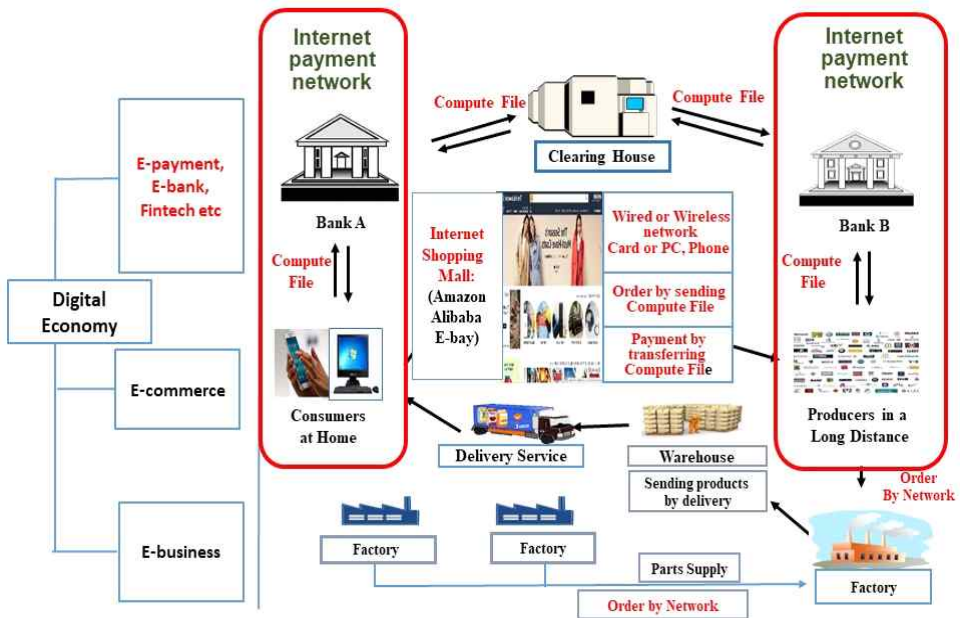
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<Appendix 1> A Digital Economy in 21st Century

Digital economy means an economy built upon the digital computing technologies. It is also sometimes called an internet economy, or the new economy. Three main components of the 'Digital Economy' are made of the e-business, e-commerce and e-business infrastructure in the Figure A-1.

<Figure A-1>

A Digital Economy in 21st Century



E-business means the new way of business where the internet and computing technology are extensively applied. It includes any process that an organization conducts over computer-mediated networks such as a new business model that uses internet technology to improve productivity and profitability. E-commerce means a new way of trade where buying or selling

activity is done online with the help of ICT. It usually means the transfer of goods through an online shop. It is classified into B2B (business to business) commerce, B2C (business to consumer) commerce, C2C (consumer to consumer) commerce, G2B (government to business) commerce, G2C (government to consumer) commerce according to the types of agents in a transaction.

Online trade is different from offline trade in many senses as shown in Figure A-1. The most important change which e-commerce brings is that both consumers and merchants separated by distance are able to trade without seeing each other. Simply, the sellers put their products in a website and the buyers search what they need in such a website and order the products from the sellers. If payment is completed, products are delivered to the buyer from the seller. Theoretically, a physical market is not required in this case.

<Appendix 2> Business Model of QR Payment

There are two main QR code applications in the payment business. First, the QR code on a mobile device of a payer is presented to a merchant and scanned by a POS or equivalent device of the payee. In this case, simply the POS device should have a function to read the QR code of the payer. Second, the QR Code is presented by the payee or the merchant and it is scanned by the payer. So the device of the payer or the person executing the payment should be able to scan the QR code.

The QR code payment system has some advantages over a cash payment or a card payment. It is very fast to complete the payment process because simply scanning the QR code may complete the payment. More importantly, it does reduce the installation cost of the payment infrastructure. If the mobile phone of the payer or payee is used for the payment, both parties do not have to carry other expensive devices such as plastic card or POS devices. Furthermore, merchants do not have to subscribe to high speed internet in their stores.

Despite of these advantages, the QR code payment system has not been successfully used in Korea and only a few stores have been using them. There are several reasons for it. First, already several efficient card payment systems have been widely used in Korea. Furthermore, mobile devices with the function of the card have already been used for years. Consequently, there were no large incentives both for customers and for merchants to adopt this new payment instrument. A simple payment by showing a plastic card can be more convenient than scanning a QR code.

<Figure A-2>

Two Business Model for QR Offline Payment

(a) Scanning by Merchant Device



(b) Scanning by User's Mobile Phone



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I. Introduction	LEE Choong Lyol
II. Proposal for the Modernization of Payment Systems in Nepal	KIM Myung Kee
III. Development of Supervision and Inspection System on Financial IT and Fin-Tech of Nepal	KIM In Seok and LEE Choong Lyol
IV. A Proposal for Development of Fin-tech, Cashless Society and Electronic Payment System in Nepal	LEE Choong Lyol

