

# **VIETNAM**

## **Data Collection Survey on E-Money and Transport Smart Card**

### **Final Report**

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## Acronyms and Abbreviations

ACS	Automatic Clearing System
ADB	Asian Development Bank
AFC	Automatic Fare Collection
AP	Application
ATM	Automated Teller Machine
BRT	Bus Rapid Transit
CCHS	Central Clearing House System
CEPAS	The Contactless e-Purse Application Specification
COBIT	Control Objectives for Information and related Technology
DB	Data Base
DOF	Department of Finance
DOHA	Department of Home Affair
DOIC	Department of Information and Communications
DOST	Department of Science and Technology
DOT	Department of Transport
EZ-Link	EZ-Link Pte Ltd
HAPI	Hanoi Authority for Planning and Investment
HCMC	Ho Chi Minh City
HPC	Hanoi People's Committee
IC Card	Integrated Circuit Card
IDA	Infocomm Development Authority of Singapore
ISACA	Information Systems Audit and Control Association
IT	Information Technology
JETRO	Japan External Trade Organization
JICA	Japan International Cooperation Agency
KOICA	Korea International Cooperation Agency
LTA	Land Transport Authority
MAUR	Management Authority for Urban Railways
MOCPT	Management and Operations Center for Public Transport
MOT	Ministry of Transport
MRB	Hanoi Metropolitan Railway Management Board
MRT	Mass Rapid Transit
NETS	Network for Electronic Transfers (Singapore) Pte Ltd
NFC	Near Field Communication
O&M	Operation & Maintenance
ODA	Official Development Assistance
OS	Operating System

PG Bank	Petrolimex Group Commercial Joint Stock Bank
POS	Point Of Sale
PPP	Public Private Partnership
PTA	Public Transport Authority
PTC	Public Transport Council
SAPI	Special Assistance for Project Implementation
SBV	State Bank of Vietnam
SMS	Short Message Service
SV	Stored Value
TMS	Ticket Management System
TRAMOC	Transport Management and Operation Center
VAT	Value Added Tax
VCB	VietcomBank
VND	Vietnam Dong
VNR	Vietnam Railways

## 1. Background and Objective

### 1.1 Background

The urban population in Vietnam was 15 million in 1995 and grew to 26 million in 2010. Thanks to Vietnam's economic growth and the spread of low-price motorbikes, most people in the major cities such as Ho Chi Minh and Hanoi owns their motorbikes. In 1990s, the number of car registration rapidly increased. The number of motorbikes grew to 1,862 million in 2006 from 121 million in 1990 and the number of automobiles increased to 97 million in 2006 from 25 million in 1990. More than half of them are used in two major cities: Hanoi and Ho Chi Minh. This situation translates higher traffic volume on roads in the major cities, which results in problems such as traffic congestion, accident, air-pollution and low-accessibility to urban services.

Based on the situation above, developing a comprehensive urban public transport network, ensuring the integration between private and public transport, and securing the connectivity among public transport modes are urgent issues in Hanoi and Ho Chi Minh. In both cities, MRTs (Mass Rapid Transit) and BRT (Bus Rapid Transit) are under development by various donors. Due to the different parties involved, the connectivity among transport modes might be issues in the future. Type of MRT ticket is particular issue. While contactless IC card type has been proposed in all MRT lines, there is lack of standard and common clearing system, then passengers possibly have to own line-specific smart cards.

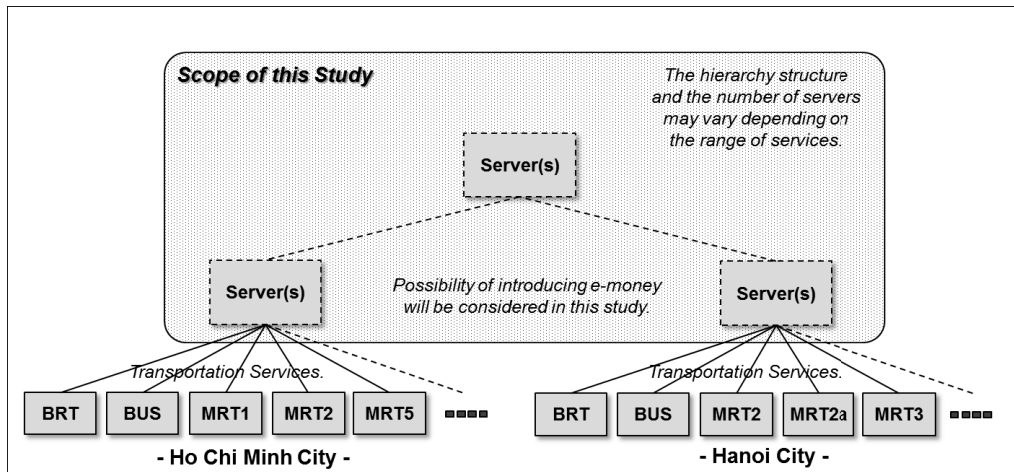
Under these circumstances, in order to increase passenger convenience through the spreading of smart cards interoperable among the various transport modes, it is important to study the configuration, implement priority and managerial structure of the clearing system among transport modes, and among operators, which is indispensable for realizing interoperability.

### 1.2 Objective

This study is aimed to increase convenience of the people's lives in Vietnam through the spreading of transport smart cards equipped with e-money function usable in market (herein after referred to as "comprehensive smart cards"). In this regards, the study was conducted to collect and analyze the information required to propose the clearing system (herein after referred to as "upper system") that enables the interoperability among the transport modes and the e-money function.

In the context of transport AFC (Automatic Fare Collection) system, the upper system is located at upper level above the line servers of each construction project as shown in Figure 1.1. In the 6 hierarchical model of the equipment configuration (Figure 1.2), upper system is located at 5th layer (CCHS: Central Clearing House System) to 4th layer (Operator server) which manages the function of the issuer<sup>1</sup>.

<sup>1</sup> Issuer function: It manages the smart card data (e.g. card ID, card status, SV (Stored Value) amount, season pass information, personal information etc. ). Card status means the categories which indicates card status (pre-issuing, issued, collected etc.) for early revenue recognition and recognizing the card issuing status.



**Figure 1.1 Scope of the Study**

Source: Study team

Level	Name of Equipment	Image	Function
5	CCHS		<ul style="list-style-type: none"> <li>-Clearing and Settlement Clearing and settlement for each operators.</li> <li>-Card Information Management Manage the most up-to-date data (e.g. card ID, card status, SV amount, Season pass information and personal info etc.) and status (“pre-issuing”, “issued” and “collected”) of IC card based on the data received from lower level.</li> <li>-Blacklist Management Manage the most up-to-date blacklist and deliver it to the lower levels.</li> <li>-Revenue Management Manage the daily / monthly revenue data of ticket sales.</li> <li>-Statistics Management Manage the daily / monthly statistical data of transport.</li> </ul>
4	Operator Server		<ul style="list-style-type: none"> <li>-Relaying data in higher/lower level</li> <li>-Outputting revenue reports for operator , etc.</li> </ul>
3	Line Server		<ul style="list-style-type: none"> <li>-Relaying data in higher/lower level</li> <li>-Outputting revenue reports for line , etc.</li> </ul>
2	Station Server, Bus Depot Server		<ul style="list-style-type: none"> <li>-Relaying data in higher/lower level</li> <li>-Outputting revenue reports for station or bus depot, etc.</li> </ul>
1	AFC Equipment		<ul style="list-style-type: none"> <li>-Communicating with IC card wirelessly and updating data in IC card.</li> <li>-Creating data for servers in higher level.</li> </ul>
0	Ticket Media		<ul style="list-style-type: none"> <li>-Holding Card ID, Usage Data, etc.</li> <li>-Communicating with equipment wirelessly.</li> </ul>

**Figure 1.2 General system hierarchy for transport smart card**

Level 1 “AFC equipment” may vary depending on traffic modes. (MRT / BRT operator: auto gate, ticket vending machine, ticket office machine, etc. BUS operator: on-vehicle terminal, handy terminal for bus crew, etc.)

Source: Study team



Generally, the types of smart cards varies depending on read and write method, payment method, a place of usage, etc. In this study, the contactless and prepaid type smart card used for public transport is described as "Transport Smart Card". And the transport smart card equipped with e-money function usable in retail stores is categorized as "comprehensive smart card"

- Read and write method

Two types, contact and contactless, are considered. For the ticket for public transport, the processing speed is important, thus the contactless smart card is generally adopted.

- Payment method

It is largely categorized into two types, prepaid and postpaid. The prepaid smart card is often adopted to ticket for public transport.

- Place to use

It is often used as a ticket for public transport and micropayment of retail stores.

### 1.3 Study Area and Counter Parts

The study area and counter parts are shown in the table 1.1

**Table 1.1 Study Area and Counter Parts**

Area	Hanoi City	Ho Chi Minh City
Authorities		
Ministry of Transport		
- Vietnam Railway Administration	X	-
Vietnam Railways	X	-
State Bank of Vietnam	X	-
People's committee	X	-
Department of Transport	X	X
Railway Management Authority	X	X
Department of Science Technology	-	X

x : target area

## 2. Overview of Smart Cards in Other Asian Countries

### 2.1 Summary

The overview of transport smartcards in the countries surrounding Vietnam is summarized in Appendix-1. The detailed description of the countries which have relatively longer usage history, Japanese and Singapore, are described in section 2.2 and 2.3 respectively.

### 2.2 Japan

(History from IC Card System Introduction until Nation-wide Interoperability)

In Japan, various IC cards for transport modes and area suitable to their services and environment have been issued since the starting of Suica service by JR-east in 2001. In this regards, common standard of IC card processing for automatic gates (namely “Cybernetics standard” which is to be mentioned later) has been developed among transportation operators. The expansion of upper system has been conducted accordingly and it contributes towards the seamless mobility among domestic public transportation such as railways and buses while keeping local brand identity.

In addition to the IC cards for transport modes, in March 2004, the Suica E-money service started. It then became possible to use the IC cards for shopping, then as a result of getting to receive various services in the station yard by a IC card, new scenes of the use of IC Card were arose.

In 2007, railway operators in Kanto area launched IC card (PASMO) service and the interoperability between Suica and PASMO was realized. The growth of IC card usage at that time was remarkable, approximately 20 % increase. Before, the medium of season pass passenger transferring between JR East area and PASMO area were magnetic cards, but the interoperability enabled comprehensive smart cards to be used instead. Therefore the growth of usage rate is supposed to be the result of the shift from magnetic card to IC card made by these season pass passengers.

While achieving interoperability in Kanto area, Suica of JR-East achieved the interoperability in Kansai area, Hokkaido area and Kyushu area expanding gradually the area of interoperability of IC card. To realize nation-wide interoperability, an association was established involving the different IC card issuers. Workshops were conducted by experts for several years to solve the issues among the different parties on equipment, system and service to be offered.

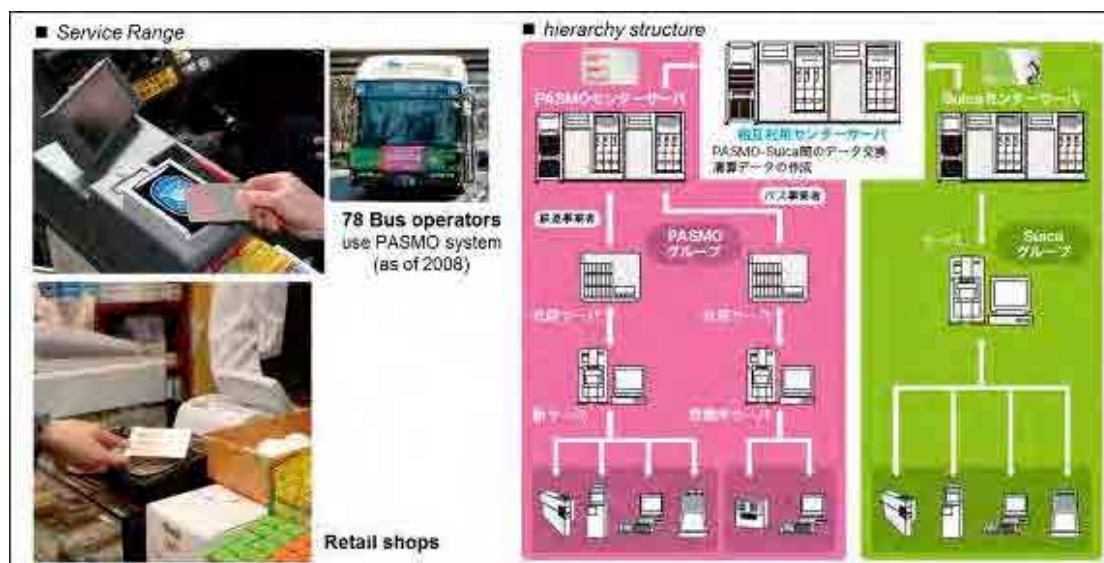
In March 2013, nation-wide interoperability among 10 kinds of IC cards was achieved. Any one of these cards can be used through 321 lines (more than 11,500km) in the 5 areas; Hokkaido, Kanto, Chukyo, Kansai, and Kyushu<sup>2</sup>. Approximately 80 million cards of 10 kinds have been issued in total and the population coverage in the interoperable areas is as high as 80%.

Monthly usage of e-money service was approximately 90 million just after the nation-wide interoperability, and it exceeded 100 million in July 2013. This shows acceptance of e-money by the

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<sup>2</sup> For further details, see Appendix-2

customers as the area of usage expanded<sup>3</sup>. Moreover, it is reported that the effectiveness of e-money to attract customers to stores where Suica is available exceeded others by about 3 points<sup>4</sup>.



**Figure 2.1 Overview of Urban Transport Smart Cards in Japanese Metropolitan**  
Source: The association of Japanese Private Railways “Mintetsu” 2008 Spring

(Background of adaptation of Felica)

The card type adopted for interoperable IC card for transportation is “Felica”. In 2001 Felica was adopted for Suica which is issued as the very first IC card issued for transportation by JR East. The main reason why Felica was chosen was its capability to make passengers flow smoothly even at the metropolitan rush hour. After more than a decade of research and development, JR East decided to introduce automatic gate which can process IC card in 1998. JR East procured the IC card system by international competitive bidding, after collecting the requirements on performance such as processing ability of automatic gates, transmission and processing speed inside the card, during the rush hour in metropolitan stations.

Among competitors of various card types and nationalities, Sony who offered Felica won the bidding through “Comprehensive evaluation method” which comprehensively appraises performance and price. Following this, Felica was also introduced to other areas with the same basic way of processing as Suica. This is a result of design and implementation along the common standard (Cybernetics Standard) which was developed for future interoperability by “Congress of Japan Railway Cybernetics”, consisting of companies such as transportation operators and IC card-capable equipment venders. Because of this common standard, it reduced the barrier of the interoperability between Suica and ICOCA (JR West) in 2004, and later achieved interoperability among other areas, and finally nation-wide interoperability in 2013.

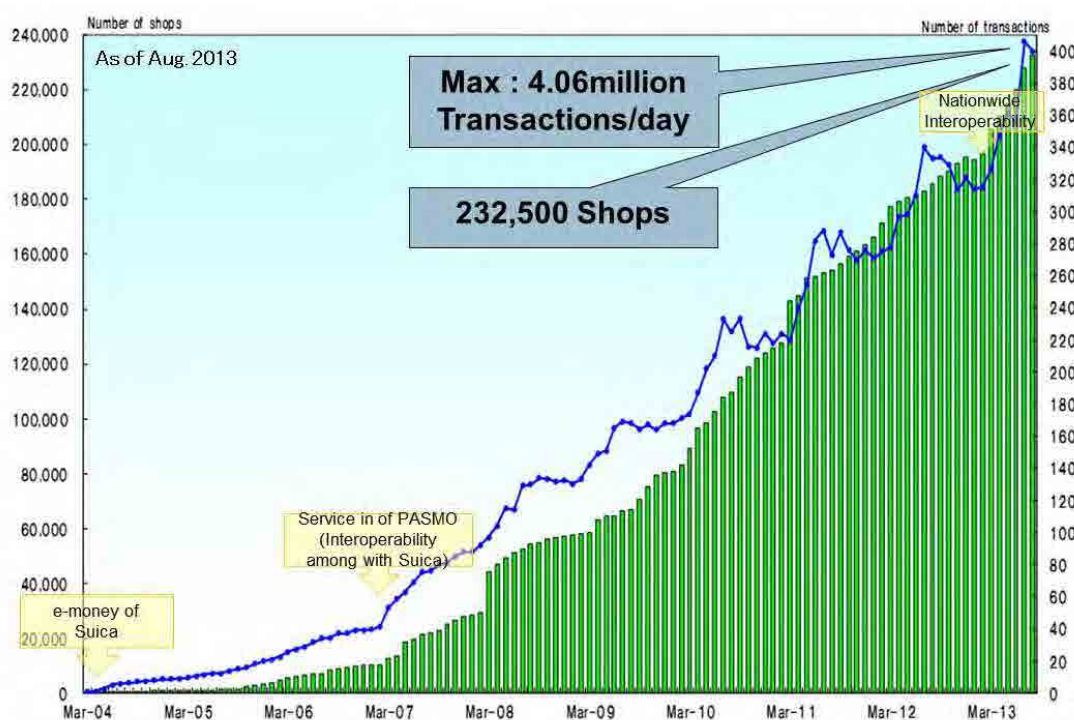
Furthermore, Felica has some advantages for further service expansion since it supports high level security and implementation of multiple applications.

<sup>3</sup> JR East press release (01/08/2013)

<sup>4</sup> ITPro : <http://itpro.nikkeibp.co.jp/article/JIREI/20071016/284678/>, October 2007

(Application to Vietnam)

Currently in Vietnam, Hanoi and Ho Chi Minh are studying smart cards for public transport respectively. Since it is performed separately by the cities, each cities might implement the smart cards differently from each other like what Japan did before. In the process of economic growth in Vietnam, there may be future needs for nationwide interoperability in public transport modes. The technology for interoperability formed in Japan could be useful for Vietnam. Vietnam government is now going to increase the ratio of non-cash payment as a national policy in order to realize economic growth. As shown in Figure 2.2, the ratio of non-cash payment has steady increased through the use of transport smart cards in Japan. The knowledge and technology in such service area could be a good reference for Vietnam. Furthermore, IC card “Felica” which can provide not only stress-free high speed data transmission and also securely the multi-application environment, and the technology and knowledge on the system implementation in Japan which the user can utilize the IC card without being aware of the method of the use and payment etc, could contribute greatly to the expansion and use of IC Card and the economic growth in Vietnam.



**Figure 2.2 E-money Transaction Volume of Suica Cards**

Source: JR-east company, August 2013

### 2.3 Singapore

Transport smart cards in Singapore started from the contactless type, namely ez-link, implemented by LTA (Land Transport Authority) in 2002. The cards could be utilized for MRTs and buses, and contributed towards the seamless mobility. However, it was built around the single issuer-single acquirer model, only ez-link cards issued by LTA, this restricted the choice of cards. Besides the ez-link card, the other stored value card, a contact type card issued by multi issuers, are widely used

for the payment of road pricing charges and parking. In line with Singapore's vision for a non-cash society, it has been decided to replace the existing system. In 2004, the development of their own standard of smart cards has been started by co-working of LTA and IDA (Infocomm Development Authority of Singapore). In 2006, after two years from the starting date, "CEPAS (The Contactless e-Purse Application Specification)" which includes e-money function was released. Now, one smart card covers a wide range of service such as public transport, highway, parking and retail shops in the country.<sup>5</sup> As for the card issuing, only entities which have a license granted by PTC (Public Transport Council) can do it. As of May 2014, there are only three issuers, EZ-Link Pte Ltd (EZ-Link), Transit Link Pte Ltd and Network for Electronic Transfers (Singapore) Pte Ltd (NETS).

When the implementation process of Singapore smart cards is referenced, one must remember that their land (just only 710km<sup>2</sup>) is managed directly by the government. It is one of reason that they were able to replace the cards without much inconvenience.<sup>6</sup> In case of countries which have major cities scattered across long land area such as Vietnam and Japan (approximately 330,000km<sup>2</sup> and 380,000km<sup>2</sup> respectively) and its public transport being managed by local authority or private entities, it is difficult to consider the overall replacement and the standardization after card implementation based on Singapore case.<sup>7</sup>

The number of public transport cards issued is approximately 10 million, annual transaction volume is just 1.5 billion Singapore dollars<sup>8</sup> as of April 2013, and the number of accepting units in retails shops is roughly 8300 only<sup>9</sup>. Hence it can be said that the card market in Singapore is not very big.

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<sup>5</sup> Silver Praksam / Director of LTA, "Evolution of E-payments in Public Transport – Singapore's Experience", 2009

<sup>6</sup> As 200 thousands existing cards were used by users just before the replacing date, while earlier replacement had been announced, there might be a certain confusion. (Ez-linkpress release dated on 30 Sept, 2009)

<sup>7</sup> Even for the comparison with cities, it should be noted that Singapore's land is one-third to two-fifth of Ho Chi Minh (2,095km<sup>2</sup>) and Hanoi (3,345km<sup>2</sup>).

<sup>8</sup> PUBLIC TRANSPORT COUNCIL's Annual Report 2012/2013

<sup>9</sup> Ez-Linkweb site (<http://www.ezlink.com.sg/added-benefits/ez-reward.php>)

### 3. Current Situation and Implementation Plan of Smartcards in Vietnam

#### 3.1 Public Transport

##### 3.1.1 Hanoi City

(The situation of smart cards system of each transport mode)

In Hanoi, BRT (14.2km construction as “Vietnam - Hanoi Urban Transport Development Project” by World Bank support<sup>10</sup>) and MRTs will start operation sequentially. All of these new transport modes will be equipped with smart card equipment until the level 2 or 3. MRT operators who will be managing line 2a, 2 and 3 is currently being established with JICA support.<sup>11</sup> For the BRT, existing bus operator (Transerco) will operate it at the start-up period, and then put to tender and award concessions for the operation.<sup>12</sup>For bus system, the Q-system which consists of GPS and auto-fare system by Transerco and city’s electric company group (Hanel) is noted by DOT (Department of Transport) letter “Request for approval and issuance of framework of fare policy and ticket technology to be applied to the public transportation network in Hanoi” (1178/TTr/SGTVT dated Aug 23, 2013). At this moment, however, no actual progress is observed. As an active project, the pilot program in “Project for Improving Public Transportation in Hanoi (Sep 2011 to Aug 2014)” by JICA is notable. Through this program, IC cards will be implemented on one bus route in July 2014. (Figure 3.1)

As for the MRT 1, although it is under Hanoi people committee’s management according to Railway Law (35/2005/QH11), its operation is handled by VNR (Vietnam Railways) as stated in “Conclusion of MOT - Mr. Dao Dinh Binh - and Chairman of HPC - Mr. Nguyen Quoc Trieu - at the meeting approving the general project of "Hanoi Elevated Railway, line Ngoc Hoi - Yen Vien" and structural project of Nhat Tan bridge” (519/TB-BGTVT-UBHN, Oct 2005). For this reason, the transport mode excluded the MRT Line 1 is described from this subsection.

Level	Name of Equipment	Public Transport in the City					National Railway (MRT)	
		Bus (JICA Pilot 2014)	BRT (2015)	MRT			(Line 1) (2022)	
				Line 2a (2016)	Line 2 (2021)	Line 3 (2019)		
5	CCHS							
4	Operator Server							
3	Line Server							
2	Station Server Bus Depot Server	JICA Pilot	Q System	Under Design	Under Construction	Under Design	Under Construction	Under Design
1	AFC Equipment							
0	IC Card	Felica	Type A	(Proposal by Successful Bidder)	Type A	Felica	Type A · B	Felica

( ): Commencement year of business transaction

Dotted Line: plan, pilot and survey stage    Solid Line: Construction project

Card Type is sated based on the DOT letter (1178/TTr/SGTVT) etc. (Some types were modified by Study Team )

**Figure 3.1 The situation of Smartcard System of Public Transport Projects in Hanoi**

Source: Study team

(Situation of Studying Interoperable Smartcards)

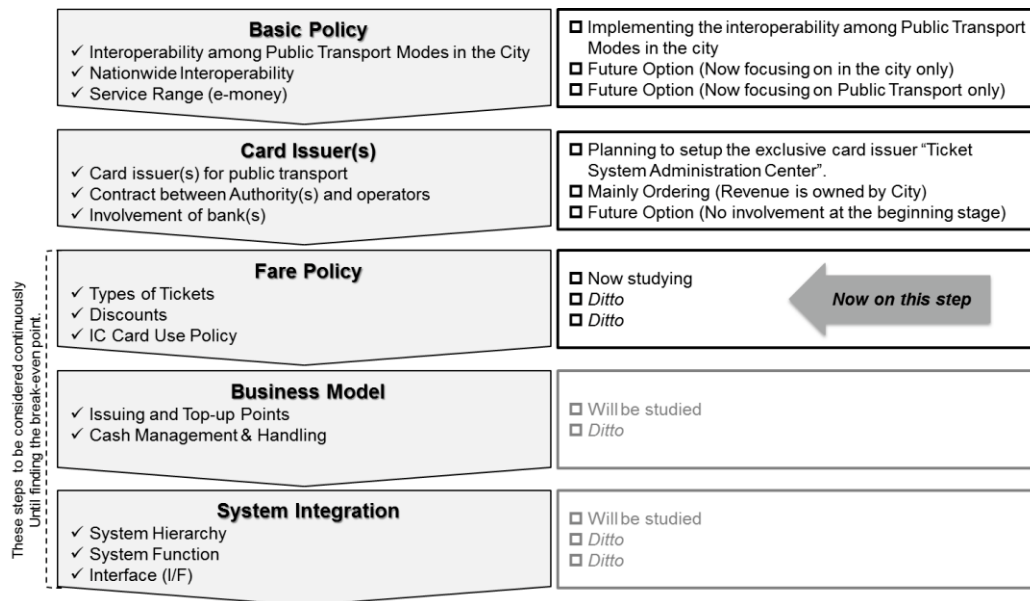
<sup>10</sup> World Bank, ENVIRONMENTAL MANAGENEMENT PLAN, Oct 14, 2013

<sup>11</sup> HPC Notice 40/ TB-VP ”Conclusion of 3rd JCC meeting of TA Project “To Strengthen the Capacity of Regulator and to Establish O&M Company for Metropolitan Railway Lines in Hanoi City””, Mar 14, 2014

<sup>12</sup> World Bank Letter to SBV “Amendment to Financing Agreement” dated Oct 22, 2013



Different types of NFC (Near Field Communication) at the lowest level (Level 0) will be implemented, since the design work of construction projects has been conducted without sufficient coordination. Based on this background, in the donor meeting held in HPC on Jul 2, 2014, Hanoi city accepted IC cards recommended by respective donors. However Hanoi city also requested them to install multi-terminals which are applicable to all NFC types for all transportation modes. At the time of preparing this report, basic policy and a card issuing body have already been decided, and fare policy such as type of ticket is under study. (Figure 3.2)



**Figure 3.2 Study Situation of Interoperable Smartcards in Hanoi**

Source: Study team

#### (Card Issuing Body)

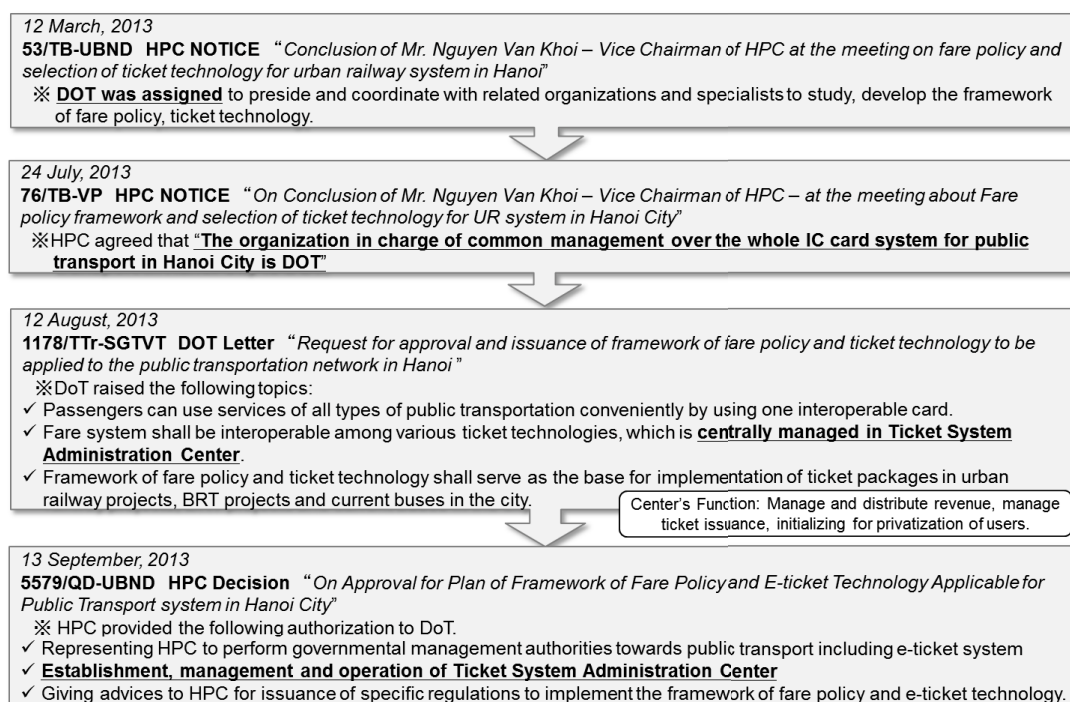
In Hanoi, the fare management structure is now under development based on the concept of "Integrated Fare Collection" which is proposed as a part of the establishment plan of PTA (Public Transport Authority) suggested by the World bank.

This direction has been accelerated by HPC notice (53/TB-UBND) issued in March 2013. DOT was assigned as an organization in charge of common management over the whole IC card system for public transport in Hanoi City. In August 2013, in response to this notice, DOT proposed the Ticket system Administration Center (hereinafter referred to as the Center) which has the following functions. This proposal was basically approved by HPC Decision (5579/QD-UBND, Sep 2013) and the department of home affair (DOHA) was instructed to give advices and submit HPC for approval of organization of operation and functions of the Center when PTA has not been established. <sup>13</sup>(Figure 3.3, Table 3.1)

#### **[The major function of the Center proposed by DOT]**

<sup>13</sup> The Integrated Fare Collection is an expected function of PTA, however, it is planned to realize the Integrated Fare Collection earlier by establishing the Ticket System Administration Center, since the establishment of PTA does not show any clear milestones.

- 1) Managing and distributing revenue
- 2) Managing ticket issuance
- 3) Initializing for privatization of users



**Figure 3.3 Events leading the Setup of the Ticket system Administration Center in Hanoi**

Source: Study team based on 4 letters above

**Table 3.1 Authorities related to Setting-up Ticket System Administration Center**

Authorities	Role
DOT	To coordinate with related departments and organizations (incl. coordination during the implementation of fare package in public transport development projects.) To represent HPC to perform governmental management authorities towards public transport, including e-ticket system via the establishment, management and operation of Ticket system Administration Center To give advices to HPC for issuance of specific regulations to implement the framework of fare policy and e-ticket technology.
DOIC	To evaluate the design of ticket systems of public transport development projects, in order to ensure the interoperability.
HAPI	To give advices to HPC during the formation, evaluation of projects and tendering, in order to ensure that the implementation of ticket packages in public transport projects
DOST	To provide comments in terms of technology aspect for selected ticket system(s) to be used for public transport network.
DOHA	To submit HPC for approval of organization of operation and functions of Ticket System Administration Center.
DOF	To issue specific guidance documents regarding the management, allocation of revenue and subsidy policies for public transport lines using e-ticket.
Projects	To obey requirements, regulations in the approved Framework of fare policy and ticket technology.

Source: HPC Decision 5579/QĐ-UBND



In the meeting with DOT dated Apr 2, 2014, the study team confirmed that the center will be formed in the building which is being constructed as a part of the package 4d of BRT project supported by the World bank (Nguyen Thai Hoc street (Figure 3.4 and 3.5). However, the support for the establishment of the center and the system implementation is not covered by the World bank. Therefore, other supports are required.



**Figure 3.4 Location of Kim Ma BRT Terminal**  
Source; Study team using Google map (★: location of center)



**Figure 3.5 Construction site of Kim Ma BRT Terminal**  
Source: Study team (taken on Jun 30, 2014)

### 3.1.2 Ho Chi Minh City

(The situation of smart cards system of each transport mode)

As for the public transport in HCMC, three MRTs and one BRT indicate their opening year. Two MRT construction projects are now under way toward sequential opening of MRT 1 and 2. MRT 5 supported by ADB (Asian Development bank) is now under Feasibility Study (F/S) with a possible opening in 2021. These MRT lines will be equipped with the AFC system up to level 2 to 3. (Figure 3.6)

Although the plans for BRT have been reported by World Bank and KOICA (the final report was issued in 2013)<sup>14</sup> separately, only the Prime minister’s decision (568/QD-TTg) listing 6 lines announced in 2012 is current official. As some media reported<sup>15</sup>, 1<sup>st</sup> line is now under F/S supported by World Bank toward opening in 2018. The other lines will be studied after the completion of 1<sup>st</sup> line.<sup>16</sup> In addition to the official plan, there is another notable project. Tokyu Corporation is now conducting BRT F/S on the outskirts of HCMC as JICA PPP project. The report is expected to be issued in the future.

Level	Name of Equipment	Bus (No Plan)	BRT (2018)	MRT		
				Line 1 (2018)	Line 2 (2020)	Line 5 (2021)
5	CCHS					
4	Operator Server					
3	Line Server		Feasibility Study (F/S)	Under Construction	Under Design	Feasibility Study (F/S)
2	Station Server Bus Depot Server					
1	AFC Equipment		(Not yet Decided)	Felica	Type A,B,Felica	Type A,B

( ): Commencement year of business transaction

Dotted Line: plan, pilot and survey stage Solid Line: Construction project

**Figure 3.6 The situation of Smartcard System of Public Transport Projects in HCMC**

Source: Study team

For the smart cards for bus system as shown in Figure 3.7, the below staged actions had been conducted in order to implement the IC cards smoothly. The pilot program of IC cards (contactless prepaid type) was started in 2010, but suspended in 2012 due to low usage resulting from lack of top-up points.<sup>17</sup> Based on the results of previous three activities, currently, DOT, DOST, MOCPT (Management and Operations Center for Public Transport) and FPT (State Owned Enterprise in IT industry) are forming the policy and standard for bus smartcards founded by the people committee.<sup>18</sup>

<sup>14</sup> Reportedly, KOICA proposed the plan of eight BRT lines (total 127,1km). They funded USD 2 million for the feasibility study for line 7 (Ben Thanh Market to Tan Son Nhat International Airport) with priority, and the study result was reported in the seminar held on July 4, 2013.

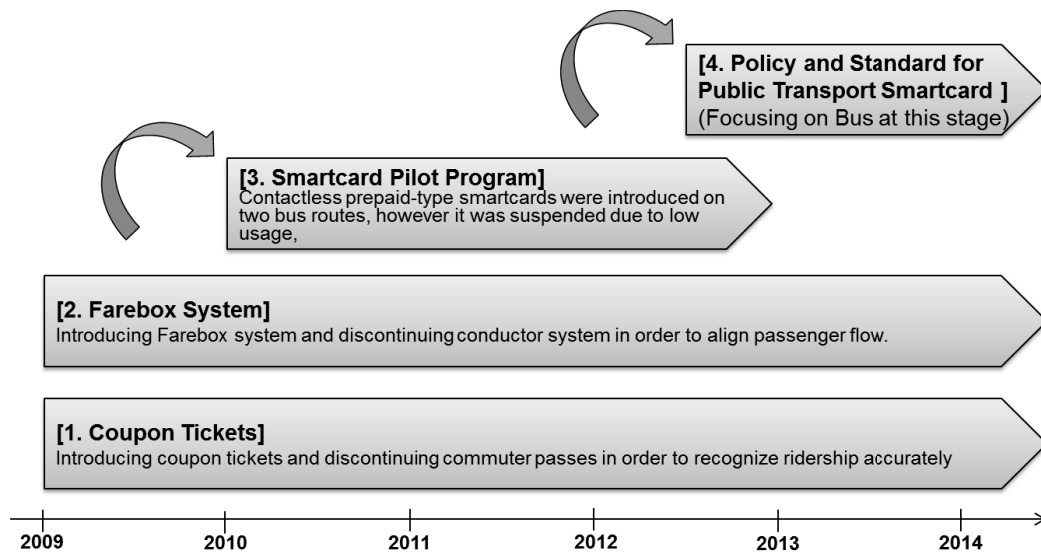
(<http://www.vietnambreakingnews.com/2013/07/final-seminar-for-bus-rapid-transit-brt-project-in-ho-chi-minh-city/>  
<http://english.thesaigontimes.vn/Home/business/infrastructure/27233/>)

<sup>15</sup> VietnamNet dated 28 Sep, 2013

<sup>16</sup> Interview with PMU (Project Management Unit) of BRT dated on mar 4, 2014

<sup>17</sup> Only 160 cards were issued in 2010 to 2012.(Interview with MOCPT dated Apr 17, 2014)

<sup>18</sup> Interview with DOT dated on Apr 11, 2014.

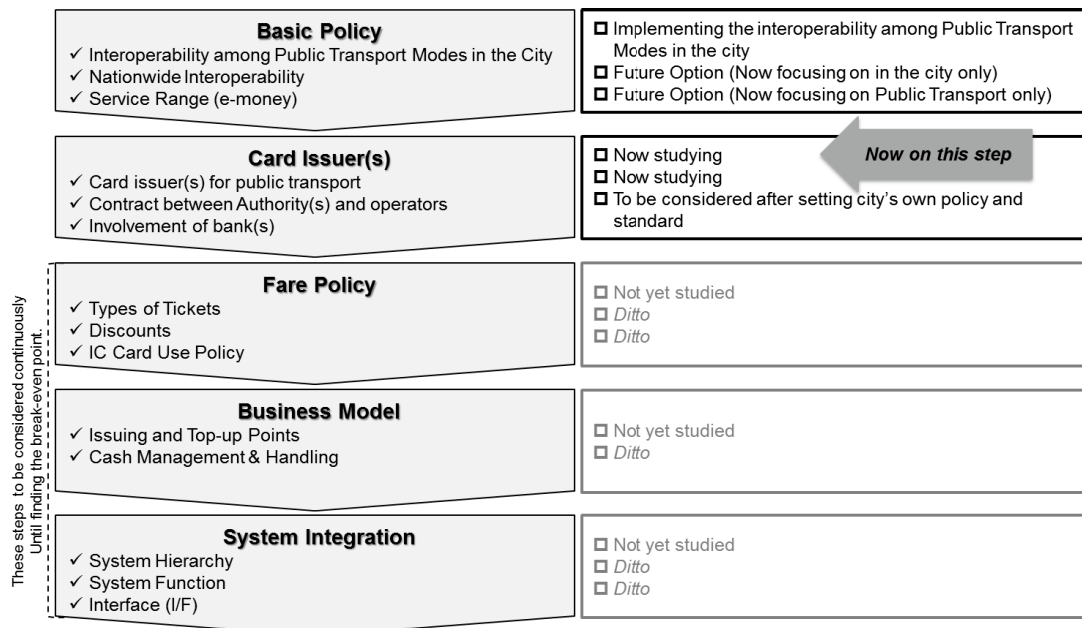


**Figure 3.7 Actions towards the Implementation of Smartcard in HCMC Public Transport**

For the details of coupon tickets, farebox system and smartcard pilot program, refer to Appendix-3  
Source: Study team

(Situation of Studying Interoperable Smartcards)

As previously mentioned, the policy and standard for public transport smartcard focusing on existing bus system in HCMC is now under development, therefore at this moment there is no detailed plan. However, the realization of interoperability among the public transport modes is already common sense among HCMC’s related authorities. (Figure 3.8)



**Figure 3.8 Study Situation of Interoperable Smartcards in HCMC**

Source: Based on the interview with DOT, DOST, MOCPT and MAUR

### 3.2 Services other than Public Transport

According to SBV report, 66.2 million cards (credit, debit, prepaid) were issued in Vietnam at the end of 2013. The number of cards issued indicates major growth in recent years. There was an increase of 22% from the previous year.

The categories of cards issued are as follows: 61.11 million debit cards, 2.67 million prepaid cards and 2.43 million credit cards.<sup>19</sup> However, it seems that the main purpose of the card was used to withdraw cash. Therefore, the cards used as payment method are on the stage in development.

For this reason, e-Money services implemented in contactless IC cards is emerging but is unfamiliar to Vietnamese consumers. JETRO report points that the current condition about e-Money growth in Vietnam is behind Thai and Indonesia. (Table 3.2)

**Table3.2 current condition about e-Money adoption in South-East Asian countries**

country	current condition about e-Money adoption	Remarks
Indonesia	The number of e-Money that were issued is 7.9 million (2010). There are 10 issuer companies.	-
Malaysia	5 bank-affiliated companies and 15 nonbanks issue e-Money. (classified by central bank's permission)	-
Philippine	Generally, e-Money on mobile phones is used by money transfer. The limit of transfer is 10000 peso or less. (This is based on central banks regulation.)	The usage of e-Money on mobile phones over the counter is not popular and limited.
Thai	OK Cash is popular e-Money. That can be used in 250 thousand merchants, including department stores, restaurants or movie theaters. There exist 10 million users.	The e-Money is popular and familiar to consumers.
Vietnam	Many people suspect reliability of e-Money, and available area is limited. Therefore e-Money is used scarcely.	Recently, mobile banking can be used in some quarters.

Source : JETRO, "The report on retail finance in Asia(March 2011)"

On the other hand, there is a diversification of payment service available. The operators of online payment, service, which is administrated by managing value on servers and networks<sup>20</sup>, start up their business. These payment services are used in online shopping or buying digital contents with PCs or smartphones. Based on the above situation with diversifying non-cash payment, e-Money is expected to become popular in Vietnam.

This section describes the plans and usage of the smart cards in the industries other than transport sector. This is based on field study done in Vietnam. For this study, the study team selected several

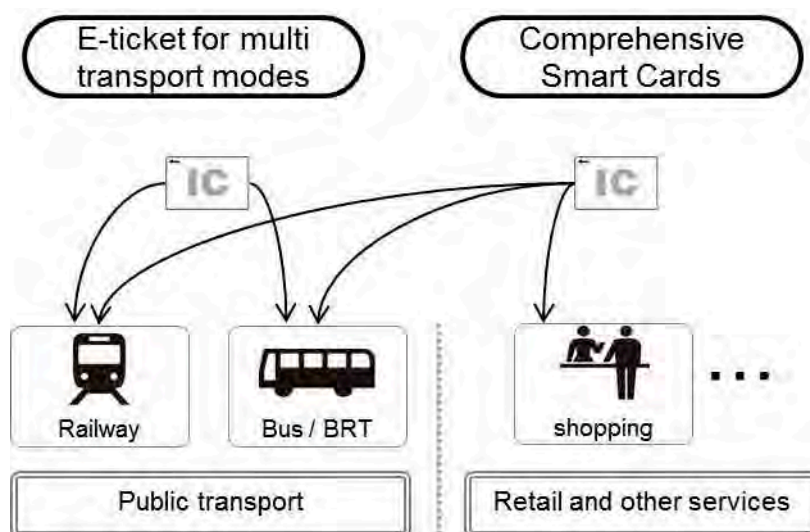
<sup>19</sup> Viet Nam News(<http://vietnamnews.vn/economy/252141/credit-payments-edge-up-in-cash-only-society.html>)

<sup>20</sup> The payment service which manages remaining value on server. (a.k.a. "e-wallet") The service is provided online and provided with bank account. The principal use is online shopping, payment for buying digital contents, paying utility charges or money transfer and so on. JETRO reports primary operators like Momo or Payoo.(The report on retail finance in Asia(March 2011))

retail operators including convenience store chains and supermarkets where future smart cards issued for transport could be used for purchase of various goods and services as “E-money”.

As can be observed not only in Japan which transport smart cards with E-money functions – e.g. Suica or PASMO – have been widely prevalent but also in ASEAN’s cities such as Hong Kong, Singapore or Bangkok where e-ticket cards for railway are in use for years. These cards would be powerful tools in Vietnam to realize “a non-cash society” which is being promoted by Vietnamese government.

In this study, the study team recognized the current circumstances surrounding card issuing bodies (mainly financial institutions) and discussed the future demand of retailers for smart cards.



**Figure 3.9 Comprehensive Smart Cards**

Source: Study team

### 3.2.1 Existing Card Issuers

In Vietnam, the State Bank of Vietnam decision No. 20 (abbr. decision No.20) is the current regulations governing the issuance of bank cards such as debit cards, credit cards and prepaid cards. For case where an organization issues cards which can uses among multiple companies, it is subjected to decision No.20, and the credit institutions such as banks can only issue those cards under various requirements. Currently, the issuing organizations who adopt those requirements are commercial banks only. In contrast, when an organization issues cards which is used for its entity only, decision No.20 is not perceived to be adopt for such business. (for decision No.20, see also subsection 4.2)

We conducted interviews with 2 operators who issue IC card or prepaid cards. Through the interviews, we gained understandings and potential issues in the way of realization of “the comprehensive smart cards” in future Vietnam.

Table 3.3 shows respondents of this survey.

**Table 3.3 Respondents to the survey (Card issuing companies)**

#	description of business
1	Commercial bank (the largest player in card market)
2	Information technology company (industry giant)

Note: 2<sup>nd</sup> company was nominated as a system developer of IC card business.

In the interviews, the study team asked respondents the following items:

- Present state of card issuing in Vietnamese market
- Expectations for the comprehensive smart cards and issued to be solved

Comments from respondents are summarized as follows:

(1) Present state of card issuing in Vietnamese market

The bank cards issued by financial institutions are classified according to the bank card regulation in Vietnam. (refer to the subsection 4.2.1). The classifications are given in the table 3.4 below:

**Table 3.4 The card types in Vietnam (bank cards)**

Classification	Card types
a) classification by useful range	International card
	Domestic card
b) classification by issuing form	Credit card
	Debit card
	Prepaid card

Source: decision No. 20

According to a financial institute interviewed, around 60 million bankcards are currently circulating in Vietnam. In terms of “a) classification by useful range” on the above table, domestic cards accounts for 90% or more of total card-in-force. International cards take only a small percent. Regarding “b) classification by issuing form” on the table, debit cards occupy 90% or more. Credit cards cover around 6% and prepaid cards do not extend beyond 2 or 3 %. Prepaid cards, prevailing as transport IC cards in Japan, are limited to application of taxi cards, gift card or gasoline cards in Vietnam.

Taxi cards are introduced at multiple taxi companies in Hanoi City or Ho Chi Minh City. For example, Taxi Group, who operates 5 taxi brands including “Hanoi Taxi” or “CP” and is known as the largest taxi company in Hanoi City, issues prepaid type taxi card (magnetic stripe card) with technical supports from VietcomBank (VCB). Those cards don’t have top up function, therefore consumers have to purchase new cards after using them up. The taxi cards were introduced with VCB’s investment for initial costs including in-taxi terminals for all cars owned by Taxi Group. VCB receives transaction fees from Taxi Group depending on actual usage of the cards. Taxi Group explained that



the share of taxi cards in passengers' payment is about 20%. The respondent observed that the reason why the percentage was low is that consumers do not feel inconvenience with cash payment.

Petrolimex Group Commercial Joint Stock Bank (abbr. PG Bank) issues contactless-type IC cards by the name of "Flexicard", which are available at gas stations. The range of use is not only gasoline but also other goods and services in affiliated to the gas station. Two types of prepaid cards are sold, "Anonymous Prepaid Flexicard" and "Named Prepaid Flexicard". The latter has money transfer function. Consumers can top up their cards at PGBank or gas stations. As can be seen, the types of the cards are not only exclusively prepaid card but also combination of debit and prepaid card.

Today, the number of issued cards is increasing in Vietnam, but the shops accepting cards are limited in urban areas. Therefore, SBV recognizes the challenges of nationwide development of common settlement infrastructure and this plays a key role towards the realization of the non-cash society in charge of the relevant policy programs.

## (2) Expectations for the comprehensive smart cards and issued to be solved

Each card issuing organizations addresses card-relate businesses as a major source of income and will possibly keep on rapidly expanding their card businesses. They also recognize potential opportunities of IC card issued for transport including railways, Buses and BRTs to be used in payment for goods and services. They mentioned advantages of the comprehensive smart cards as follows:

- Improvement in convenience for card holders. (They can use a single card for multi-funciton.)
- Decrease of time for payment processing. (by comparison with credit card)
- Ensuring security of handling and keeping of cash in business facilities.
- Prevention of fraud and stealing by staff.

On the other hand, they are still keeping a conservative position toward early adoption, despite the advantages of the Comprehensive smart card. They mentioned challenges and problems of the Comprehensive smart card as follows:

- Business practices and people's lifestyle in Vietnam. (They prefer keeping cash in their hand.)
- Incentives for card usage like discount. (Consumers put discount above the time or the style of payment)
- Card payment fees for business operators. (Expenses are often passed on to customers. This is a contributory factor that the consumers pull away from card payment.)

- Environment equipment to top up their cards. (For example, over the counter, kiosks, automatic top up using debit or credit cards or bank accounts.)

Above merits and demerits contain conflicting matters. But, the points of contention can be represented as remarked below from a comprehensive standpoint. Expectations of card issuing organizations in order for them to introduce the comprehensive smart cards are summarized as follows:

- How to visibly show to customers the convenience and benefits of using a comprehensive smart card.
- How to make a scene that the customers regard the comprehensive smart cards as daily essentials through their lifestyle including public transportation and vicinities in Vietnam.
- How to promote environment equipment to issue or top up the comprehensive smart cards.

### 3.2.2 future demand for the IC card

At present, there are very few IC card issued and used by retailers in Vietnam. This subsection addresses future challenges and conditions to be considered during the implementation of comprehensive smart cards in Vietnam. The study team conducted interviews with four (4) Japanese companies regarding their motivations or challenges to introduce the comprehensive smart cards to their businesses. The surveyed companies have been (or plan to) expand into Vietnamese market.

Apart from them, we have conducted similar interviews with some Vietnamese retailers who will possibly issue or accept the comprehensive smart cards in future. (3 companies shown in Table 3.5)

**Table 3.5 Retailers (domestic company in Vietnam)**

#	description of business
1	Supermarket (60 shops in Vietnam)
2	Consumer-electronics retailer (7 shops in Hanoi city)
3	Major Taxi Operator

Surveyed items for each company are as follows:

- Present state of card payment
- Expectations for the comprehensive smartcards
- Future issues of implementation of the comprehensive smartcards

#### (1) Present state of card payment

Traditional retail businesses like small independent stores, public markets or street traders dominate 80% of market in Vietnam. Modern retail businesses like supermarkets, shopping malls, mass marketers or convenience stores are steadily spreading in urban areas including Hanoi City or HCM City.



Major foreign retailers including Japanese companies expand their business to Vietnam. FamilyMart, a Japanese convenience store franchise chain, has set up dozens of shops. AEON, one of the largest retailers in Asia, runs a shopping mall in HCM City. It is their first store in Vietnam and opened at Jan 2014.

Vietnam's retail business is largely dominated by traditional retailers. Nevertheless, modern retailers are steadily keep growing in recent years. According to an investigation of USDA Foreign Agricultural Services in November 2013, most modern retail industry contacts estimate that the modern retail channel accounts for around 20 percent of sales in Vietnam.

As the retail market becomes modernized, there will be demands made for various payment methods and the use of comprehensive smartcards could possibly be the answer.

By contrast, cash is the most popular means of payment in modern retailers at the moment as well as traditional ones. An answerer, even who operates relatively high-priced stores in respondents, expanded that 95% or more of payments is cash or bank wire transfer while the rate of credit card payment is less than 3%. (Its stores didn't accept debit card.)

## (2) Expectations for the comprehensive smartcards

All respondents of this survey already have some kind of card payment. Moreover, they have a common view that non-cash payments should grow popular in Vietnam gradually. However, each company has own method to introducing of the comprehensive smartcards respectively.

Some Japanese companies see E-money as a useful tool and hope to introduce it as a way to retain customers and also to improve their own operation efficiency. Even though, these visionary companies might play a significant role in IC cards market, they implied that they might possibly issue or adopt their own IC cards independently of other cards including transport IC cards. They will give primary priority to speed, functions or services correspondently to their business strategies when introducing IC cards.

Indeed the comprehensive smartcard, which is the scope of our study, should be considered along with long term projects to improve transportation in urban cities. However, it is expressed that such a transport centric approaches may not necessarily fit well with the above leading retailers' business speed or strategies.

While some companies show positive interests in early adopt of E-money, others estimate it is still untimely to introduce it to their business. This tendency is particularly apparent in Vietnamese local companies who have less experience for card business. Thus, they possibly consider that they will adopt IC cards in timely manner looking at growth of IC cards society in Vietnam.

## (3) Issues to be solved towards the comprehensive smart cards

As previously mentioned, cash payments are firmly embedded in the Vietnamese business practice. It is difficult to spread E-money smoothly without benefit both businesses and consumers. Each company pointed out the following key factors for IC cards to be popular among Vietnamese people:

- Understanding for the benefits of card payments among consumers.
- Learning and adjusting card payments
- Recognized as symbol of modern lifestyle.
- Incentives for consumers like loyalty programs with bonus point or discounts.
- Promotion of environment equipment to issue or top up the cards.
- Covering system cost both initial investment and running cost. (ex. fees)
- Social policies encouraging cards expansion. (or else by force)

The comprehensive smartcard will be accepted by Vietnamese if the above issues are resolved.

All company surveyed expressed high expectation on the comprehensive smartcard concept that customers can use public transport as well as can do some shopping with a single multi-purpose card although they show negative stance to early adopt IC cards in their business.

As the IC cards are introduced in public transport and become familiar to Vietnamese citizens, adoption of the comprehensive smartcards by retail businesses will be possibly accelerated.

## 4. Legal Framework for Smart Cards

### 4.1 Japan

#### 4.1.1 Overview of Legal Framework

Legal framework for payment services had been developed mainly for banks. Thanks to technological innovation, prepaid cards issued by entities other than banks are becoming major common. In responding to this situation, Financial Services Agency started a discussion for “the development of payment and settlement system with high security, efficiency, and convenience” in spring of 2008. As a result of this deliberation, “Payment Service Act” (Act # 59) was in put in force on Jun 24, 2009, and the previous act “Act on Regulation, etc on Advanced Payment Certificate” was abolished.

The major topics in the Act 59 are as follows.

- application expanding: it is not storage media specific  
(Server type which was not covered by previous act is incorporated.)
- Enforcing on Self-issuing type (cards issued by service providers for use in the payment for their services)  
(By new regulation such as Business Improvement Orders, Business Suspension Orders etc, the supervision to “self-issuing type” is enforced)
- prohibiting refund generally  
(In considering the article regarding deposits of the Act Regulating the Receipt of Contributions, Receipt of Deposits and Interest Rates, refund is not basically allowed. In the Act, Receipt of Deposit is prohibited except for the special entity regulated in the other acts (e.g. banks based on bank act) from viewpoint of the protection to the common people and maintenance of credit and order, because it would be affected not only to the common people against unforeseen damages, but also becomes disrupt to the social credit system and economic order, in case the entity receives the deposit from common people and once such business is collapsed.)
- application expanding: money transfer services by entities other than banks  
(The server type becomes the target of new act, hence money transfer services comes under the new act. New act allows the entities other than banks to provide this service with some conditions.)
- Deposit by card issuers  
(This is the counter measure for bankruptcy of card issuers. Issuers must deposit their cash more than the half of unused balance to the government. In case the card issuers bankrupt, this deposit is utilized for the refund to the user.)

“Payment Service Act” accepts the entities outside of banking sector to issue prepaid cards. It is the remarkable point in compared to the acts of other countries which allow only entities in banking sector

to issue prepaid cards. It encourages the entities outside of banking sector to jump in the card payment business and promotes diversity of cards, resulting in expanding the e-money market.<sup>21</sup>

## 4.2 Vietnam

### 4.2.1 Trend of Non-Cash Payment

The target for the proportion cash in total payments has been set in the Prime Minister's Decision "Approving the Scheme to Set up Non-Cash Payment in Vietnam Period 2011 – 2015" (2453/QD-TTg) (referred to as Prime Minister's Decision No.2453). To reduce the cash percentage to below 11% by 2015, the development of a non-cash payment method such as cards is encouraged.

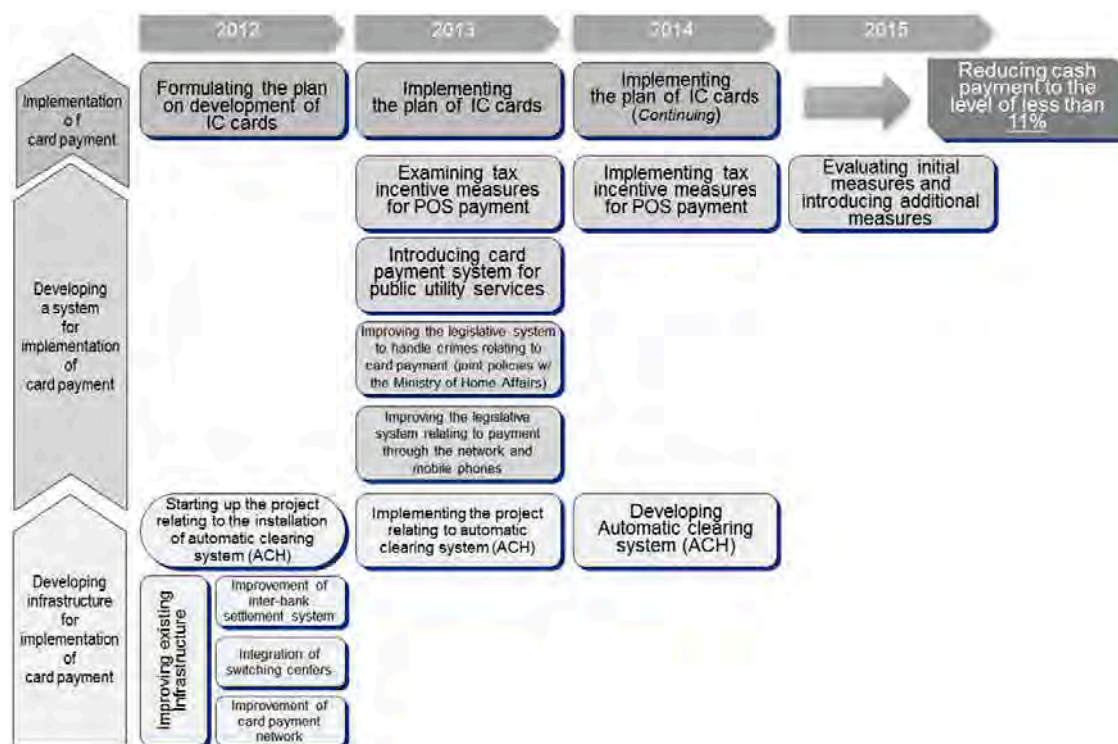
In this decision, the versatile cards for toll collection, gasoline, bus tickets, taxis, social security is proposed. The related implementation plan for the cards has been disclosed in SBV Decision (1131/QD-NHNN), as shown in Figure 4.1. According to this plan, the implementation of IC cards will be started by 2014. Accordingly, big movement could be observed in a couple of years.

In Vietnam, the payment cards can be used for purchasing services and goods provided by entities other than card issuers (3<sup>rd</sup> party type in Japanese Payment Service Act) falls under the Decision of State Bank of Vietnam (20/2007/QD-NHNN: SBV Decision 20) as "Bank Cards", and can be issued by commercial banks only.<sup>22</sup> (In other words, self-issuing type is outside of the regulation.) (Table 4.1)

As described above, the types of IC cards used in transport industry, 3<sup>rd</sup> party or self-issuing, may largely affect the implementation scheme and business models. Thus, 1) interoperability among transport modes managed by different fare-management bodies and 2) e-money function will become major issues when formulating the master plan of the upper system.

<sup>21</sup> Nobuhiko Sugiura "Current status and future challenges of legal framework for advanced payment system", Jurist (No.1319), Dec 15, 2009

<sup>22</sup> Yu-Cho Foundation, "The study report of retail banking system in the world (2011)" reported: "The card issuing entities are required to meet the prudential ratio such as capital-to-asset ratio and liquidity ratio which are set at the level of banks, and requested to follow the regulation and inspection by SBV. From those viewpoints, any non-financial enterprises have difficulties to enter the market without the non-banking service license and as a result, only commercial banks can be card issuers." The study team understands that the entities other than commercial banks are allowed to issue bank cards from the legal viewpoint, however, practically only commercial banks can be issuers in the way of confidence.



**Figure 4.1 Major Activities of SBV for Non-Cash Payment**

Source: Study team based on SBV web site

**Table 4.1 Requirements for the Entities involved in Card Payment Services**

Requirements in SBV Decision 20		
Name	Function	Requirement
Card-issuing organization	Entities issuing bank cards	<ul style="list-style-type: none"> <li>Safety ratio(*1) comprising minimum capital adequacy ratio etc must be met. Currently, only commercial banks can meet this requirement.</li> </ul>
Card payment organization	Entities providing card payment services	<ul style="list-style-type: none"> <li>Subject to license provided by SBV</li> <li>Safety ratio(*1) comprising minimum capital adequacy ratio etc must be met. Currently, only commercial banks can meet this requirement.</li> </ul>
Card transaction clearing service-providing organization	Intermediary entities conducting the exchange of electronic or paper data and clearing financial obligations	<ul style="list-style-type: none"> <li>Subject to permission of SBV</li> <li>Electronic clearing will be conducted through an account opened by the entity at SBV. (23/2010/TT-NHNN)</li> </ul>
Card-accepting unit	Entities (individuals) accepting the card payment for goods and services and providing the services of cash loading etc	<ul style="list-style-type: none"> <li>no specific requirement</li> </ul>

\*1: The detailed requirements are specified in SBV Circular 13/2010/TT-NHNN etc

Source: Study team based on SBV Decision 20

### 4.2.2 Legal Constraints on Data of Upper System

In SBV Decision 20, there are some requirements which are related to the entities involved in the payment business. Considering the types of data managed by the upper system, those requirements must be taken into account. The requirements are summarized as follows.

(Reporting to SBV)

Since a bank card is an item regulated by SBV, organizations involved in payment business are required to report to SBV regularly and irregularly. Reporting types stipulated in SBV Decision 20 are summarized in Table 4.2.

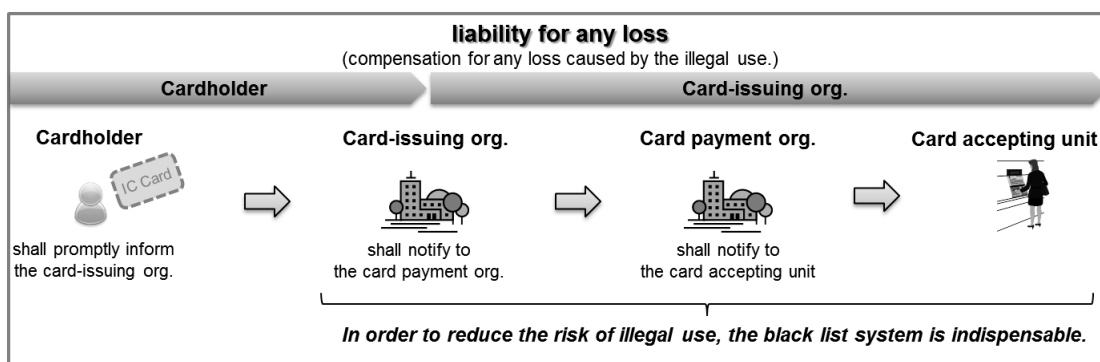
**Table 4.2 Reporting to SBV**

Reporting Organization	Scheduled (Monthly) (Statistical Data on the number of cards distributed, balance and volume of business, and case of illegal use etc)	Unscheduled • Upon request of SBV • When there appear problem in the operations
Card-issuing organization	X	X
Card payment organization	X	X
Card transaction clearing service-providing organization	-	X

Source: Study team based on SBV Decision 20

(Counter Measure to Illegal Use)

As shown in Figure 4.2, when a card holder lost his/her card, it shall be reported to the card issuer. After that, a cardholder is wholly liable for any loss caused by the illegal use of lost card, and shall compensate it. Therefore, it is important for a card issuer to immediately inactivate the lost cards in order to reduce the risk of illegal use. In this regards, the blacklist management by IT system is indispensable.



**Figure 4.2 Owner of Liability for Illegal Card Use**

Source: Study team based on Decision 20

### 4.2.3 Difference from Japanese Legal Frame

Topics regarding the prepaid cards described in subsection 4.1.1 and 4.2.1 are summarized in Table 4.3 below.

**Table 4.3 Comparison between The Payment Services Act (Japan) and SBV Decision 20 (Vietnam)**

Item		Japan	Vietnam	Remarks
		The Payment Services Act No. 59 (June 24, 2009)	SBV Decision 20/2007/QD-NHNN	
Supervisory bureau		Finance Services Agency	State Bank of Vietnam	
Target		Prepaid payment instruments (paper, magnetic card, IC card, server type) ⇒ Targeting value	Credit card, debit card, and prepaid card ⇒ Targeting card	
Application target	Self-issuing	Both types are application targets (when the balance exceeds a certain amount)	Not targeted	
	Third-party		Targeted	
Issuing entity		Allows general operators	Practically, banks only	
Permitting and licensing method		Self-issuing type: Notification	Permits and licensing by State Bank of Vietnam (Need to satisfy the standard of SBV such as safety ratio in operation, etc.)	In Vietnam, the regulation slightly differs between a signed card and an unsigned card.
		Third-party type: Registration		
Application to e-tickets		Not targeted (tickets which have the nature of the numbered ticket such as railway ticket and admission ticket, are excluded) *Targeted when the ticket can be used as e-money	No definition (Possibly the targeted when the ticket can be interoperably used for transport modes operated by different revenue management bodies)	
Obligation for depositing issuing security		½ of the unused balance (Not required for bank)	No definition	
Refund of value		Prohibited in principle	Refund is obligatory.	
Supervision method		On-site inspection/Off-site monitoring. The viewpoints of inspection are clarified and publicly announced as the Guideline for Administrative Process.	Regular and Irregular reporting to SBV is required	

### 4.2.4 Development of Laws for Diffusion of Transport Smart Card

As summarized in Table 4.3 in the previous subsection, the ones which have the nature of the numbered ticket such as railway ticket is not targeted in the Payment Service Act in Japan, therefore the scope of application is relatively understandable. Meanwhile, in Vietnam, the scope of application is not clear as it only states “cards used only for payment to the goods and service provided by the card-issuing organization themselves are not targeted” in the decision No.20.

As for the MRT in Hanoi city, as described in the subsection 3.1.1, MRT-Line 1 may be operated by VNR and the others (Line 2, 2a, 3) may be operated under the scheme which Hanoi city manages the fare. Therefore, in case IC card interoperable for both parties is considered, it can be interpreted that “cards used only for payment to the goods and service provided by the card-issuing organization themselves are not targeted”, in the decision No.20, is not applicable, but is targeted in the said

decision. However, considering the purpose of the decision No.20, it can be assumed that the scope of application is not for the prepaid (coupon ticket on the transport service) against the particular service by cash and the sales of railway ticket by agent, but it is regulated for the cards (credit, debit and prepaid) which are used as a non-cash payment.

Although it can be interpreted as being under the scope of application, it is better to be more specific and provide examples for scope exclusion like Japan; else transactions other than the intended ones are also incorporated into the decision.

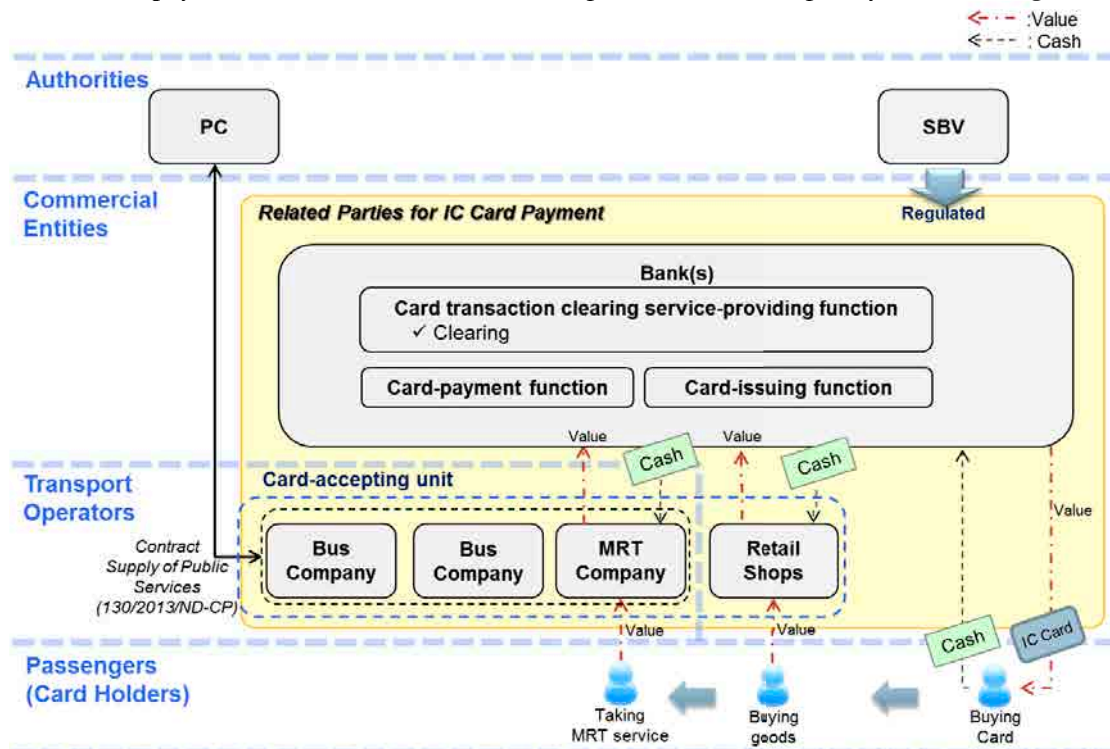


## 5. Master Plan for Upper System Implementation in Vietnam

### 5.1 Master Plan

#### 5.1.1 E-money Use in Market

The situation which the transport smart card equipped with e-money function (i.e. comprehensive smart card) is available in market can be translated into the situation which e-money can be accepted by the retail market in the contract with card issuers. In other words, it is the bank cards (3<sup>rd</sup> party type) stipulated in SBV Decision 20 described in the section 4.2. The services (other than card accepting unit) such as card payment and card transaction clearing service are managed by banks.<sup>23</sup> (Figure 5.1)



**Figure 5.1 Business model for E-money Use in Market**

The number of banks can be based on the issuing policy.

Source: Study team based on SBV Decision 20

#### 5.1.2 Developmental Stage toward Nationwide Interoperable Transport

As described in chapter 3, the urban public transport modes are now being constructed in Hanoi and Ho Chi Minh in Vietnam. In these projects, the implementation of IC cards for ticket system has been decided. Under these circumstances, it seems that the regular usage of smart cards will be started in transport industry, and then expanding to the e-money market. As described in chapter 2, Vietnam is similar to Japan geographically, it has major cities scattered in narrow land extending from north to south. Both countries also have the same structure of urban transport management: in Vietnam, the urban transport is being managed by provincial people committees and in Japan by local operators. Thus, both public transports are identified locally. Given this situation, the expansion of transport smartcards in

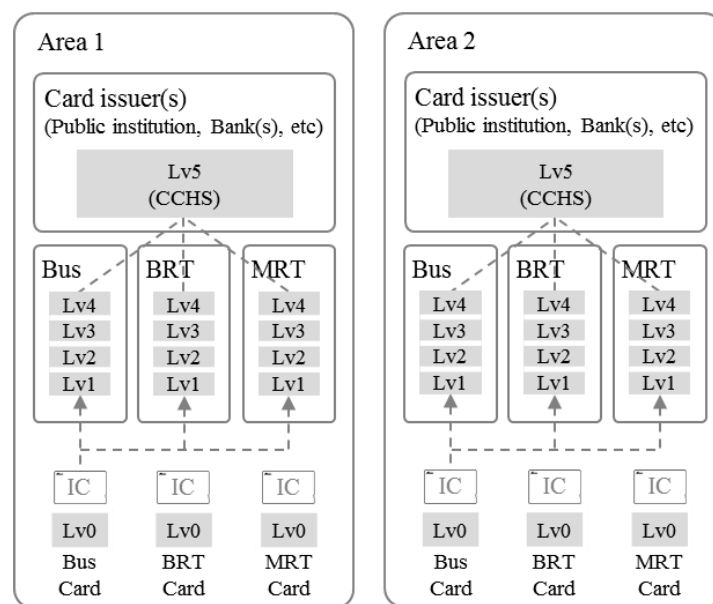
<sup>23</sup> As shown in Appendix-1, there are cases in other countries which banking sector entities are established through the investment by transport operators. It cannot be the case in Vietnam, since Decree 71/2013/ND-CP strictly regulates the investment of 100% state owned enterprises.

Vietnam can be patterned after the footprint of transport smartcards in Japan, though there is a difference in legal framework.

The way toward nationwide interoperable transport includes the following 4 steps:

- 1<sup>st</sup> stage: IC cards for transportation start operation in each district
- 2<sup>nd</sup> stage: Settlement service for comprehensive IC cards to starts in stores in each district
- 3<sup>rd</sup> stage: Direct connection of comprehensive IC card systems to starts among the districts
- 4<sup>th</sup> stage: Interoperable service of comprehensive IC cards to starts nation-wide

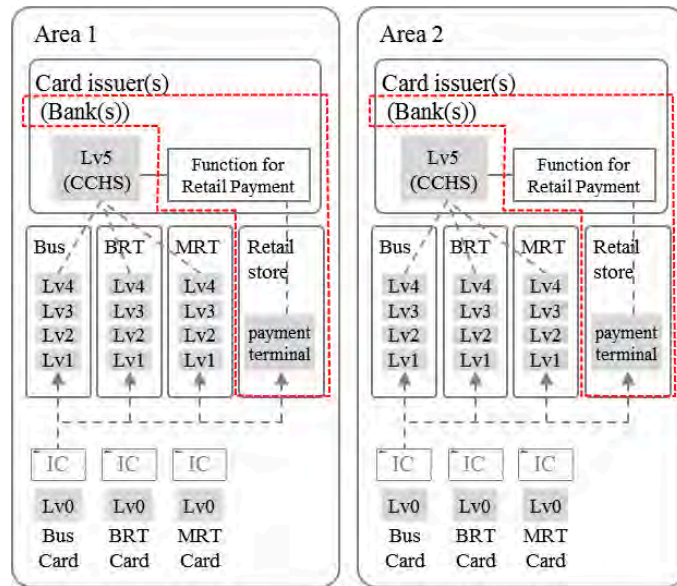
In the first stage, IC cards for transportation services (which are already in budget of construction projects) will start in each district. Upper system in this stage is supposed to be constructed and operated by the card issuers (such as public organizations and banks) of each district (see figure 5.2).



**Figure 5.2 System Overview of Comprehensive Smartcards (1<sup>st</sup> Step)**  
Source: Study team

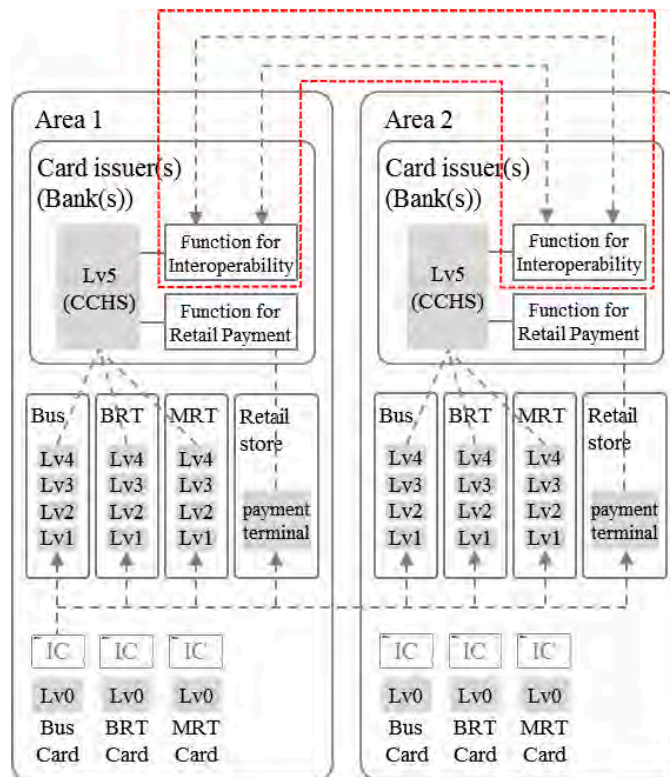
In the second stage comprehensive IC card settlement service at stores inside stations and markets is to be started in each district, to expand convenience for the users. POS terminals are to be facilitated in each store and the upper system will add functions for settlement (see figure 5.3).

As indicated in 5.1.1, management of the upper system, including card issuance is restricted to commercial banks at this stage, since there are service providers other than public transportation who are involved.



**Figure 5.3 System Overview of Comprehensive Smartcards (2<sup>nd</sup> Step)**  
Source: Study team

In the third stage, interoperable function for the comprehensive IC card is added to the systems and equipment, and the function of mutual data transfer among the districts is added to the upper system. Thus the upper systems installed in each district is directly connected with each other and this enables IC card to be used in each districts (see figure 5.4).



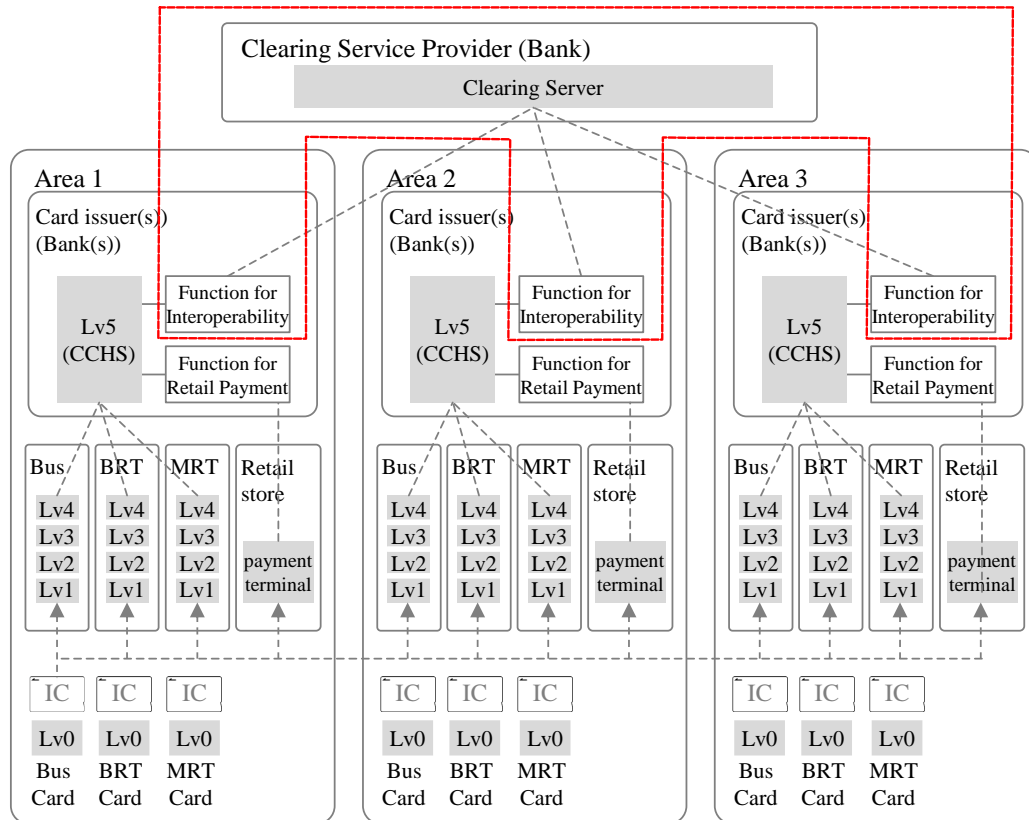
**Figure 5.4 System Overview of Comprehensive Smartcards (3<sup>rd</sup> Step)**

Lv0-1 needs to be revised in case the NFC differs between the districts.

Lv-4 needs to be revised in case the data format or encryption key differs between the districts.

Source: Study team

In the fourth stage, interoperable service of comprehensive IC card starts nation-wide just like in Japan. Data would be transferred to the upper systems of other districts, via data transfer system which is operated by a third party (Figure5.5).



**Figure 5.5 System Overview of Comprehensive Smartcards (4<sup>th</sup> Step)**

Lv0-1 needs to be revised in case the NFC differs among the districts.

Lv-4 needs to be revised in case the data format or encryption key differs among the districts.

Source: Study team

It would be better to adopt common standard and data format from the first stage since the cost to realize interoperability among the systems of each district would be much higher if they are developed with totally different specifications.

Japanese Ministry of Land, Infrastructure, Transport and Tourism (MLIT) has developed “Common Standards and Design Guidance for Interoperable AFC System of Public Transportation” which is minimal basic technical foundation, such as framework of card format and data format to realize IC card interoperability among each transportation mode. This has been submitted it to MOT in February 2013, as one of the assistance to Vietnamese transportation. Furthermore, in March 2014, MLIT has developed “Investigation Report of 2013 on Development of Common Implementation Specifications over Multiple Lines for the Automatic Fare Collection System in Vietnam” which describes more detailed specifications such as IC card encode format, system operations and data flows, which are necessary to develop the common standard.

Making use of these intellectual properties from the first stage would be preparatory steps for future realization of interoperability with comparatively low cost.

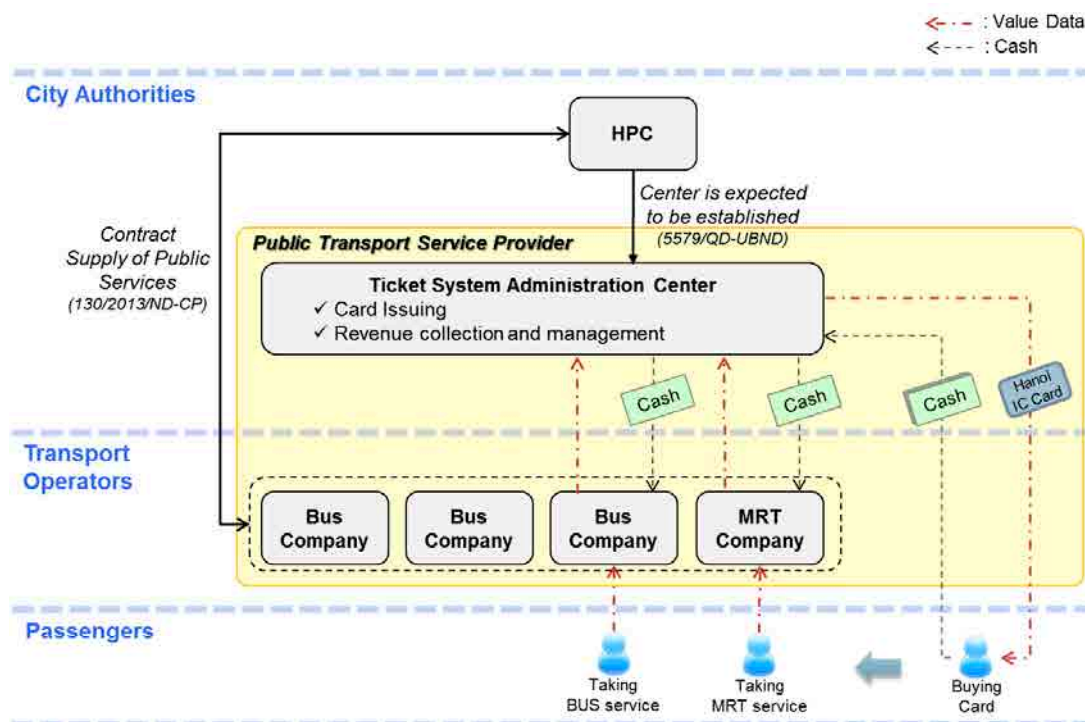
## 5.2 Hanoi City

In this section, the comprehensive smartcards in Hanoi at 1<sup>st</sup> stage mentioned in section 5.1 is described.

### 5.2.1 Comprehensive Smart Cards

As described in subsection 3.1.1, Hanoi city is now planning to set up “Ticket System Administration Center (hereinafter referred to as the Center)” which will be an exclusive transport smart card issuer. Since the city is not going to consider an e-money function at the beginning stage, the study team understands that the business model for card issuing and settlement will be the scheme describe in Figure 5.6.

As described in chapter 4, card issuing and settlement business is governed by SBV Decision 20. However, as stipulated in the Decision: “Cards regulated in this Regulation do not cover types of cards issued by service providers for use in the payment for services by the issuing organizations themselves.” The cards (Figure 5.6) issued by “Ticket System Administration Center” to be used in the payment for public transport services by Hanoi city, will not fall into the Decision 20. Therefore the smartcard for Hanoi public transport will not be a bank card and they can be issued without the banks<sup>24</sup>.



**Figure 5.6 Business model for Hanoi Public Transport Smart Card**

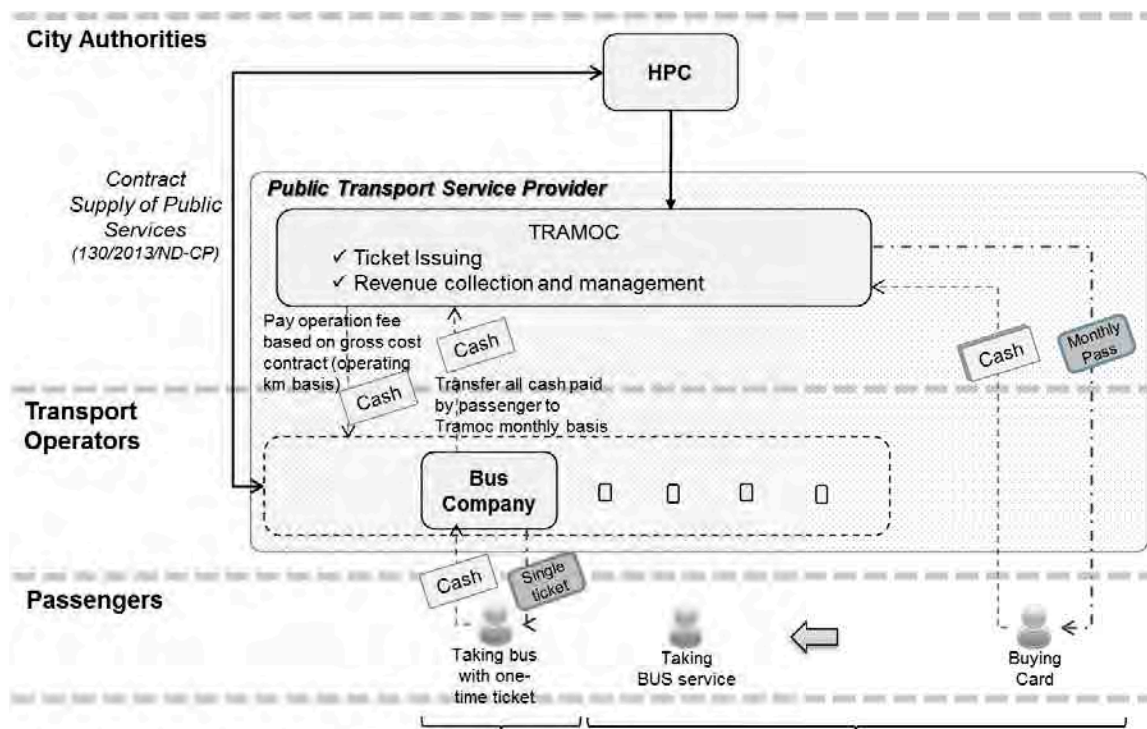
Source: Study team based on HPC Decision 5579/QD-UBND

As for the bus, which is the existing public transport, TRAMOC (Hanoi Urban Transport Management and Operation Center) is an exclusive ticket issues. Thus, it would not be difficult to

<sup>24</sup> According to the local legal firm appointed by the study team in this study.



accommodate institutionally add the lines such as BRT and MRT by following their scheme of the similar ticket issuance and revenue correction and management. (Figure 5.7)



**Figure 5.7 Sales Model for Bus Ticket on Existing Public Transport in Hanoi**

A part of sales task of monthly pass is also consigned to the bus company.

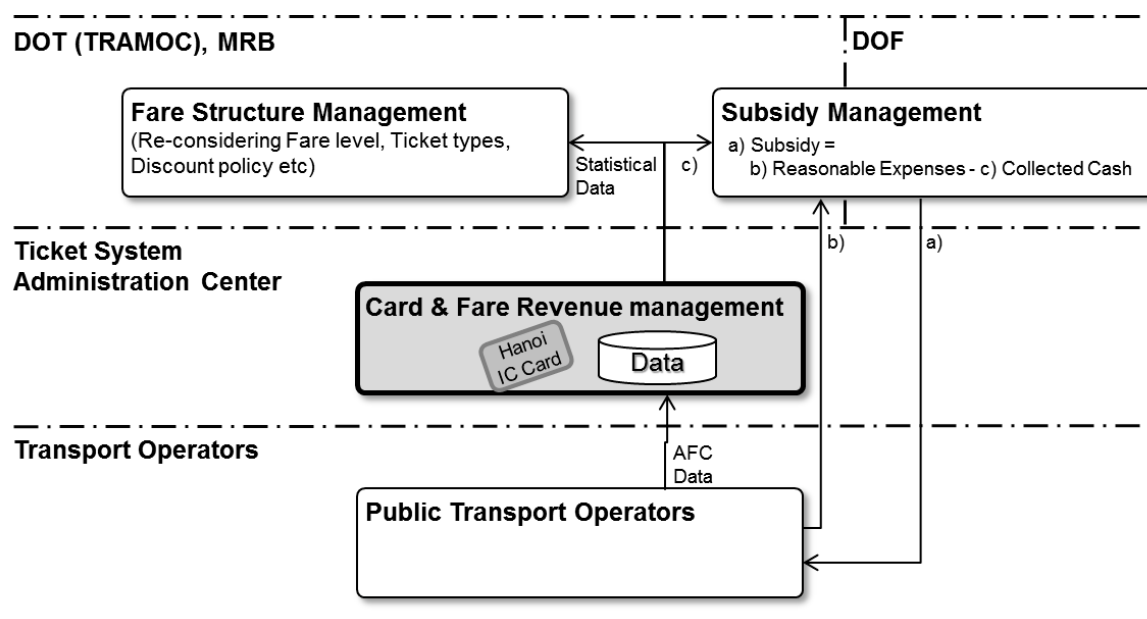
Source: Study team based on the interview with Tramac

### 5.2.2 Main Roles of the Center

In this section, the 3 major roles of the Center proposed in the DOT letter (1178/TTr-SGTVT) are reviewed. The contents in this subsection to 5.2.5 were reviewed with the working group in TRAMOC assigned by DOT as our counterpart and DOT itself.

(Revenue management and distribution to the operators)

In terms of revenue management, the division of duties with the existing regulatory agencies (TRAMOC and MRB) must be clarified. As the DOT letter (1178/TTr-SGTVT) proposed, the role of the Center is limited to the revenue management and ticket issuance. Therefore, TRAMOC and MRB will continue to be responsible for the fare structure management and subsidy management based on statistical data provided by the Center. (Figure 5.7)



**Figure 5.8 Conceptual Diagram of Function of the Center and Existing Authorities**

Source: Study team

(Ticket issuing management and initialization)

The Center has responsibility for the management of ticket issuance. However, it will be inconvenient for passengers to go to the Center to purchase tickets. Thus, it is assumed that the tickets can be bought at the stations and bus ticket offices under the subcontract agreement between the Center (or HPC) and operators, same as existing scheme.

For asset management, especially, it is suitable that the entity that manages/purchases the tickets will perform the ticket initialization collectively. Therefore, it is assumed that each construction project should transfer the Initializer (equipment to initialize the smart card) to the Center, and the Center performs the ticket initialization. Ticket sales to the passenger are performed at stations and bus ticket offices, collected tickets (smart cards) are returned to the Center, and the Center will determine if those tickets are to be disposed or re-used. (Figure 5.9)

DOT is currently considering two options on the entity that will have a management responsibility on the sales task. Option A is to give the management responsibility to the respective transport operators; while Option B is to let the entity, which specializes in selling the ticket, to have the management responsibility. (Figure 5.10) For option A, there will be no big difference with the current situation as the respective transport operators do the ticket selling at the moment. On the other hand, in case of Option B, it is different from the current setup; thus, it is necessary to consider the separation of duty, business process and property right of equipment.

Since the Center has a management responsibility of the ticket issuing, the Center should also have the function to respond to the illegal use of cards. Therefore a card information management function, such as blacklist management, should be under the Center's responsibility.

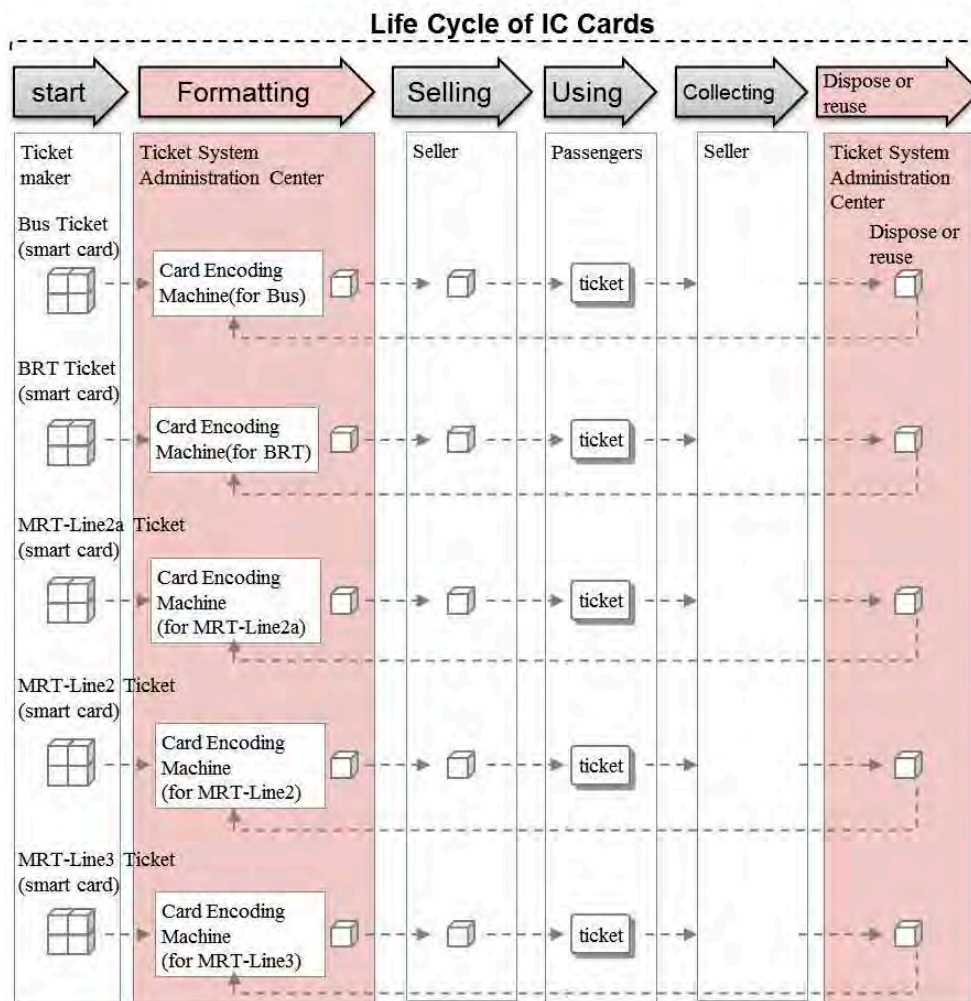


Figure 5.9 Division of Roles between the Center and Operators over Smartcard Life-Cycle  
Source: Study team

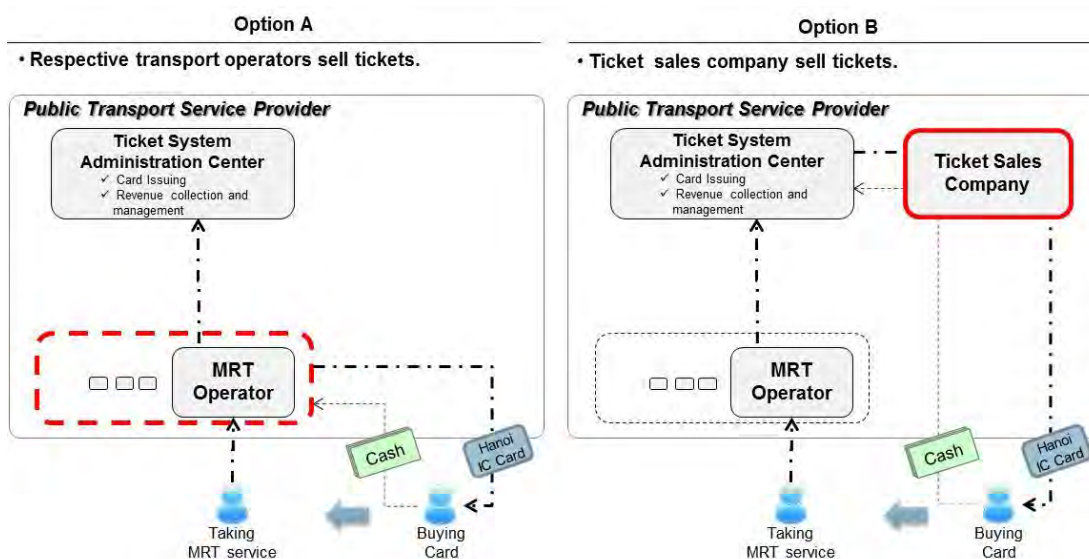


Figure 5.10 Options of Sales Scheme for Transport Smartcard  
Source: Study team based on the interview with DOT



In connection with the revenue management and ticket sales, cash management should also be concerned as one of major important topics. It is necessary to study it through the following items at the next phase.

- Cash flow of the Center.

It is necessary to consider the budget of the city and the handling of fare in order not to run out of money for the purchasing tasks (card purchasing and equipment maintenance) which are handled by Ticket System Administration Center.

- Cash flow of transportation operators.

It is necessary to consider delivering subsidies at the right time in order not to run out of money for the operation of the respective operators.

- Cash change balance at stations and offices for daily sales activities and fare adjustment.

It is necessary to ensure enough balance of small bills at stations and offices for corresponding to the ticket sales and settlement with passengers.

### 5.2.3 Upper System Overview

In Figure 1.2, Lv 5 system is named as “CCHS”. However, a clearing function is not required in Hanoi as described above, therefore the system managing transport smartcards in the Center is named as “TMS (Ticket Management System)”.

The Center is required to manage the tickets of all transport modes, and responsible to handle the numerous data appropriately in time. Therefore, the Center should consider their operation on the basis of information systems.

To operate the business on IT system basis described in subsection 5.2.1, the following information management should be considered.

**Table 5.1 Information to be handled by the upper system**

#	Information		Communication between AFC equipment and TMS (Direction and frequency)	Function of TMS
	Type	Content		
1	Transaction Data	[Ticket sales information] Data for checking the card processing results. (Card status update also included) Mainly the following items are included; Card ID, point of sales, date and time of selling, season pass information (type, validity etc.), personal information (name, telephone number etc.) and balance of SV	up/anytime	- Revenue management - Card information management
		[Ticket usage of each transportation] Data for checking the card processing results. (Card status update also included)	up/anytime and Scheduled(ex. hourly)	- Statistic management - Card information

		Mainly the following items are included; Card ID, point of use, date and time of use, used amount of SV and balance of SV		management
2	Blacklist	Card id list to protect against the fraud use of cards.TMS merge and deliver this card id list to associated system.	Down/anytime and Scheduled(ex. daily)	- Blacklist management
3	Information Query	Data to query the card information.	up and down/anytime	- Card information management

\* card status grasp card issuing status(pre-issuing, issued, collected, etc.)

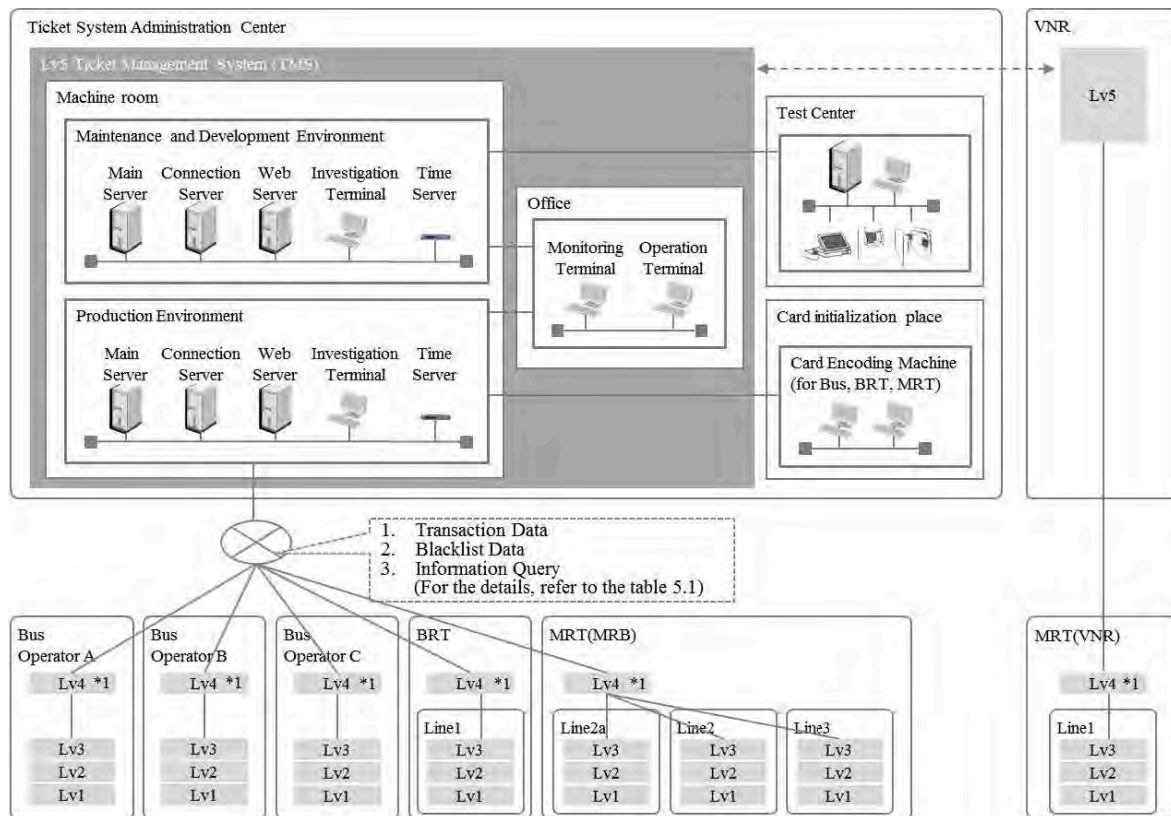
Source: Study team

The consideration points for upper system are described in table 5.2. Based on these points, the conceptual system configuration is formed in Figure 5.11. Physical configuration should be considered on the later stage in reference to the physical condition of related rooms.

**Table 5.2 Consideration Points for Upper System**

Points	Description
Reliability	Business impact caused by system fault should be analyzed from following perspectives. <ul style="list-style-type: none"> <li>- Level of impact on customers</li> <li>- Scope of impact (e.g. only specific operator, general public, specific bus)</li> <li>- Substitutability</li> </ul> Setting the level of operation service and definition of the following things are need. <ul style="list-style-type: none"> <li>- Service level of each system (e.g. usability, backup)</li> <li>- System architecture (e.g. server structure, storage capacity, backup method)</li> </ul>
Availability	Redundancy and back-up etc. should be considered.
Maintainability	Response to defect, easiness of maintenance, usability of changing/adding function and time of system stop by defect etc. should be considered.
System Architecture	Server configuration, storage capacity and back-up method should be considered.
Fault Tolerance	System operation for disaster recovery should be considered (e.g. storing backup data and programs at distant site)
Environment	<ul style="list-style-type: none"> <li>- Production Environment Environment for the system in actual operation</li> <li>- Maintenance Environment Environment in the same condition as Production Environment, where revisions and tests for system errors occurred in Production Environment are processed</li> <li>- Development Environment Environment for developing and testing the programs for next generation. Linked with test center (environment set the equipment from Lv1 to 4 for testing)</li> <li>- Office Place for residing the IT system operation department and maintenance department</li> <li>- Place for initializing the card Place for setting the Card Encoding Machine which can initialize the card</li> </ul>

Source: Study team



**Figure 5.11 Conceptual System Configuration**

\*1: Lv4 is not mandatory requirement, since Lv5 can accommodate to that function.

Source: Study team

As shown in Figure 5.11, Communication network needs inside and outside of the upper system area. Therefore, network type (public line or leased line), speed, security, redundancy, and clarification of the scope between the Center and operators should be studied at the next phase.

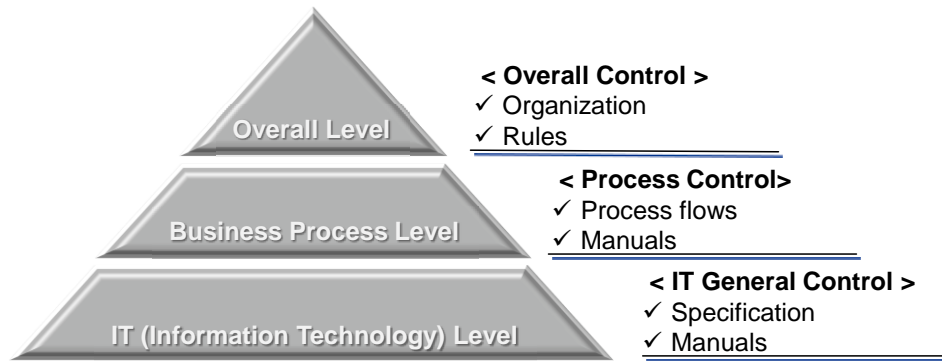
**Table 5.3 Function of Each Server**

No	Name	Roles
1	Main(AP/DB)Server	Card information management, validity check, fare settlement, etc.
2	Connection Server	Control of connection with servers in other layers
3	Web Server	Providing function related to Web Server
4	Investigation terminal	Searching and outputting information of card and transaction
5	Operation terminal	Operation, setting and displaying information of each server
6	Monitoring terminal	Displaying system conditions
7	Time Server	Time adjustment of each server

Source: Study team

### 5.2.4 Organization of the Center

Since the Center has to manage the revenue and smart card of the entire public transport, the Center must design appropriately the controls responding to the fraud risk. In particular, at the each three levels, i.e. Overall, Business process, and IT (Information Technology) level, appropriate business procedures should be designed, documented, and operated strictly. (Figure 5.12)

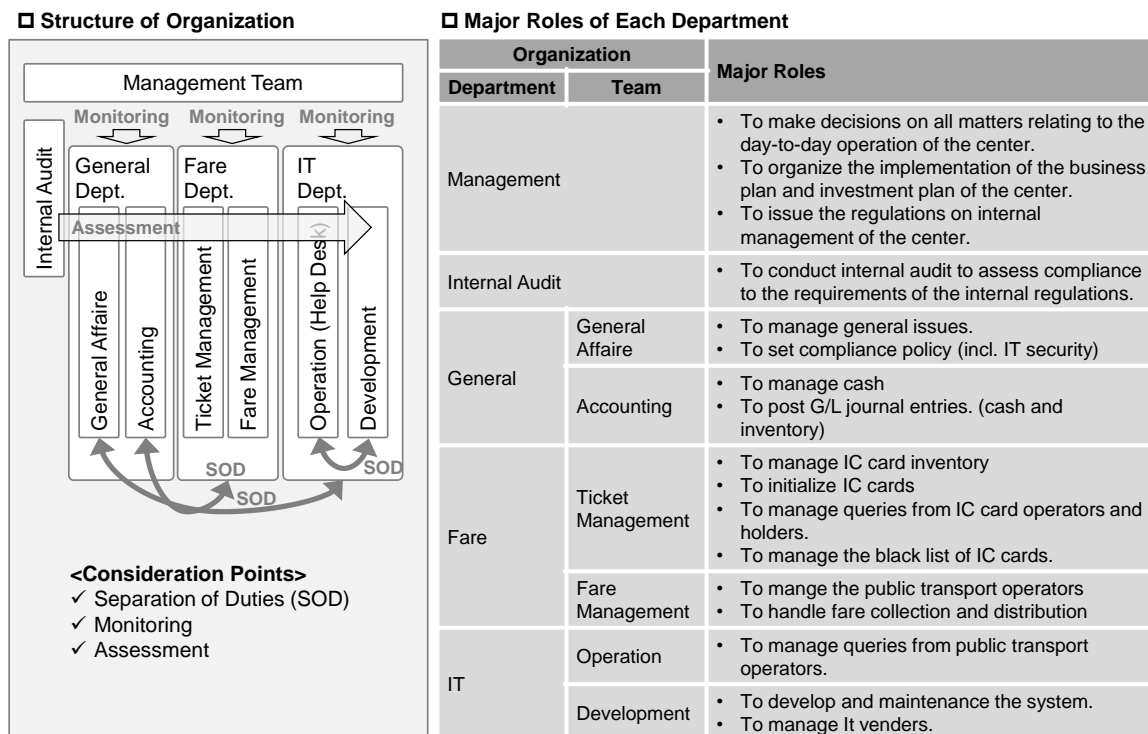


**Figure 5. 12 Items to be documented in the Center (draft)**

Source: Study team

(Overall level)

At the Overall level, it is important that the organization and business rules are designed to prevent from fraud risk, and to be documented clearly. As for the organizations, in order to implement and manage the system function shown the previous sections, the Center holds the Sales Division (to manage the revenue and ticket) and System Division (to manage the system). Apart from these departments, in order to respond to fraud risk, supporting departments should be considered from the viewpoints of segregation of duties, monitoring by the management, internal audit etc. (Figure 5.13)



**Figure 5. 13 Organization of the Center (draft)**

Source: Study team

As for the regulations, in addition to the personnel rules generally formed in an organization, it is useful to consider the matters described in Table 5.4

**Table 5.4 Major Rules to be Concerned**

Rules		Description
Category	Name	
General	Internal Control	• Defining the internal controls (*) in the center.
	Internal Audit	• Defining internal audit along with its process cycle.
Security	Information Security management	• Defining security policy for information handled by the center
	Personal Information	• Defining protection code for personal information
IT	IT System Operation	• Defining general procedures for IT system operation
	IT System Development	• Defining general procedures for IT system development and maintenance

\* Activities by the departments to prevent and detect a fraud.

Source: Study team

**\*Operation and maintenance regime**

IT human resources can be a bottle-neck in terms of hiring and training. The Center should be designed based on the organization that operates their business with minimum resources. Since the public transport modes are continuously operated on 365 days basis, the Upper System should be in operation on the daily basis as well. In this regards, a shift system for human resources should be considered. Therefore, it should be planned to reduce the number of operators through installing servers at a single machine room.

Plan of regime and role necessary for operating the Upper System is described below. Please note that the roles described below are from the logical view, so multiple roles can be performed by single person in physically.

(Development team)

1) System Manager

Person responsible for operation of the total system. In charge of establishment of the system administration regime, system running status management and recovery plan consideration when a defect has occurred. Also considers functionality modification of the system and version updates of hardware and software.

2) Infrastructure Administrator

Person in charge for hardware, OS, middleware, etc. Manages maintenance of hardware, middleware, etc.

3) Application Administrator

Person in charge of business application software. Performs planning and method study in case of modification or replacement of the application software.

4) Network Administrator

Person in charge of network of the system. Investigates cause of network defects, and consider counterplans.

(Operation team)

1) System Operator

Person in charge of the system operation and monitoring. In case of defects, System Operator will report to the System Manager and receive instruction for further action. Also stores and manages the backup media.

2) Liaison

Contact person for inquiries and operation requests. Receives inquiry in case of defects or operation requests to System Operators.

(Business process level)

At the Business process level, it is important that the processes must be designed and documented in order to prevent fraud risk. This level includes the design of business flow describing the specific operation and the preparation of manuals for business procedures. The list of the Center's business, drafted based on subsection 5.2.2, is shown in Table 5.5.

**Table 5.5 The list of the Center's Business (draft)**

Process		Remarks
Category	Sub-category	
Card handling	Inventory Control	Receiving from a card vendor -> Physical inventory check
	Initializing	Retrieving from stock yard -> Initializing -> sending cards to operators
	Disposing	Collecting cards from operators
Fare Collection	Error Correction	System error correction
Fare Distribution	Noticing	Sending the notice to operators
	Reporting	Reporting to DOT(TRAMOC) and MRB
Planning and Closing	Planning	Making-up the plan for coming fiscal year and mid-term (5 years) and reporting to authority
	Closing	Making-up closing report for the fiscal year.

\* Cash management and handling may be added to the list above.

Source: Study team

(IT Level)

The major roles of the Center are carried out by the information system, thus it is important that IT management procedures are clearly documented. For the design of the procedures, COBIT (Control Objectives for Information and related Technology) is generally referred in Japan and other countries. COBIT is an IT governance guidelines of ISACA (the Information Systems Audit and Control Association) in the United States. Examples of the control processes based on COBIT are shown in Table 5.6

In addition, Access control is the most important thing among the procedures. It is a mechanism that allows only authorized individuals to access to the document management and information systems.

**Table 5.6 Control Domain to be considered in the IT management (Examples)**

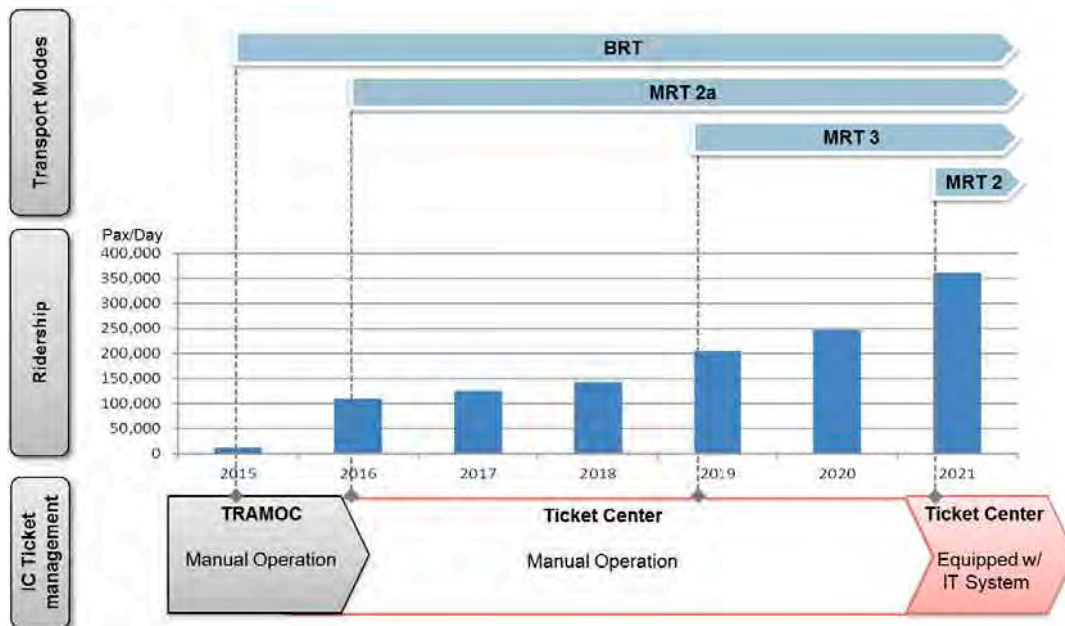
Control Processes		Remarks
Domain	Processes (examples)	
Planning and Organization	<ul style="list-style-type: none"> <li>✓ Define a strategic IT plan</li> <li>✓ Manage human resources</li> <li>✓ Assess risks</li> </ul>	
Acquisition & Implementation	<ul style="list-style-type: none"> <li>✓ Acquire and maintain application software and technology infrastructure</li> </ul>	
Delivery & Support	<ul style="list-style-type: none"> <li>✓ Manage facilities</li> <li>✓ Manage data</li> <li>✓ Manage problems and incidents</li> <li>✓ Manage the configuration</li> <li>✓ Assist and advise customers</li> <li>✓ Educate and train users</li> <li>✓ Identify and allocate costs</li> <li>✓ <b>Ensure systems security</b></li> <li>✓ Ensure continuous service</li> <li>✓ Manage performance and capacity</li> <li>✓ Manage third-party services</li> </ul>	<p><b>Physical Access Control</b></p> <ul style="list-style-type: none"> <li>- entrance and exit control for the building and rooms ex. Security check, ID registration, access log monitoring and physical inventory check on ID cards.</li> </ul> <p><b>Logical Access Control</b></p> <ul style="list-style-type: none"> <li>- Documented security rules (internal regulation and manuals)</li> <li>- SODs for the person in charge of IT.</li> <li>- ID and password for individuals who have authorization ex. ID registration, access log monitoring and physical inventory check on IDs.</li> <li>- ID management for emergency cases</li> </ul>
Monitoring	<ul style="list-style-type: none"> <li>✓ Monitor the processes</li> <li>✓ Assess internal control adequacy</li> </ul>	

Source: COBIT

### 5.2.5 The milestones of the Establishment of the Center

The milestones of the establishment of the Center are described in this subsection. The demand forecast of public transport newly opened from 2015 is shown in Figure 5.14 and Table 5.7 respectively. When BRT open in 2015, it is a slight increase in ridership. However, after the opening of MRT Line 2a, it is expected to increase by 100,000 per day. And after the opening of MRT Line 2 (year 2021), it is expected to reach around 350,000 per day. To handle the large-scale usage data, capable systems and organizational body are required. At the least, it is necessary to launch a center organization before the opening of MRT line 2a (the early 2016), and it is necessary to develop the upper system to handle the usage data from each line automatically, before the opening of MRT Line 2 (in 2021). (For the time-schedule, please refer to the chapter 6.)





**Figure 5. 14 The number of users changes in the new public transport(Hanoi City)**

Source: BRT: WB "Environmental Management Plan for BRT project in hanoi" Oct, 2013

MRT: JICA "Establishment of an Organization for the O&M of Metropolitan Railway Lines in Hanoi City", Nov 2011

**Table5.7 Expected of public transport user numbers(Hanoi City)**

Year	Ridership				
	Bus*1	BRT*2	MRT*3 (L2a, 2 and 3)	Total	
				Year	Daily
2011	440,629,503			459,388,906	1,258,600
2012	453,719,550			466,809,597	1,278,930
2013	460,000,000			466,280,450	1,277,481
2014	472,709,967			472,709,967	1,295,096
2015	BRT open 483,403,455	4,380,000		487,783,455	1,336,393
2016	MRT 2a open 493,298,090	14,600,000	25,374,508	533,272,598	1,461,021
2017	504,397,453	14,600,000	31,329,906	550,327,359	1,507,746
2018	514,959,948	14,600,000	37,285,305	566,845,253	1,553,001
2019	MRT 3 open 525,478,779	14,600,000	60,238,388	600,317,167	1,644,705
2020	536,205,675	14,600,000	76,003,892	626,809,567	1,717,286
2021	MRT 2 open 546,808,416	14,600,000	117,430,395	678,838,811	1,859,832

\*1: 2011 - 2013: TRAMOC, "Alternative of Bus Fare Adjustment in Hanoi City", Oct 2013.

2014 - 2020: accumulated the average annual growth for last 3 years.

\*2: World Bank "Environmental Management Plan" for BRT project in hanoi, Oct 2013

\*3: JICA "Establishment of an Organization for the O&M of Metropolitan Railway Lines in Hanoi City", Nov 2011

### 5.2.6 Cost for the implementation, Operation and Replacement of the Upper System

The cost examples for the design, development and commissioning of the Upper System are shown in the tables below. The cost covers the upper system only, and does not include the design and test at AFC equipment side. (For the details of Implementation cost, please refer to the Appendix-4.)

**Table 5.8 Implementation Cost for Upper System (Example)**

#	Category	Item	Price (M JPY)								
			Foreign Portion			Local Portion			Total		
			Total	JICA Portion	Others	Total	JICA Portion	Others	Total	JICA Portion	Others
1	I. IT System Implementation (Design and Installation)	Hardware	51	51	0	52	20	32	103	71	32
2		Software (incl. license fee)	261	261	0	47	18	29	308	279	29
3		Implementation (personnel expenses)	287	287	0	0	0	0	287	287	0
4		Subtotal	<b>599</b>	<b>599</b>	<b>0</b>	<b>99</b>	<b>38</b>	<b>61</b>	<b>698</b>	<b>637</b>	<b>61</b>
5	II. IT System Operation and Maintenance (O&M) during implementation *1	Hardware	0	0	0	1	0	1	1	0	1
6		Software	0	0	0	14	5	9	14	5	9
7		Subtotal	<b>0</b>	<b>0</b>	<b>0</b>	<b>15</b>	<b>5</b>	<b>10</b>	<b>15</b>	<b>5</b>	<b>10</b>
8	III. Training Services, Test Support	Training Services	16	16	0	0	0	0	16	16	0
9		Test Support	9	9	0	0	0	0	9	9	0
10		Subtotal	<b>25</b>	<b>25</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>25</b>	<b>25</b>	<b>0</b>
11	IV. Machine room construction costs	Expansion of air-conditioning and power capacity, security equipment, network equipment, Chair and desk for workstation *2	5	5	0	15	15	0	20	20	0
12	Contingency *3	Price Escalation	29	29	0	15	6	9	44	35	9
13		Physical Contingency	33	33	0	7	3	4	40	36	4
14		Subtotal	<b>62</b>	<b>62</b>	<b>0</b>	<b>22</b>	<b>9</b>	<b>13</b>	<b>84</b>	<b>71</b>	<b>13</b>
Procurement Package Total											
15	Consulting Service	Basic Design, Tendering Assistance including tender document preparation, Supervision for Implementation & Training	120	120	0	30	30	0	150	150	0
16	Administration Cost		-	-	-	66	0	66	66	0	66
Total (excluded tax and duties)			<b>811</b>	<b>811</b>	<b>0</b>	<b>247</b>	<b>97</b>	<b>150</b>	<b>1,058</b>	<b>908</b>	<b>150</b>

\*1 Hardware and software maintenance costs that occur during system implementation. Hardware and software maintenance costs are generated from the point of purchase, however it is necessary to purchase them one year before operation, and then carry out environmental setting and various test beforehand.

\*2 Assumption that there is enough space for setting Rack Cabinet (Height: 1,200 mm, Width: 600 mm, Depth: 1,200 mm) x 2 set

\*3 Price escalation rate (Foreign portion: 1.7% p.a., Japanese portion: 4.9% p.a.), Contingency (5% of from I to IV-1 ), Administration cost (8% from I to I-IV)

**Table 5.9 Maintenance cost for the Upper System (Annual)**

#	Category	Item	Price (M JPY)
1	IT System Operation and Maintenance (O&M)	Hardware	6
2		Software (incl. license fee)	47
3		Implementation (personnel expenses)	38
4		Subtotal	<b>91</b>
5	Tax and Duties		-
6	Total		<b>91</b>

**Table 5.10 Replacement cost for the Upper System (every 5 years)**

#	Category	Item	Price (M JPY)
1	IT System Implementation (Design and Installation)	Hardware	56
2		Software (incl. license fee)	125
3		Implementation (personnel expenses)	61
4		Subtotal	<b>242</b>
5	IT System Operation and Maintenance (O&M) during implementation *1	Hardware	1
6		Software	7
7		Subtotal	<b>8</b>
8	Tax and Duties		-
9	Total		<b>250</b>

\*1 Hardware and software maintenance costs that occur during system implementation. Hardware and software maintenance costs are generated from the point of purchase, however it is necessary to purchase them one year before operation, and then carry out environmental setting and various test beforehand.

Conditions or premises are listed below.

- System performance is based on the number of passengers (table 5.7), and system function is based on TMS (Level-5) function.)
- It is assumed that the data association between Lv5 and each operators(Bus, BRT, MRT) are built in compliance with the common interface specification.
- Main servers and equipment are installed in a single machine room.
- Support services of hardware and software is assumed correspondence during day-time on the weekday.

### 5.2.7 Interoperable of the urban railway line 1

In "Special Assistance for Project Implementation (SAPI) for Establishment of an Organization for the Operation and Maintenance of Metropolitan Railway Lines in Hanoi City" conducted by JICA in 2011 – 2012, it is recommended that VNR (Vietnam Railways) should be an O&M organization for MRT Line 1 from the operational viewpoint, since line 1 uses the track of existing national railway. However, it was not discussed from the viewpoint of revenue management. 519/TB-BGTVT-UBHN also keeps silence for the fare-revenue and subsidy, while it mentions only operation.

As described in section 3.1, according to railway law (35/2005/QH11) and “Decision on Approval of Master Plan for Socio-Economic Development in Hanoi Capital till 2020, with Orientation towards 2030” (1081/2011/QD-TTg), the management of urban railway is under the provincial people committee. The scheme which revenue management is handled by the city and O&M work is conducted by VNR through subcontract can be one of options. In this case, MRT line 1 is one of lines under the city as shown in the Figure 5.6.

If the management of Line 1, including revenue management is performed by VNR, and transport smartcards for both lines (Line 1 and other lines in Hanoi) is applied, it falls into “cards for use in the payment for goods and services provided by the organizations other than issuers” stipulated by the SBV Decision 20, and as a result, commercial banks seem to be the card issuers.

## 5.3 Ho Chi Minh City

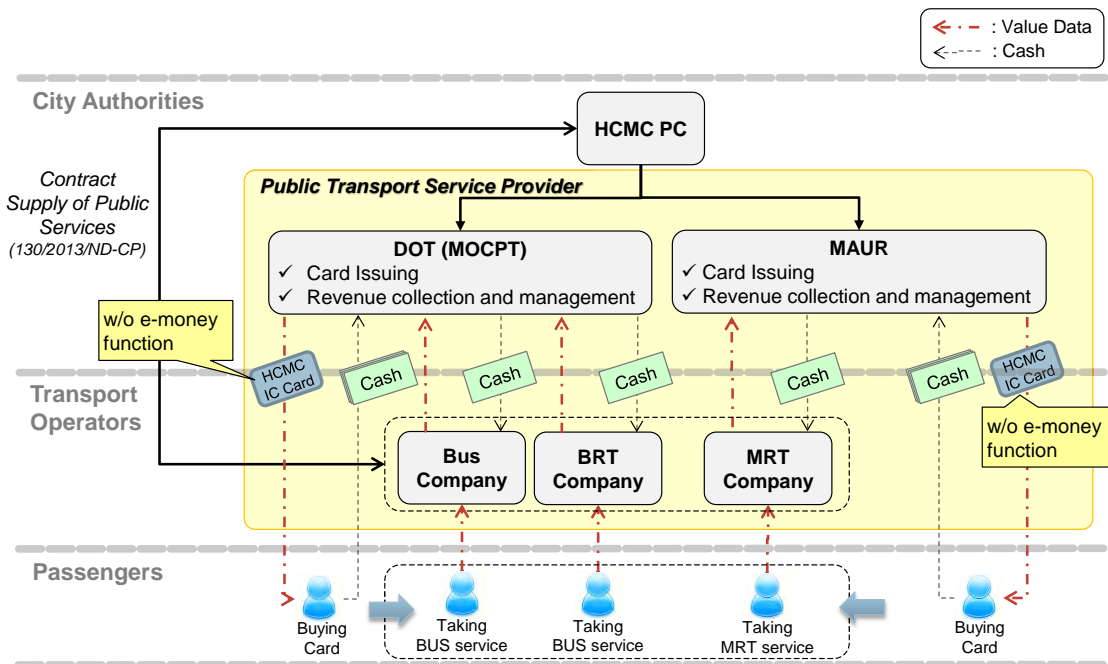
### 5.3.1 Comprehensive Smart Cards

While there is a policy for exclusive issuing transport smart cards based on HPC decision in Hanoi, a policy for card issuance in HCMC has not yet been decided officially. Only there is the target towards the realization of interoperability among the public transport modes as described in subsection 3.1.2. However, the study by DOT has the budget authorized by the people’s committee. Thus the study team understands that the official policy for bus system will be made available in reference to the result of study by DOT (estimated to be issued in July 2014). It may be extended to BRT system under the supervision of DOT in the future. As for the MRT system, MAUR is in charge for the construction including smartcard system implementation.

In addition to the situation above, those authorities have no intention to apply e-money function on the transport smartcards at the beginning stage. In this case, as described in Figure 5.2, city authorities and/or banks can be the issuers. It is preferable, however, that the city authorities will be the card issuers at the beginning stage because of the following two points.

- AFC equipment for BRT and MRT is purchased by each construction project under the ODA program, and the city retains its repayment obligation, it is difficult to share these assets with 3<sup>rd</sup> parties or to transfer them to 3<sup>rd</sup> parties such as banks. Those assets should be under supervision of the authorities in-charge.
- For the existing bus system, there are two types of tickets: one by MOCPT, common coupon tickets, and the other one is the one-time ticket sold in buses by operators. For the smartcard pilot program, MOCPT was the one who sold cards. Therefore, if the MOCPT will be an issuer for existing bus system, existing framework does not have to be changed.

From a practical viewpoint, there may be two card issuers, i.e. DOT(MOCPT) will be an issuer for Bus and BRT, MAUR will be for MRT. In this case, the business model will be as Figure 5.15.

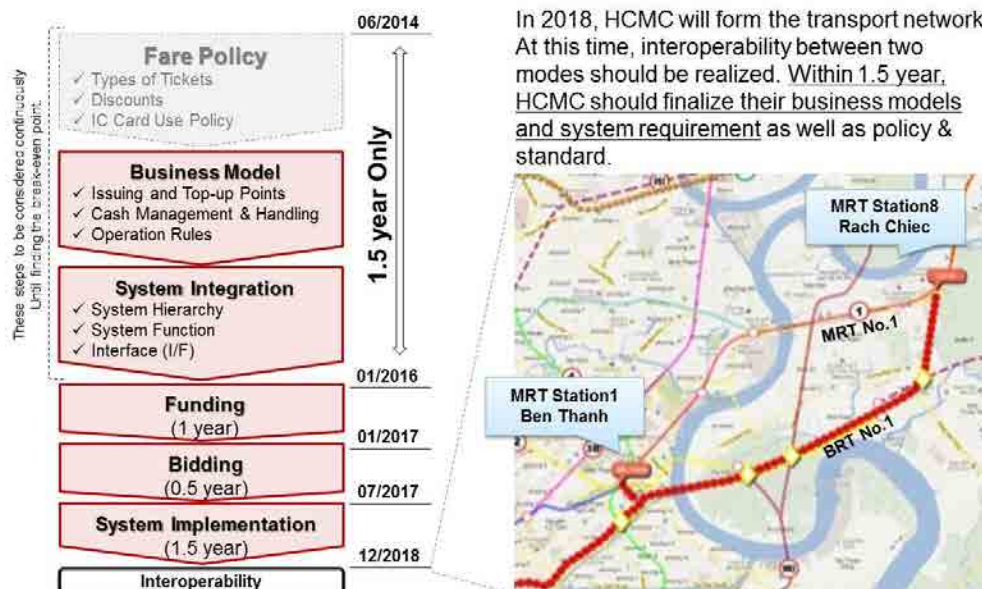


**Figure 5.15 Business Model for HCMC Public Transport Smart Card**

Source: Study team

### 5.3.2 Ownership of Upper System during the Form of Transport Network

As described in Figure 3.6, BRT 1 and MRT 1 will be opened in 2018, MRT 2 in 2020 and MRT 5 in 2021. There are interchange points among those modes, the ridership is expected to rise rapidly from 2018. Therefore, the server covering those modes has to be implemented by January 2019. (Figure 5.16)



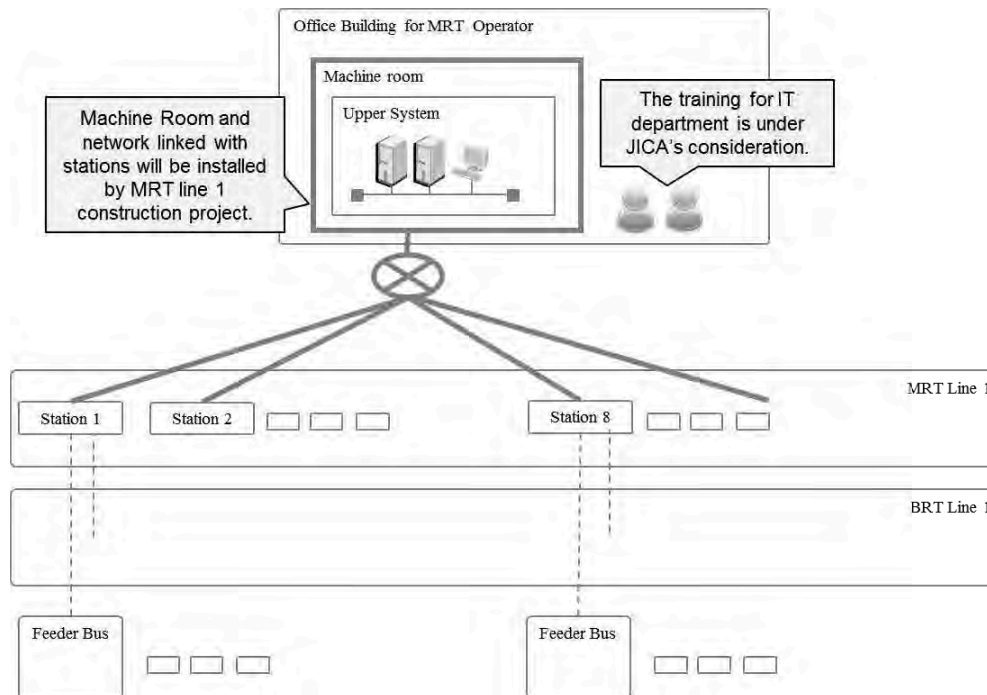
**Figure 5.16 Interchange Points between MRT 1 and BRT 1**

Source: Study team

As shown in Figure 5.16, there is a time constraint having only 4.5 years left before the deadline for interoperability. The system implementation must be considered in parallel with policy making (even though the implementation of transport smartcards has to be studied after the development of policy and standard in HCMC) in order to secure the interoperability among transport modes during the formation of transport network (2018 to 2021).

In order to save time, the resources provided by related activities should be utilized as much as possible. In principal, upper system requires: 1) human resources for operation and maintenance, 2) a machine room equipped with air-conditioning system, security system and stable power source, and 3) external network lined with the stations. The preparation works for those items are time consuming.

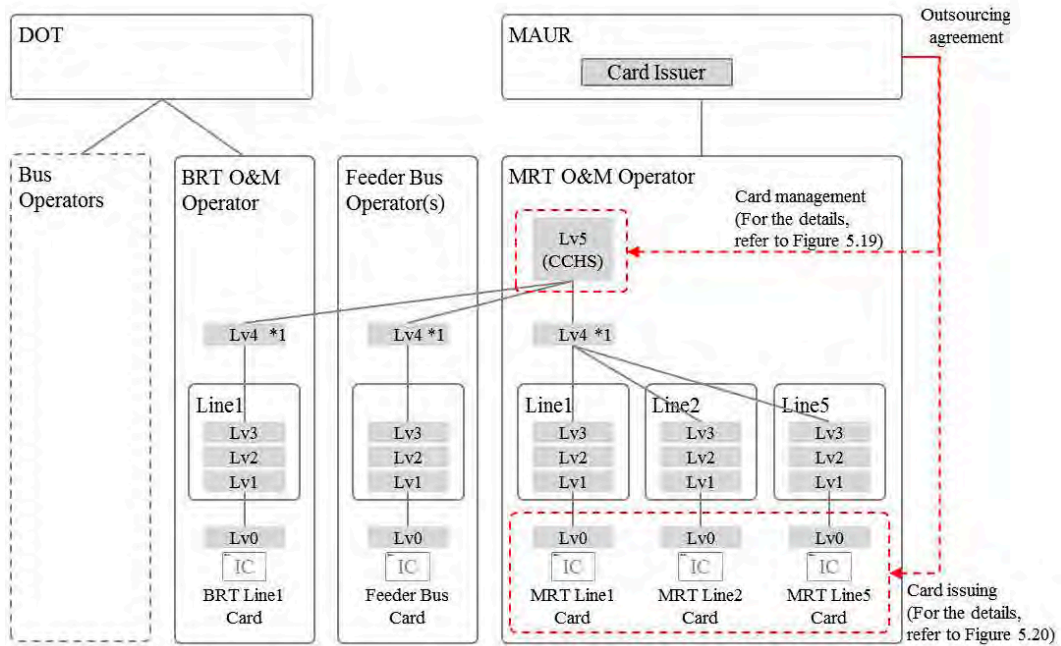
By 2018, those items will be covered by JICA Technical Assistance and the MRT line 1 construction project respectively. The network infrastructure installed by the MRT line 1 project could be a data corridor for interoperability during the formation of transport network (2018 to 2021). Thus, MRT operator would be the most suitable entity to operate the upper system. (Figure 5.17 and 5.18)



**Figure 5.17 Available Resources for Interoperability**

Source: Study team



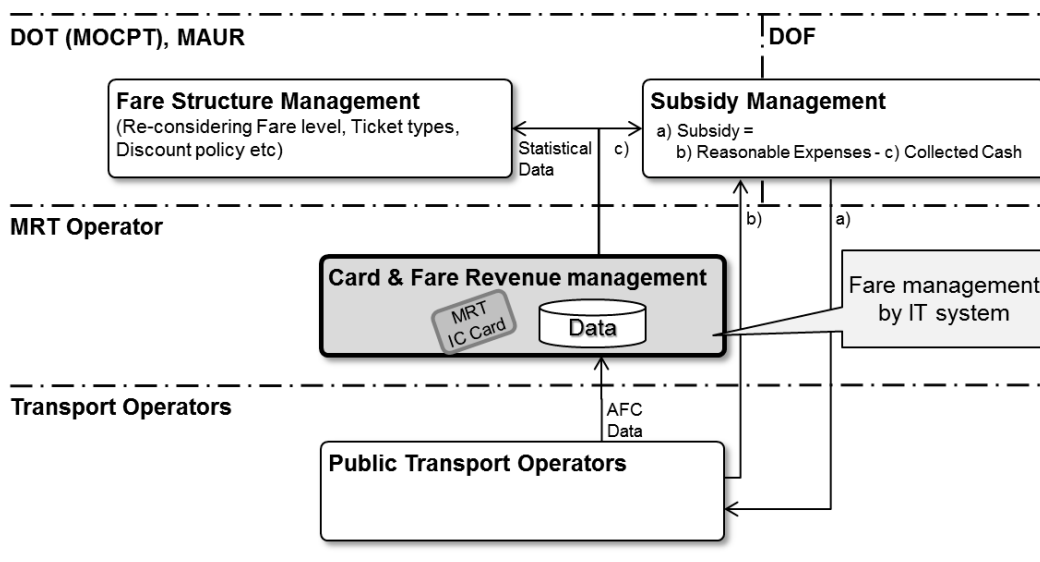


**Figure 5.18 the Upper System during the Form of Transport Network**  
Lv4 is not mandatory requirement, since Lv5 can accommodate to that function. Source: Study team

### 5.3.3 Role of MRT Operator as an Upper System Operator

(Outsourcing Agreement for Upper System)

If the MRT operator has an upper system under subcontract agreement with MAUR (or HCMC PC), they have a role of revenue reporting to the existing regulatory agencies (MOCPT and MAUR) for their management. Therefore, MOCPT and MAUR continue to be responsible for the fare structure management and subsidy management based on statistical data provided by the MRT operator. (Figure 5.19)



**Figure 5.19 Conceptual Diagram of Role of the MRT Operator**

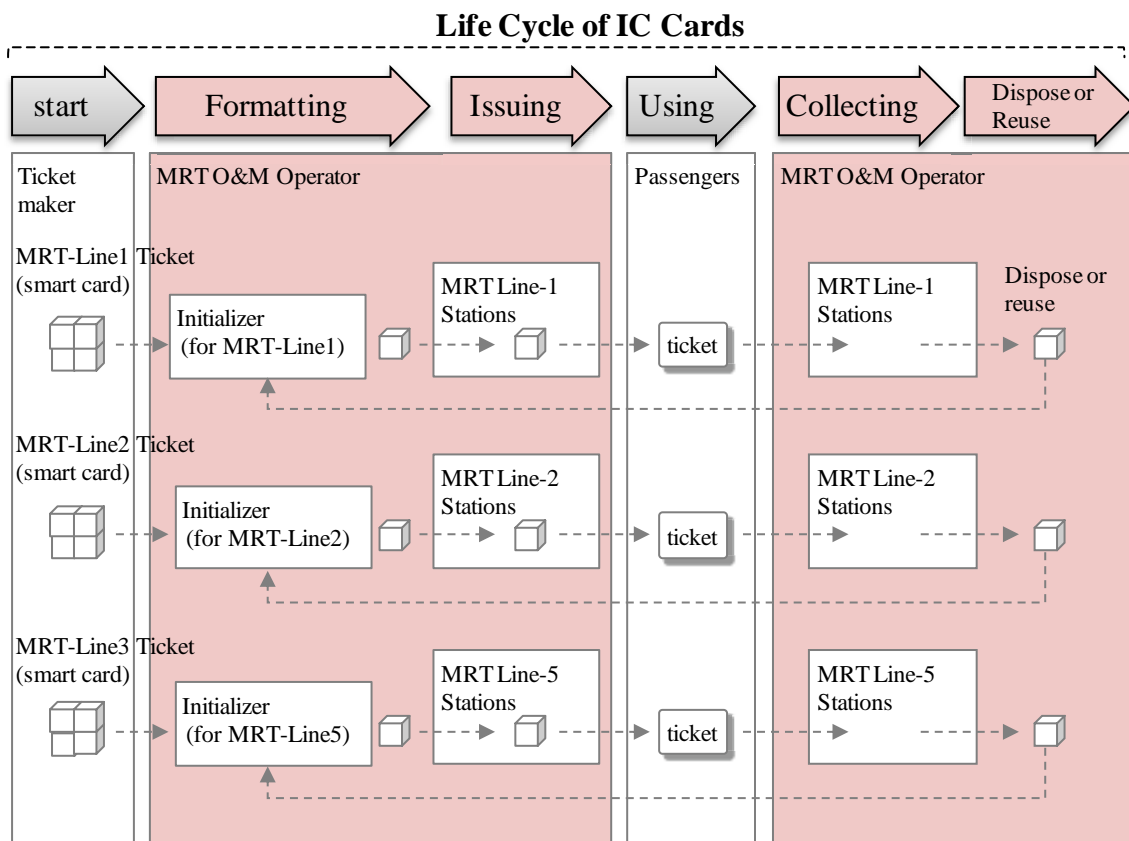
Source: Study team



(Outsourcing Agreement for Card Selling)

As for the MRT ticket issuing management, MAUR should retain the management responsibility for this. However, it is inconvenient that passengers have to go to the office of MAUR for purchasing tickets and top-up. It may bring low usage, as the bus pilot program in HCMC faced before. Thus, it is assumed that it will be performed at the stations under the subcontract agreement between the MAUR (or HCMC PC) and MRT O&M Operator.

In terms of asset management, especially, it is suitable that an entity that will manage and purchase the tickets will perform the ticket initialization collectively. Therefore, it is assumed that each construction project should transfer the Initializer (equipment to initialize the smart card) to MRT O&M Operator, and the MRT O&M Operator performs initialization of the tickets. Ticket sales to the passenger is performed at stations, collected tickets (smart cards) are returned to MRT O&M Operator, and the MRT O&M Operator will determine of the dispose or reuse. (Figure 5.20) Since the MAUR has a management responsibility of the ticket issuances, MRT O&M Operator should have a function to respond to the illegal use of cards under MAUR’s supervision.



**Figure 5.20 Roles of the MRT Operator over Smartcard Life-Cycle**  
Source: Study team

In connection with a revenue management and ticket sales, cash management should be considered as one of the major topics. It is necessary to study it through the following items at the next phase.

- Cash flow of MRT O&M Operator.

It is necessary to consider delivering subsidies at the right time in order not to run out of money for the operation of respective operators.

- Cash change balance at stations and offices for daily sales activities and fare adjustment.

It is necessary to ensure enough balance of small bills at stations and offices for passenger's sales and settlement.

### 5.3.4 Overview of Upper System

In Figure 1.2, Lv 5 system is named as "CCHS". However, a clearing function is not required in Ho Chi Minh as described above, the system managing transport smartcards in the MRT operator is named as "TMS (Ticket Management System)".

The MRT operator is required to manage the tickets of MRT lines, and handle with numerous data related to all transport modes having interchange points with MRT line 1 appropriately in time. Therefore, the MRT operator should consider their operation on the information systems basis.

To operate the business on IT system basis described in subsection 5.3.3, the following information management should be considered.

**Table 5.11 Information to be handled by the upper system**

#	Information		Communication between AFC equipment and TMS (Direction and frequency)	Function of TMS
	Type	Content		
1	Transaction Data	[Ticket sales information] Data for checking the card processing results. (Card status update also included) Mainly the following items are included; Card ID, point of sales, date and time of selling, season pass information (type, validity etc.), personal information (name, telephone number etc.) and balance of SV	Up /anytime	- Revenue management - Card information management
		[Ticket usage of each transportation] Data for checking the card processing results. (Card status update also included) Mainly the following items are included; Card ID, place of use, date and time of use, used amount of SV and balance of SV	Up /anytime and Scheduled(ex. hourly)	- Statistic management - Card information management
2	Blacklist	Card id list to protect against the fraud use of cards.TMS merge and deliver this card id list to associated system.	Down /anytime and Scheduled (ex. daily)	- Blacklist Management
3	Information Query	Data to query the card information.	up and down /anytime	- Card information management

\* card status grasp card issuing status(pre-issuing, issued, collected ,etc.)

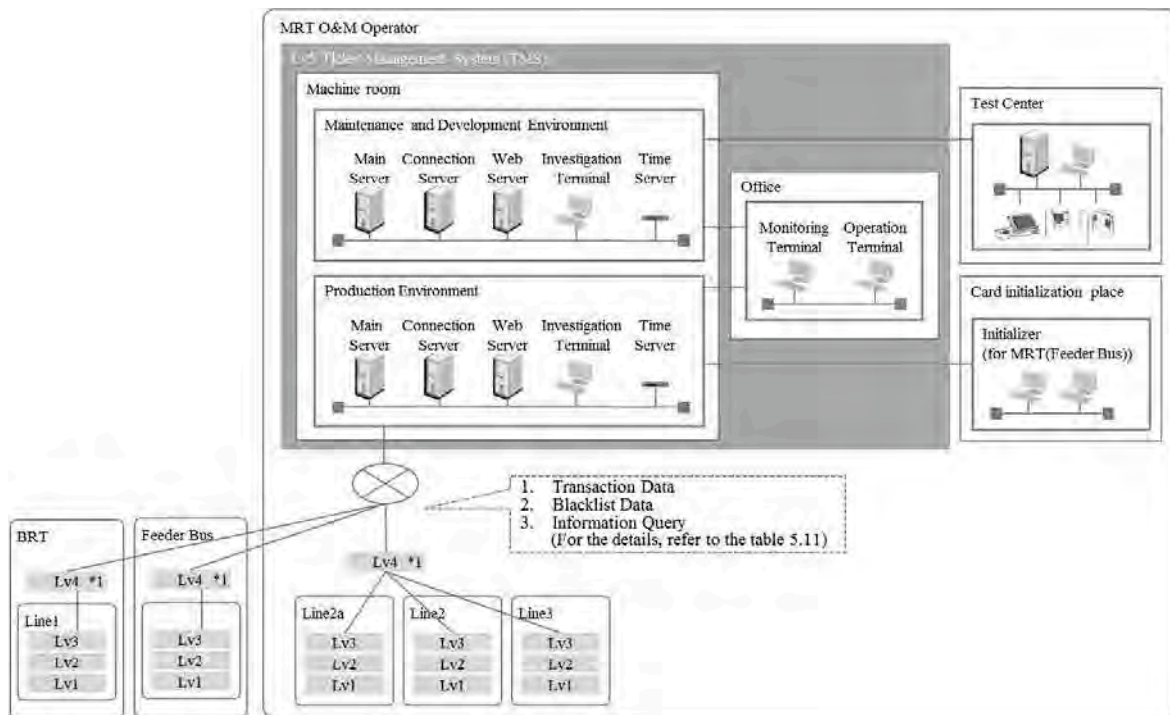
Source: Study team

The consideration points for upper system are described in table 5.12. Based on these points, the conceptual system configuration is formed in Figure 5.21. Physical configuration should be considered on the later stage in reference to the physical condition of related rooms.

**Table 5.12 Consideration Points for Upper System**

Points	Description
Reliability	Business impact caused by system fault should be analyzed from following perspectives. <ul style="list-style-type: none"> <li>- Level of impact on customers</li> <li>- Scope of impact (e.g. only specific operator, general public, specific bus)</li> <li>- Substitutability</li> </ul> Setting the level of operation service and definition of the following things are need. <ul style="list-style-type: none"> <li>- Service level of each system (e.g. usability, backup)</li> <li>- System architecture (e.g. server structure, storage capacity, backup method)</li> </ul>
Availability	Redundancy and back-up etc. should be considered.
Maintainability	Response to defect, easiness of maintenance, usability of changing/adding function and time of system stop by defect etc. should be considered.
System Architecture	Server configuration, storage capacity and back-up method should be considered.
Fault Tolerance	System operation for disaster recovery should be considered (e.g. storing backup data and programs at distant site)
Environment	<ul style="list-style-type: none"> <li>- Production Environment Environment for the system in actual operation</li> <li>- Maintenance Environment Environment in the same condition as Production Environment, where revisions and tests for system errors occurred in Production Environment are processed</li> <li>- Development Environment Environment for developing and testing the programs for next generation. Linked with test center (environment set the equipment from Lv1 to 4 for testing)</li> <li>- Office Place for residing the IT system operation department and maintenance department</li> <li>- Place for initializing the card Place for setting the Card Encoding Machine which can initialize the card</li> </ul>

Source: Study team



**Figure 5.21 Conceptual System Configuration**

\*1: Lv4 is not mandatory requirement, since Lv5 can accommodate to that function.  
Source: Study team

As shown in Figure 5.21, Communication network needs inside and outside of the upper system area. The network infrastructure within MRT line 1 boundary, i.e. from the stations to the machine room in the depot, will be secured by the construction project, the network within BRT boundary by their construction project. Thus, only the connection between MRT line 1 and BRT line 1, and MRT line 1 and feeder buses should be clarified at the later stage. The following should be considered: type of line whether public line or leased line, speed, security, redundancy, and clarification of the scope between them.

**Table 5.13 Function of Each Server**

No	Name	Roles
1	Main(AP/DB)Server	Card information management, validity check, fare settlement, etc.
2	Connection Server	Control of connection with servers in other layers
3	Web Server	Providing function related to Web Server
4	Investigation terminal	Searching and outputting information of card and transaction
5	Operation terminal	Operation, setting and displaying information of each server
6	Monitoring terminal	Displaying system conditions
7	Time Server	Time adjustment of each server

Source: Study team

### 5.3.5 Operational Requirement for Upper System

Since the MRT operator has to manage the smart cards of the MRT lines and data related to the public transport having interchange points with MRT line 1, they must design appropriately the

controls responding to the fraud risk in their internal regulations and IT controls. Those controls should be subject to MAUR’s approval.

As for the regulations, in addition to the rules generally formed in an organization such as personnel rules, it is useful to consider the matters described in Table 5.14.

**Table 5.14 Major Rules to be Concerned**

Rules		Description
Category	Name	
General	Internal Control	• Defining the internal controls (*) in the MRT operator.
	Internal Audit	• Defining internal audit along with its process cycle.
Security	Information Security management	• Defining security policy for information handled by the MRT operator
	Personal Information	• Defining protection code for personal information
IT	IT System Operation	• Defining general procedures for IT system operation
	IT System Development	• Defining general procedures for IT system development and maintenance

\* Activities by the departments to prevent and detect a fraud.

Source: Study team

**\*Operation and maintenance regime**

Generally, IT human resources can be a bottle-neck in terms of hiring and training, since IT job is knowledge intensive. The MRT operator should be designed based on the organization that operates the business with minimum human resources. Since the public transport modes are continuously operated on 365 days basis, the Upper System should be in operation on the daily basis as well. In this regards, a shift system for human resources should be considered. Therefore, it should be planned to reduce the number of operators through installing servers at a single machine room.

Plan of regime and role necessary for operating the Upper System is described below. Please note that the roles described below are from the logical view, so multiple roles can be performed by single person in physical.

(Development team)

1) System Manager

Person responsible for operation of the total system. In charge of establishment of the system administration regime, system running status management and recovery plan consideration when a defect has occurred. Also considers functionality modification of the system and version up of hardware and software.

2) Infrastructure Administrator

Person in charge for hardware, OS, middleware, etc. Manages maintenance of hardware, middleware, etc.

3) Application Administrator

Person in charge of business application software. Performs planning and method study in case of modification or replacement of the application software.

4) Network Administrator

Person in charge of network of the system. Investigates cause of network defects, and consider counterplans.

(Operation team)

1) System Operator

Person in charge of the system operation and monitoring. In case of defects, System Operator will report to the System Manager and receive instruction for further action. Also stores and manages the backup media.

2) Liaison

Contact person for inquiries and operation requests. Receives inquiry in case of defects or operation requests to System Operators.

(Business process level)

At the Business process level, it is important that the processes must be designed and documented in order to prevent fraud risk. This level includes the design of business flow describing the operation specifically and the preparation of manuals stating business procedures. The list of the MRT operator's business, drafted based on subsection 5.3.2, is shown in Table 5.15.

**Table 5.15 The list of the MRT operator's Business (draft)**

Process		Remarks
Category	Sub-category	
Card handling	Inventory Control	Receiving from a card vendor -> Physical inventory check
	Initializing	Retrieving from stock yard -> Initializing -> sending cards to stations
	Disposing	Collecting cards from stations
Fare Collection	Error Correction	System error correction
Fare Reporting	Reporting	Reporting to DOT(MOCPT) and MAUR

\* Cash management and handling may be added to the list above.

Source: Study team

(IT Level)

The major roles of the MRT operator are carried out by the information system, thus it is important that IT management procedures are clearly documented. For the design of the procedures, COBIT (Control Objectives for Information and related Technology) is generally referred in Japan and other countries. COBIT is an IT governance guidelines of ISACA (the Information Systems Audit and

Control Association) in the United States. Examples of the control processes based on COBIT are shown in Table 5.16

In addition, Access control is the most important thing among the procedures. It is a mechanism that allows only authorized individuals to access to the document management and information systems.

**Table 5.16 Control Domain to be considered in the IT management (Examples)**

Control Processes		Remarks
Domain	Processes (examples)	
Planning and Organization	<ul style="list-style-type: none"> <li>✓ Define a strategic IT plan</li> <li>✓ Manage human resources</li> <li>✓ Assess risks</li> </ul>	
Acquisition & Implementation	<ul style="list-style-type: none"> <li>✓ Acquire and maintain application software and technology infrastructure</li> </ul>	
Delivery & Support	<ul style="list-style-type: none"> <li>✓ Manage facilities</li> <li>✓ Manage data</li> <li>✓ Manage problems and incidents</li> <li>✓ Manage the configuration</li> <li>✓ Assist and advise customers</li> <li>✓ Educate and train users</li> <li>✓ Identify and allocate costs</li> <li>✓ <b>Ensure systems security</b></li> <li>✓ Ensure continuous service</li> <li>✓ Manage performance and capacity</li> <li>✓ Manage third-party services</li> </ul>	<p><b>Physical Access Control</b></p> <ul style="list-style-type: none"> <li>- entrance and exit control for the building and rooms</li> <li>ex. Security check, ID registration, access log monitoring and physical inventory check on ID cards.</li> </ul> <p><b>Logical Access Control</b></p> <ul style="list-style-type: none"> <li>- Documented security rules (internal regulation and manuals)</li> <li>- SODs for the person in charge of IT.</li> <li>- ID and password for individuals who have authorization</li> <li>ex. ID registration, access log monitoring and physical inventory check on IDs.</li> <li>- ID management for emergency cases</li> </ul>
Monitoring	<ul style="list-style-type: none"> <li>✓ Monitor the processes</li> <li>✓ Assess internal control adequacy</li> </ul>	

Source: COBIT

### 5.3.6 Cost for the Implementation, Operation and Replacement of the Upper System

The sample cost for the design, development and commissioning of the Upper System are shown in the tables below. The cost covers the upper system only and does not include design and test at AFC equipment side. (For the details of Implementation cost, please refer to the Appendix-4.)



**Table 5.17 Implementation Cost for Upper System**

#	Category	Item	Price (M JPY)								
			ForeignPortion			Local Portion			Total		
			Total	JICA Portion	Others	Total	JICA Portion	Others	Total	JICA Portion	Others
1	IT System Implementation (Design and Installation)	Hardware	51	51	0	52	52	0	103	71	32
2		Software (incl. license fee)	261	261	0	47	47	0	308	279	29
3		Implementation (personnel expenses)	287	287	0	0	0	0	287	287	0
4		Subtotal	<b>599</b>	<b>599</b>	<b>0</b>	<b>99</b>	<b>99</b>	<b>0</b>	<b>698</b>	<b>637</b>	<b>61</b>
5	IT System Operation and Maintenance (O&M) during implementation *1	Hardware	0	0	0	1	0	1	1	0	1
6		Software	0	0	0	14	5	9	14	5	9
7		subtotal	<b>0</b>	<b>0</b>	<b>0</b>	<b>15</b>	<b>5</b>	<b>10</b>	<b>15</b>	<b>5</b>	<b>10</b>
8	Training Services, Test Support	Training Services	16	16	0	0	0	0	16	16	0
9		Test Support	9	9	0	0	0	0	9	9	0
10		Subtotal	<b>25</b>	<b>25</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>25</b>	<b>25</b>	<b>0</b>
11	Machine room construction costs	Expansion of air-conditioning and power capacity, security equipment, network equipment, Chair and desk for workstation	-	-	-	-	-	-	-	-	-
12	Contingency *2	Price Escalation	29	29	-	15	6	9	44	35	9
13		Physical Contingency	33	33	-	7	3	4	40	36	4
14		Subtotal	<b>62</b>	<b>62</b>	<b>-</b>	<b>22</b>	<b>9</b>	<b>13</b>	<b>84</b>	<b>71</b>	<b>13</b>
Procurement Package Total											
15	Consulting Service	Basic Design, Tendering Assistance including tender document preparation, Supervision for Implementation & Training	<b>120</b>	<b>120</b>	<b>0</b>	<b>30</b>	<b>30</b>	<b>0</b>	<b>150</b>	<b>150</b>	<b>0</b>
16	Administration Cost		-	-	-	64	0	64	64	0	64
Total (excluded tax and duties)			<b>806</b>	<b>806</b>	<b>0</b>	<b>230</b>	<b>82</b>	<b>148</b>	<b>1,036</b>	<b>888</b>	<b>148</b>

\*1 Hardware and software maintenance costs will be incurred since the point of purchase, however it is necessary to purchase them one year before operation, and then carry out environmental setting and various test beforehand.

\*2 Price escalation rate (Foreign portion: 1.7% p.a., Japanese portion: 4.9% p.a.), Contingency (5% of from I to IV-1 ), Administration cost (8% from I to I-IV)

**Table 5.18 Maintenance cost for the Upper System (Annual)**

#	Category	Item	Price (M JPY)
1	IT System Operation and Maintenance (O&M)	Hardware	6
2		Software (incl. license fee)	47
3		Implementation (personnel expenses)	38
4		Subtotal	<b>91</b>
5	Tax and Duties		-
6	Total		<b>91</b>

**Table 5.19 Replacement cost for the Upper System (every 5 years)**

#	Category	Item	Price (M JPY)
1	IT System Implementation (Design and Installation)	Hardware	56
2		Software (incl. license fee)	125
3		Implementation (personnel expenses)	61
4		Subtotal	<b>242</b>
5	IT System Operation and Maintenance (O&M) during implementation	Hardware	1
6		Software	7
7		Subtotal	<b>8</b>
8	Tax and Duties		-
9	Total		<b>250</b>

Conditions or premises are listed below.

- System performance is based on the number of transport modes , and system function is based on TMS (Level-5) function.)
- Main servers and equipment are installed in a single machine room.
- The following machine room is required. It is not include in the table 5.17.
  - Machine room (space for two rack cabinets (height 1200mm, width 600mm, depth 1200mm))
  - Facilities for enabling installation/operation of computers (Main frames, servers, etc.) such as air-conditioning, communication line, power capacity and security equipment which are not included in the price.
  - Facilities for enabling installation/operation of computers (Main frames, servers, etc.) such as air-conditioning, communication line, power capacity and security equipment (power capacity of “15,000VA” peak for each rack.)
  - Network equipment between the machine room and the external network (e.g. firewall).
  - Servers require power capacity of “2,000W” usual, “15,000W” peak for each rack.
- It is assumed that the data association between Lv5 and each operator (Bus, BRT, MRT) are built in compliance with the common interface specification.
- Support services of hardware and software is assumed correspondence during day-time on the weekday.

## 6. Priority Plan for the Upper System in Vietnam

### 6.1 Target Area and Executing Agency

In this section, we will detail the target area for upper system for Hanoi and Ho Chi Minh and propose the priority plan for the upper system.

#### 6.1.1 Hanoi City

(Target Area)

Hanoi city has the concept of the central management of transport smart cards via the establishment of the Center as mentioned in HPC Decision 5579/QD-UBND. Based on this concept, the system for transport smartcards installed in the Center falls into the target area, i.e. Ticket Management System (TMS).

(Executing Agency)

DOT is in charge of transport smartcards in Hanoi as mentioned in subsection 3.1.1. Therefore, DOT will be the executing agency. Currently, the working group<sup>25</sup> in TRAMOC which has been formed by DOT for JICA IC card pilot program mentioned in subsection 3.1.1 is going to draft a plan for the establishment of the Center.

(Funding Plan)

As described in section 3.1, the system for transport smartcards is not covered by the World bank, whilst the building planning to hold the function of Center is now being constructed through the support of World bank. Therefore, DOT has to find another source of funding for the system. In the meeting between DOT and the study team held in May 2014, they mentioned that they can expect the budget from the city, thus it is not important issue at this stage.

(The Steps toward the Cut-over of the Upper System)

The priority plan based on Japanese ODA program shows in Figure 6.1. The design for the system described in section 5.2 requires 1 year. The test and commission needs around 6 months. Thus, the preparation of tendering for the system implementation must be started in July 2018, if it is started in January 2021. Moreover, in order to proceed it under Japanese ODA program, the preparatory study must be started in second fiscal half, and then the following items should be developed further.

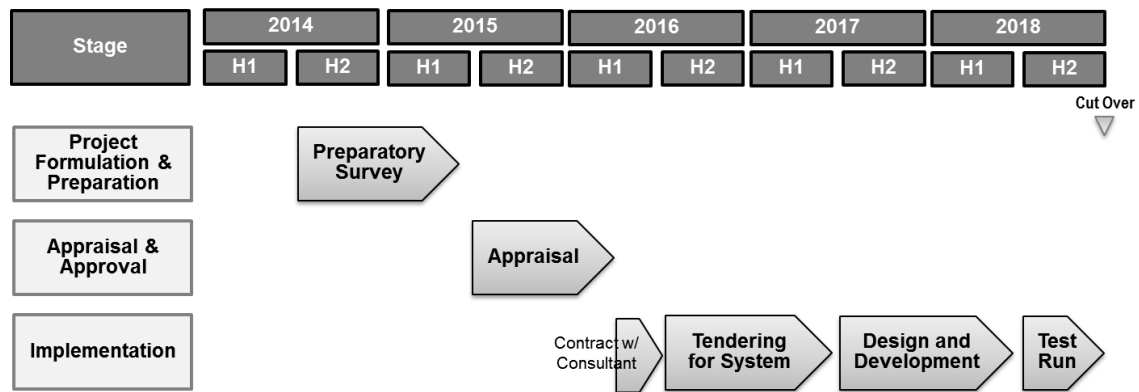
(Business Process)

The definition of business processes managed by the Center will be used in defining the system requirement. Hence the business process list such as Table 5.5 should be used as the first point to develop the detailed business processes.

<sup>25</sup> DOT Decision 90/QD-SGTVT dated Feb 21, 2013.

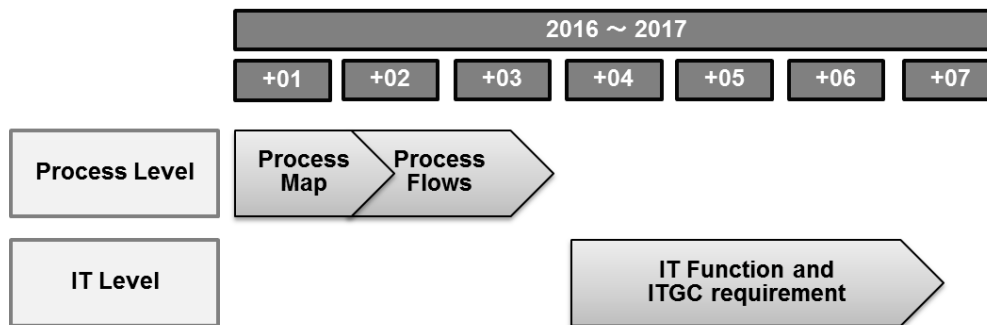
(System Function and IT General Controls)

Based on the not only ticket types and discount menus etc, also the business processes mentioned above, the system requirement should be defined. Internal controls for system operation in the Center, as listed in Table 5.6, should also be considered in the design.



**Figure 6.1 Priority Plan for the Implementation of Ticket Management System in Hanoi**

Source: Study team



**Figure 6.2 The Activities to be conducted in Preparatory Study (Draft)**

Source: Study team

Before starting the preparatory study, AFC system in BRT line and MRT line 2 will have started, thus the Technical Assistance by JICA for supporting the following topics is required. By this effort, the data consistency among the different modes can be secured, and interoperability between systems can be developed.

**[Supporting work in JICA Technical Assistance]**

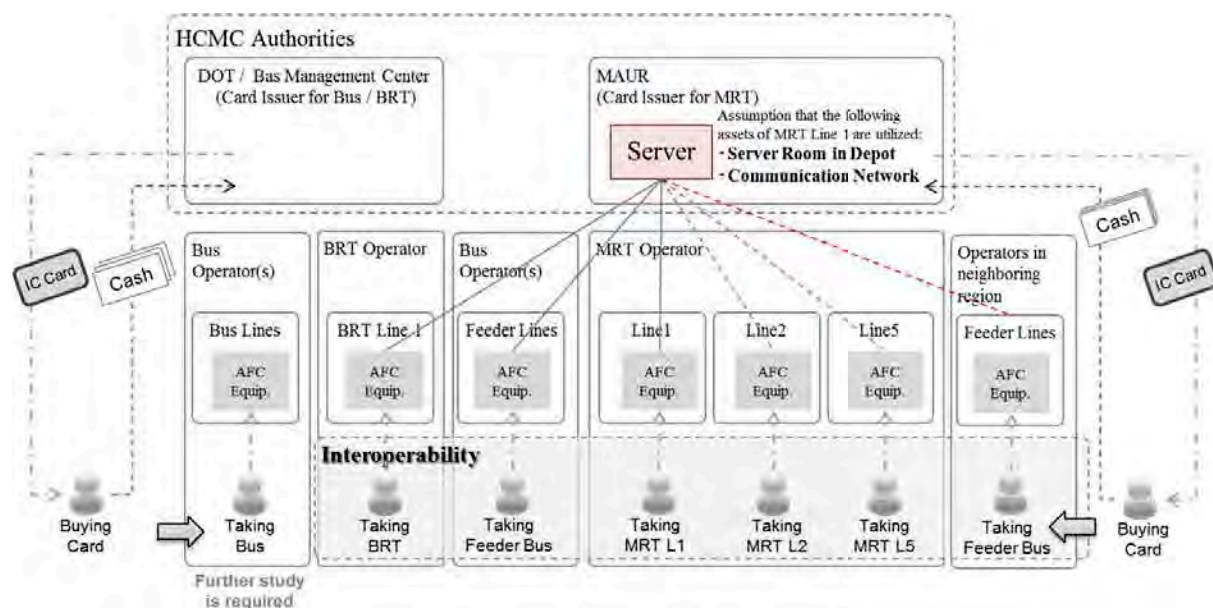
- Obtaining the official decision on the fare structure for public transport
- Defining the common data items among transport modes such as discount information
- Control rule for card access key

### 6.1.2 Ho Chi Minh City

(Target Area)

The system under MAUR described in section 5.3 falls into the target area. In addition to the system, the information exchange can be performed for the smart card policy and standard under development process by DOT, in order to facilitate their work.

From viewpoint of transportation network building-up which MRT Line 1 is centered on, it is valuable to consider data possession targeted for all of transportation mode which has the contact point with MRT Line 1. Therefore, it is encouraged to study in next preparatory study on the data coordination including neighbor provinces.



**Figure 6.3** Scope of Interoperability to be considered in Next Preparatory Study

Source: Study team

(Executing Agency)

The study team understands that MAUR can be the executing agency. However, DOT and other related parties are in charge of the development of transport smart cards policy and standard for bus system in Ho Chi Minh City, thus it is important to share the information with DOT.

(Funding Plan)

As for the system at Lv5 described in section 5.3, the system implementation including the planning activity has not been yet developed, as a consequence the funding source is also not considered yet. Therefore, the technical and funding support is required. MAUR managing MRTs, particularly, needs the upper system for realizing the interoperability among MRT lines. It also contributes the increasing the share of public transport which is the purpose of the development of urban railways supported by JICA, Japanese ODA can be one of funding options for the system. Based on the range of transport modes in Ho Chi Minh City, the initial investment could be roughly 1 billion JP yen, it is relatively small scale, thus a grant scheme might be considered.

(The Steps toward the Cut-over of the Upper System)

If the system size is assumed based on the transaction volume of MRT line 1, 2 and 5, BRT 1 and their feeder buses, the priority plan for HCMC would be as Figure 6.4. The design for the system requires around 1 year, the testing and commissioning needs around 6 months. Thus, the preparation of tendering for the system implementation must be started in July 2016. Moreover, in order to proceed it by Japanese ODA program, the preparatory study must be started in second fiscal half, and then the following items should be developed further.

As a precondition of this preparatory study, public transport fare policy (3<sup>rd</sup> step of Figure 3.2) which will be an input for the definition of system function must be drafted by the end of 2014. Based on the study result of business model and/or system function, fare policy may be reviewed again. Therefore, draft version of fare policy can be a condition for starting the preparatory study.

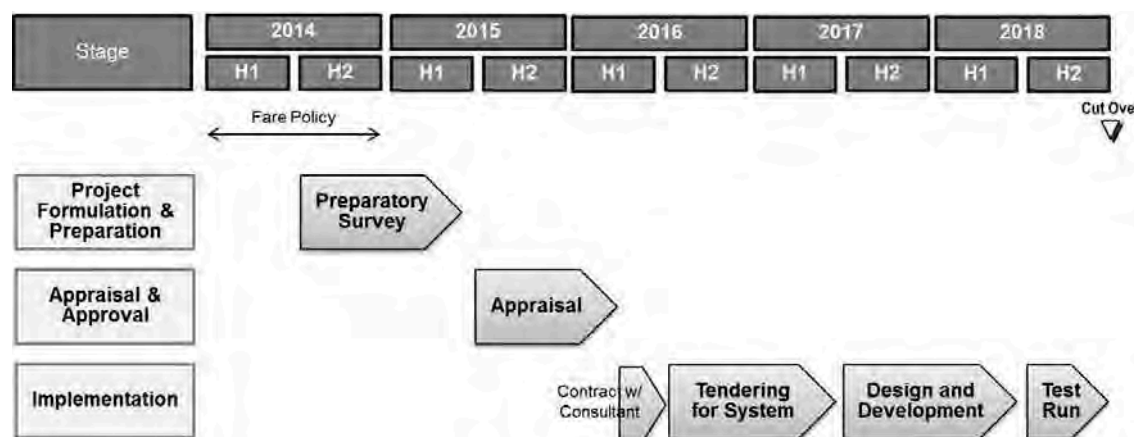


Figure 6.4 Priority Plan for the Ticket Management System in HCMC

Source: Study team

(Institutional)

It is required to clarify the institutional aspect: data management scheme between the HCMC and neighbors, and relation between two card issuers in the HCMC. The major topics will be as follows.

- The institutional scheme for the interoperable transport smartcards issued by the authorities in the same city.
- The institutional scheme for interoperable transport smartcards issued by the entities located in different cities.
- The institutional data-management scheme handled by a delegated city for the interoperable transport smartcards among cities, such as value transaction and cities' debts and credits.

(O&M organization for the Upper System)

Since new function will be added to MAUR and MRT operator, the definition of its roles and the interface with related parties must be studied. These include the position and major roles regarding the card management and issuing which are pointed out in subsection 5.3.2, 5.3.3 and 5.3.5.

(Business Process of O&M Organization)

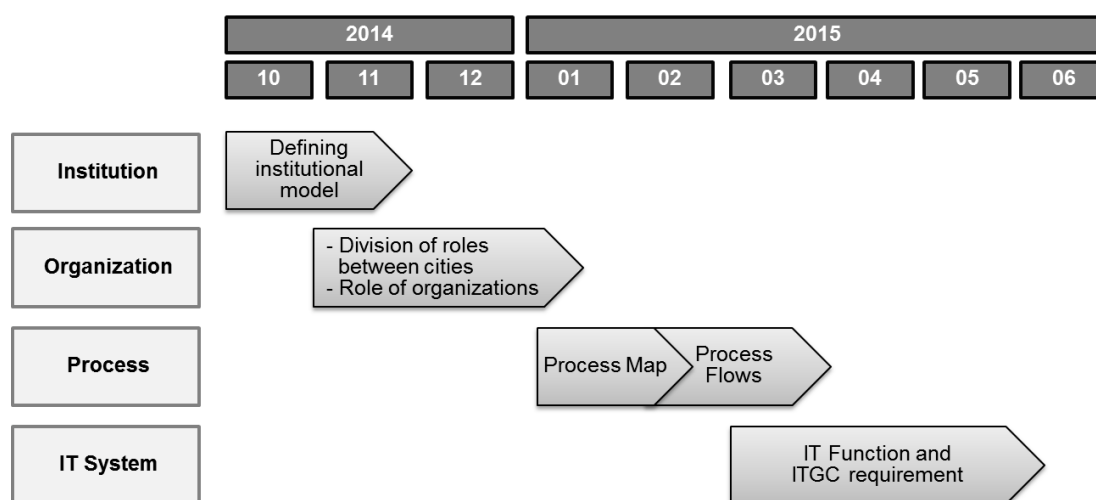
The definition of business processes managed by the MRT operator is the important information for defining the system requirement. Firstly, the business process list such as Table 5.5 should be extracted and then develop the business processes.

(System Function and IT General Controls)

Based on the not only ticket types and discount menus etc, also the business processes mentioned above, the system requirement should be defined. Addition to this, the internal controls for system operation in the Center as listed in Table 5.6 should also be considered in design.

(Sharing the information for Transport Smartcard Policy and Standard)

Although the support from Japan was not requested in the meeting with DOT held on Apr 11, 2014, it was mutually agreed to share the information by both sides. The study team understands that we can continuously share the useful information for DOT based on Japanese experience. It is also useful for the interoperability between MRTs and Bus system. Although this work is not clearly mentioned in Figure 6.5, it is desirable to have the information exchange sessions between DOT and the JICA study team.



**Figure 6.5 The Activities to be conducted in Preparatory Study (Draft)**

Source: Study team

**6.2 Framework of marketing activity for comprehensive smart cards penetration**

This chapter describes marketing activities to promote comprehensive smart cards.

Generally, comprehensive smart cards cover e-Money functions for retail market as well as e-ticket for public transport. As the cards issued for public transport become popular as e-Money, so the cards are expected to increase their speed of penetration or usage. Therefore, this chapter focuses on marketing activity for e-Money usage.



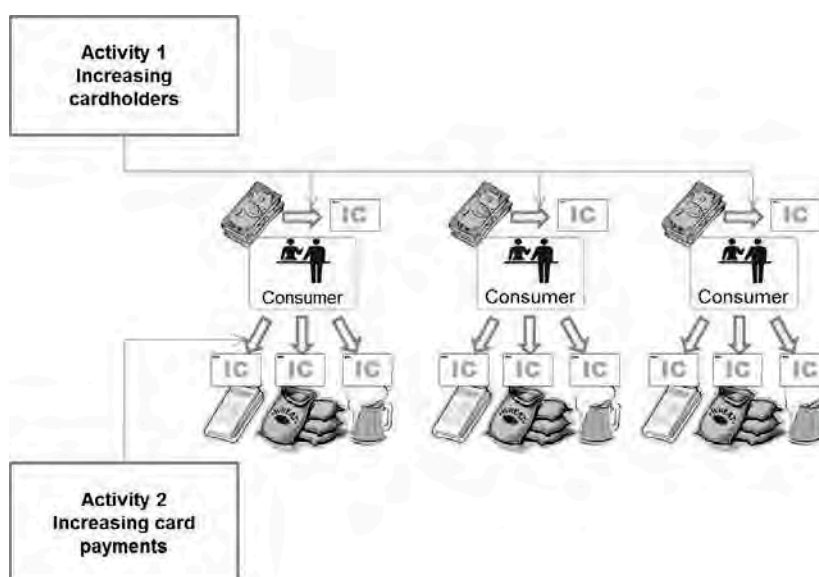
The objective of marketing activities described in this chapter is to expand e-Money payment with comprehensive smart cards. Marketing activities described here has the following points of view:

Activity-1. Increasing card holders

Activities to promote owning comprehensive smart cards by consumers.

Activity-2. Increasing card payments

Activities to enhance card payments with improving environment for the usage.



**Figure 6.6 Activities to promote comprehensive smart cards**

Source: study team

Above two activities are complementary to each other. Thus, both are deemed and described as an unified one in this chapter.

The table below shows the examples of promotion activities for existing payment service such as point loyalty program and privilege service in Vietnam. Based on these examples, we consider marketing activities for comprehensive smart cards promotion.

**Table 6.1 Services relating to comprehensive smart card**

Service	Promotion activities
Credit card	Point loyalty program Courtesy with card Merchant expansion
Prepaid mobile phone	Top-up bonus improving top-up environment
Courtesy card	Merchant expansion

## 6.2.1 Activity in credit card

The table below shows credit card services issued by 6 major commercial banks in Vietnam including foreign banks as well as Vietnamese local banks. Each bank offers additional privileges for cardholders to encourage them to pay more by cards.

**Table 6.2 Credit card provided by banks**

Bank name	Card name	Annual fee (VND)	Credit limit (VND)	Income (VND /Month)	Point loyalty program	Courtesy with card	Other privilege (summary) *1
Citibank vietnam	Citibank PremierMiles	1,500,000	900 million	20million	X	X	-airline mileage -travel insurance
	Citibank ACE Life Credit Card	1,200,000	900 million	15million	X	X	-
	Citibank Cash Back	1,000,000	900 million	15million	X	X	-
HSBC vietnam	Classic Visa Credit Card	300,000	60 million	6million	X	X	-
	Gold Visa Credit Card	600,000	300 million	12million	X	X	-
	Platinum Visa Credit Card	1,200,000	1000 million	18million	X	X	-travel concierge
	Premier MasterCard® Credit Card	Free	1000 million	UNK	X	X	-airline mileage -airport lounge -concierge
ANZ vietnam	ANZ Signature Priority Banking Visa Platinum Credit Card	Free	1000 million	UNK	X	X	-golf support -concierge -travel insurance
	ANZ Credit Card Classic	350,000	1000 million	20million	X	X	-golf support -concierge -travel insurance
	ANZ Credit Card Gold	550,000	400 million	16million	X	X	-
	ANZ Credit Card Platinum	1,100,000	100 million	8million	X	X	-
Vietcombank	Vietnam Airlines American Express Platinum	800000	200 million or more	UNK	X	X	-golf support -airport lounge -travel insurance
	Vietcombank Visa Platinum	800000	1000 million	UNK	X	X	-golf support -travel insurance
	Vietcombank VISA Gold	200000	300 million	UNK	-	-	-
	Vietcombank VISA Standard	100000	50 million	UNK	-	-	-
Eximbank	Visa International Credit Card standard	300,000	50 million	UNK	-	-	-
	Visa International Credit Card gold	400000	900 million	UNK	-	-	-
	Eximbank-Visa Platinum Credit Card	1,000,000	0.5 million USD	UNK	-	X	-golf support -concierge -travel insurance
Vietinbank	Cremium Visa Platinum VietinBank	UNK	1000 million	UNK	-	X	-golf support -concierge -travel insurance
	VietinBank Cremium MasterCard	UNK	50 million	UNK	-	X	-concierge
	VietinBank Cremium Card - JCB	UNK	299 million	UNK	-	X	-airport lounge

Source: Each banks' websites

Examples of common privileges introduced by each banks is as follows:

- Point loyalty program (Rewards for payment amount with constant rate by points)
- Courtesy with card

- Travel insurance
- Airport lounge
- Concierge(Reserving hotels or booking tickets etc.)
- Golf support(Reserving or discount etc.)

Among these, “Point loyalty program” and “Courtesy with card” for comprehensive smart cards are widely common in Japan and will be helpful in Vietnam as well. By contrast, privileges such as insurance or airport lounge are generally provided for high-income consumers; therefore, these measures will not possibly be common in comprehensive smart cards.

### **(1) Point loyalty program**

“Point loyalty program” is the one of useful measures broadly known in the world to increase both opportunities and amounts of card payments. That approach will be effective for comprehensive smart cards as well.

In the case of comprehensive smart cards, large number of cardholders will be assumed to use e-Money routinely, for example, on the way to work or to school. Point loyalty program may encourage users to use cards in their daily shopping.

A Vietnamese domestic retailer, who is a respondent of the study team’s interview described in chapter 3.2 “Services other than Public Transport”, has already introduced point loyalty program in their business. According to their explanation, the point loyalty program is well-accepted by consumers in urban area. The retailer has also been devising their program. The more card payments a consumer conducts, the more rewards he or she receives at a high rate. Such kind of programs will be helpful for the promotion of comprehensive smart cards as well. Besides, some point programs commonly accepted by various merchants are emerging. These services will possibly raise awareness of point loyalty programs<sup>26</sup>.

### **(2) Courtesy with card**

“Courtesy with card” is one of the discount programs. Consumers get around 10% - 30% discounts on the payment scene in specified merchants with card. These programs may promote card payment instead of cash.

In Japan, for example, not only money-saving discount but also giving novelties or giving priorities to reserve are provided as courtesy with card. These approaches might be effective for comprehensive smart cards as well.

<sup>26</sup> “Lingo” is one of examples applying point loyalty program in Vietnam. They started its service in 2012 and now has 30,000 card holders. (<http://card.lingo.vn/tin-tuc/the-lingo-dep-hon-voi-dien-mao-moi-504.html>)  
The number of member stores reaches 400 in Hanoi and HCMC, and on Web. (VnExpress, Oct 01, 2013)  
<http://kinhdoanh.vnexpress.net/tin-tuc/hang-hoa/san-pham-moi/phat-hanh-the-dong-thuong-hieu-vinaphone-lingo-2887705.html>)

### **(3) increasing merchants**

Some card issuers list merchants' name or address accepting credit card and also provide a list of special privileges on their websites. Those information may encourage card holders to prefer merchants who offer those courtesy.

The merchants expect more loyal customers through courtesy with cards. Therefore, courtesy with cards is one of the reasons for a merchant to be willing to accept the card. This approaches will be effective for comprehensive smart cards as well.

## **6.2.2 Activity in prepaid mobile phone**

Prepaid mobile phone services are very popular in Vietnam. Promotion activities of 3 major mobile phone companies (Vietttel, Vinaphone, Mobiphone) are described in this chapter for reference.

### **(1) Top-up bonus**

Each mobile phone company provides top-up bonus at certain times. This is one of the promotion programs for consumers to receive bonus value when consumers top up their phones.<sup>27</sup>

For example, consumers can get 50% up bonus based on top-up amount from 0:00 to 23:59 in a designated day. The information about the promotion is put into the website or is delivered by SMS (short message service) on the mobile phone. This program may encourage users to increase top-up amount. These approaches will most possibly work for comprehensive smart cards as well.

### **(2) improving top-up environment**

There are various methods to top up prepaid mobile phone in Vietnam.

- Buying scratch cards at retailers
- SMS top-up with combining bank account and phone number
- Top-up service on the internet
- KIOSK terminals at convenience stores etc.

Providing sufficient top-up environment will increase usage of comprehensive smart cards. Besides, both comprehensive smart cards and prepaid mobile phones are used in consumers' daily lives.

Thus, for comprehensive smart cards, how easily users top-up their cards will be a benchmark in current comparison with prepaid mobile phones. In other words, if top-up environment for comprehensive smart cards is poorer than prepaid mobile phone, Vietnamese people will feel more frustration with comprehensive smart cards themselves.

<sup>27</sup> Announcement about top-up bonus by Viettel  
(<https://vietteltelecom.vn/tin-tuc/tin-khuyen-mai/tang-50-the-nap-cho-thue-bao-tra-truoc-dang-hoat-dong-41.html>)

### 6.2.3 Activity in courtesy cards

Major cities such as Hanoi, HCMC or Da-nang attract many tourists or business persons. Hence comprehensive smart cards will most likely be to be introduced in the major cities first ahead of other areas in Vietnam.

In 2013, Vietnam enjoyed 7.57 million foreign arrivals, increase of 10.6 percent over last year.<sup>28</sup> According to Hanoi City officials, they got 2.58 million foreign arrivals, generating 38.5 trillion VND (1.83 billion USD) in revenue and expect 3 million foreign visitors in 2014.<sup>29</sup>

Because many visitors purchase goods and services actively in the area accessible via urban transport; their behaviors will be important factors in increasing comprehensive smart cards usage more rapidly. Courtesy cards for tourists can also be useful references for future comprehensive smart cards. In Da-nang City, well known as a famous sightseeing destination in Vietnam, “Tourist Cards” are issued by a local private company, Skylight Media JSC. When a tourist visits a merchant and show the Tourist Card to its clerks, he or she can get some discounts. Though the card itself has no payment functions now, Skylight Media announced the Tourist Card will support payment in future.<sup>30</sup>

The cards are sold at a price of 90,000 VND and 3000 cards have been issued. There are 200 merchants where this card is accepted. Cardholders can get a discount for around from 10% to 50%. The website of Tourist Card introduces merchants such as hotels, shopping malls or restaurants.<sup>31</sup>

The improvement activity, which increases convenient merchants for tourist such as urban transport, hotels or restaurants, is effective for comprehensive smart cards as well. It will possibly be one of the most effective measures for expansion of comprehensive smart cards preferentially to introduce these card to the place where there is high tourist traffic like hotels, restaurants and urban transports.

### 6.2.4 Considerations in terms of existing services

#### (1) improving environments of using comprehensive smart cards

In the early stage of deploying comprehensive smart cards, cardholders might not easily find or recognize merchants where their cards are accepted.

For example, “Lingo”<sup>32</sup>, a common point program service, provides information of card acceptable merchants on the website or smart phone application for cardholders. Lingo’s acceptances utilize the website or the application as a means to advertise their goods or services. Besides, Lingo supplies signs to be displayed at store fronts to identify Lingo merchant.

<sup>28</sup> Ministry of Culture, Sports and Tourism (<http://vietnamtourism.gov.vn/english/index.php/items/6709>)

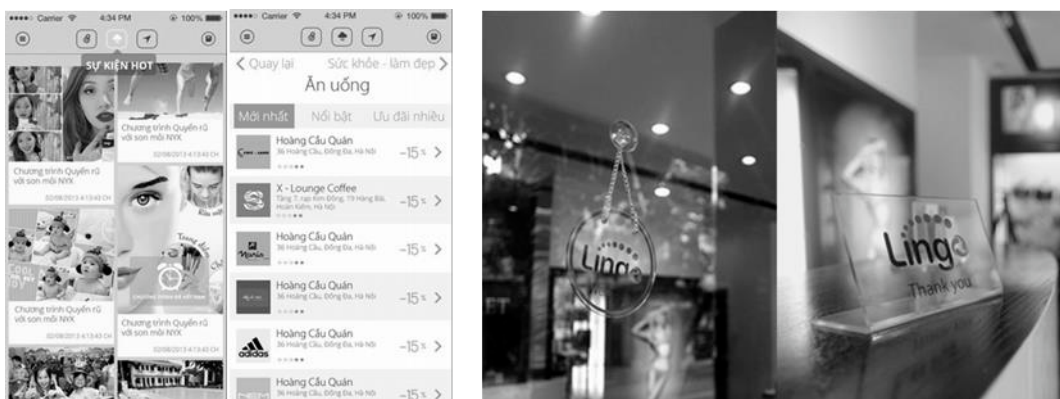
<sup>29</sup> Ministry of Culture, Sports and Tourism (<http://vietnamtourism.gov.vn/english/index.php/items/6862>)

<sup>30</sup> News on 22nd January 2014 (<http://www.eturbonews.com/41965/vietnam-introduces-discount-card-tourists>)

<sup>31</sup> Tourist card website (<http://www.touristcard.net.vn/>)

<sup>32</sup> Lingo is one of the common point programs available in Vietnam. They started in 2012 and currently have 3,000+ users. (<http://card.lingo.vn/tin-tuc/the-lingo-dep-hon-voi-dien-mao-moi-504.html>) 400+ merchants exist in Hanoi city and HCMC. Also available in e-commerce. (VnExpress, Oct-1,2013,<http://kinhdoanh.vnexpress.net/tin-tuc/hang-hoa/san-pham-moi/phet-hanh-the-dong-thuong-hieu-vinaphone-lingo-2887705.html>)

In comprehensive smart cards as well, business operators will recognize merits to be merchants of comprehensive smart cards, and the merchants are expected to increase through such efforts.



**Figure 6.7 Lingo smart phone application and Shop Sign**

Left: smart-phone application, Right: shop sign

Source: Ling website

## (2) promotions for using comprehensive smart cards

It will be important for comprehensive smart cards to treat or greet their loyal customers to increase card payment opportunities and amounts of use. Therefore, enhancement of point loyalty program or courtesy with cards will possibly be effective measures as well as any credit cards or other services. Some respondents in the interview described in chapter 3.2 “Services other than Public Transport” stated that “benefits in visible ways such as discount are very effective to attract customers” as well.

However, it is necessary that card issuers must cover the cost of issuing points in order to provide point loyalty program. Since comprehensive smart cards will be mostly issued by public entities, who should share the cost to issue points might cause controversy. Nevertheless, card issuers do not necessarily cover all the cost of issuing points in other countries. There are some cases in which business operators who wants to utilize point loyalty program cover the cost of issuing points. For example, a retailer pays its cost and gets more customers with rewarding more points than other competitors. It is necessary to consider whether or not card issuers of comprehensive smart cards are allowed to adopt such kind of commercial activities. Cost sharing about top-bonus will also face the same problems in future.

## Appendix - 1 Overview of Transport Smart Cards in Other Asian Countries



	Japan		Singapore		Hongkong	Thailand		Malaysia
Brand Name	Suica	Pasmo	Ez-Link	NETS	Octopus	Rabbit (Skytrain)	MRT Card	Touch'n Go
1 Image								
2 Prime Issuer (entity type)	JR-East (Railway Company)	Pasmo (E-ticket and e-money service provider owned by major transport companies)	Ez-Link (E-ticket and e-money service provider owned by LTA)	NETS (Financial transaction processing services company owned by Banks)	Octopus Holdings (E-ticket and e-money service provider owned by major transport companies)	Bangkok Smartcard System (E-ticket and e-money service provider owned by BTS)	+ Tokens BMCL (Railway company)	Touch'n Go (E-ticket and e-money service provider owned by bank and investment companies etc)
3 Starting Year	2001	2007	2002	1985 (Contactless-cards have been issued since 2009)	1997	2012	2004	1997
4 Application	- MRT - LRT - Bus - Taxi - Car parking - Locker - Retail shops - Online	- MRT - LRT - Bus - Taxi - Car parking - Locker - Retail shops	- MRT - LRT - Bus - Highway - Car parking - Retail shops	- MRT - LRT - Bus - Highway - Car parking - Retail shops	- MRT - LRT - Bus - Highway - Car parking - Retail shops - Online	- Skytrain - BRT - Retail shop	- MRT	- MRT - LRT - Bus - Highway - Car parking - Retail shops
Covered MRT lines and operating length (app.)	321 lines / 11,529 km		12 lines / 178 km		11 lines / 247 km	2 lines / 37km	1 line / 20 km	3 lines / 65 km
5 NFC Type	Felica		Type B		Felica	Type A	Card: TypeA Token: Felica	Type A
6 Issued number	45,57mil (as of 01/2014)	22,89mil (as of 05/2013)	10 mil (as of 04/2013)		over 24 mil	over 13 mil	20mil (as of 07/2005)	over 11 mil
7 Remarks	Wide range of application	affiliated by various transportation companies.	Own standard	Own standard	Innovator in multi-purpose card sector.	It is not available for MRT.	It is not available for Skytrain.	Derived from highway-card

Source : Web site of MRT operators and card issuers.

## Appendix - 2 MRT Lines and Operating-km in Nationwide Interoperable Transport Smartcards in Japan

JR

Operator	Line	Length ( Km )	Length (IC-compliant area) (Km)	IC- compliant stations	Notes
Hokkaido Railway Company	Hakodate Line	458.4	74.4		Otaru ~ Iwamizawa
	Esu Line	79.9	0.0		
	Sassho Line	76.5	28.9		Soen ~ Health Sciences University of Hokkaido
	Chitose Line	59.2	59.2		
	Sekisho Line	148.5	0.0		
	Muroran Line	218.0	8.8		Tomakomai ~ Numanohata
	Hidaka Line	146.5	0.0		
	Rumoi Line	66.8	0.0		
	Furano Line	54.8	0.0		
	Nemuro Line	443.8	0.0		
	Soya Line	259.4	0.0		
	Sekihoku Line	234.0	0.0		
	Senmo Line	166.2	0.0		
	Kaikyo Line	87.8	0.0		
	<b>Subtotal</b>	<b>2,499.8</b>	<b>171.3</b>	<b>55</b>	
East Japan Railway Company	Tokaido Line	169.8	169.8		
	Yamanote Line	20.6	20.6		
	Akabane Line	5.5	5.5		
	Nambu Line	45.0	45.0		
	Tsurumi Line	9.7	9.7		
	Musashino Line	105.5	105.5		
	Yokohama Line	42.6	42.6		
	Negishi Line	22.1	22.1		
	Yokosuka Line	23.9	23.9		
	Sagami Line	33.3	33.3		
	Ito Line	16.9	16.9		
	Chuo Line	247.8	247.8		
	Ome Line	37.2	37.2		
	Itsukaichi Line	11.1	11.1		
	Hachiko Line	92.0	92.0		
	Koumi Line	78.9	23.4		Kobuchisawa ~ Nobeyama
	Shinonoi Line	66.7	13.3		Shiojiri ~ Matsumoto
	Oito Line	70.1	0.0		
	Tohoku Line	571.7	448.6		Tokyo ~ Kuroiso, Yabuki ~ Hiraizumi
	Tohoku Shinkansen	713.7	713.7		
	Joban Line	350.4	272.9		Nippori ~ Iwaki, Haranomachi ~ Iwanuma
	Suigun Line	147.0	65.1		Mito ~ Hitachidaigo, Kamisuagya ~ Hitachioota
	Kawaqoe Line	30.6	30.6		
	Takasaki Line	74.7	74.7		
	Joetsu Line	164.4	59.1		Takasaki ~ Minakami
	Joetsu Shinkansen	303.6	303.6		
	Azuma Line	55.6	0.0		
	Ryomo Line	84.4	84.4		
	Mito Line	50.2	50.2		
	Nikko Line	40.5	40.5		
	Karasuyama Line	20.4	0.0		
	Senzan Line	58.0	58.0		
	Senseki Line	50.2	50.2		
	Ishinomaki Line	44.9	0.0		
	Kesennuma Line	72.8	0.0		
	Ofunato Line	105.7	0.0		
	Kitakami Line	61.1	0.0		
Kamaishi Line	90.2	0.0			
Tazawako Line	75.6	75.6		Akita Shinkansen	
Yamada Line	157.5	0.0			
Iwaizumi Line	38.4	0.0			
Hanawa Line	106.9	0.0			
Hachinohe Line	64.9	0.0			
Ominato Line	58.4	0.0			

Operator	Line	Length ( Km )	Length (IC-compliant area) (Km)	IC- compliant stations	Notes
	Banetsuto Line	85.6	23.1		Funehiki ~ Kouriyama
	Banetsusai Line	175.6	81.2		Kouriyama ~ Kitakata
	Tadami Line	135.2	0.0		
	Ouu Line	484.5	148.6		Yamagata Shinkansen ( Fukushima ~ Shinjo )
	Yonesaka Line	90.7	0.0		
	Aterazawa Line	24.3	0.0		
	Oga Line	26.6	0.0		
	Gono Line	147.2	0.0		
	Tsugaru Line	55.8	0.0		
	Uetsu Line	271.7	59.4		Niitsu ~ Murakami
	Hakushin Line	27.3	27.3		
	Rikuuto Line	94.1	44.9		Kogota ~ Naruko-onsen
	Rikuusai Line	43.0	0.0		
	Shinetsu Line	250.3	166.0		Takasaki ~ Yokokawa, Naoetsu ~ Niigata
	Hokuriku Shinkansen	117.4	117.4		
	Iiyama Line	96.7	0.0		
	Echigo Line	83.8	83.8		
	Yahiko Line	17.4	17.4		
	Sobu Line	145.4	145.4		
	Sotobo Line	93.3	93.3		
	Uchibo Line	119.4	119.4		
	Keiyo Line	54.3	54.3		
	Narita Line	119.1	119.1		
	Kasima Line	17.4	0.0		
	Kururi Line	32.2	0.0		
	Togane Line	13.8	13.8		
	<b>Subtotal</b>	<b>7,512.6</b>	<b>4,561.3</b>	<b>786</b>	
Central Japan Railway Company	Tokaido Line	360.1	360.1		Kannami ~ Sekigahara
	Tokaido Shinkansen	552.6	552.6		
	Gotenba Line	60.2	24.7		Gotemba ~ Numazu
	Minobu Line	88.4	11.9		Fuji ~ Nishi-Fujinomiya
	Iida Line	195.7	8.7		Toyohashi ~ Toyokawa
	Taketoyo Line	19.3	19.3		
	Takayama Line	189.2	27.3		Gifu ~ Mino-Ota
	Chuo Line	174.8	76.6		Kanayama ~ Nakatsugawa
	Taita Line	17.8	17.8		
	Kansai Line	59.9	37.2		Nagoya ~ Yokkaichi
	Kisei Line	180.2	0.0		
	Meisho Line	43.5	0.0		
	Sanqu Line	29.1	0.0		
	<b>Subtotal</b>	<b>1,970.8</b>	<b>1,136.2</b>	<b>149</b>	
West Japan Railway Company	Hokuriku Line	353.8	31.4		Miagara ~ Oumi-Shiotsu
	Obama Line	84.3	0.0		
	Etsumihoku Line	52.5	0.0		
	Nanao Line	59.5	0.0		
	Johana Line	29.9	0.0		
	Himi Line	16.5	0.0		
	Takayama Line	36.6	0.0		
	Oito Line	35.3	0.0		
	Tokaido Line	143.6	143.6		
	Kosei Line	74.1	74.1		
	Sanin Line	676.0	34.2		Kyoto ~ Sonobe
	Kusatsu Line	36.7	21.4		Kibukawa ~ Kusatsu
	Nara Line	34.7	34.7		
	Osaka Loop Line	20.7	20.7		
	Sakurajima Line	4.1	4.1		
	Fukuchiyama Line	106.5	58.4		Amagasaki ~ Sasayamaguchi
	Kansai Line	115.0	115.0		
Sakurai Line	29.4	29.4			
Katamachi Line	44.8	44.8			



Operator	Line	Length ( Km )	Length (IC-compliant area) (Km)	IC- compliant stations	Notes
	JR Tozai Line	12.5	12.5		
	Osaka-higasi Line	9.2	9.2		
	Kansai Airport Line	11.1	11.1		
	Wakayama Line	87.5	11.5		Oji ~ Takada
	Harwa Line	63.0	63.0		
	Kisei Line	204.0	0.0		
	Sanyo Line	530.8	314.1		Kobe ~ Aioi, Wake ~ Minami-Iwakuni, Hyogo ~ Wadamisaki
	Kakogawa Line	48.5	0.0		
	Kisin Line	158.1	0.0		
	Maizuru Line	26.4	0.0		
	Bantan Line	65.7	0.0		
	Akoh Line	57.4	25.6		Aioi ~ Banshuako, Osafune ~ Higashi-Okayama
	Tsuyama Line	58.7	2.3		Okayama ~ Houkaiin
	Kibi Line	20.4	20.4		
	Uno Line	32.8	14.9		Okayama ~ Chayamachi
	Honshibisan Line	12.9	12.9		
	Hakubi Line	138.4	0.0		
	Geibi Line	159.1	20.6		Hiroshima ~ Karuga
	Fukuen Line	78.0	8.4		Fukuyama ~ Kannabe
	Imbi Line	70.8	0.0		
	Sakai Line	17.9	0.0		
	Kisuki Line	81.9	0.0		
	Sanko Line	108.1	0.0		
	Kure Line	87.0	87.0		
	Kabe Line	14.0	14.0		
	Gantoku Line	43.7	0.0		
	Yamaguchi Line	93.9	0.0		
	Ube Line	33.2	0.0		
	Onoda Line	13.9	0.0		
	Mine Line	46.0	0.0		
	Hakata-minami Line	8.5	0.0		
	Sanyo Shinkansen	644.0	644.0		
	Nano Line	28.0	0.0		
	<b>Subtotal</b>	<b>5,019.4</b>	<b>1,883.3</b>	<b>428</b>	
Shikoku Railway Company	Honshibisan Line	18.1	18.1		
	Yosan Line	327.0	32.7		Takamatsu ~ Tadotsu
	Uchiko Line	5.3	0.0		
	Yodo Line	76.3	0.0		
	KotokuLine	74.5	0.0		
	Naruto Line	8.5	0.0		
	Dosan Line	198.7	0.0		
	Tokushima Line	67.5	0.0		
	Mugi Line	79.3	0.0		
	<b>Subtotal</b>	<b>855.2</b>	<b>50.8</b>	<b>13</b>	
Kyushu Railway Company	Kyushu Shinkansen	288.9	0.0		
	Sanyo Line	6.3	6.3		
	Kagoshima Line	281.6	281.6		
	Nippou Line	462.6	181.5		Nishikokura ~ Kouzaki, Kokubu ~ Kagoshima
	Nagasaki Line	148.8	63.4		Tosu ~ Sakaga, Isahaya ~ Nagasaki
	Sasebo Line	48.8	0.0		
	Chikuhi Line	68.3	42.6		Meinohama ~ Karatsu
	Sasaqui Line	25.1	25.1		
	Miyazaki Airport Line	1.4	0.0		
	Chikuho Line	66.1	45.3		Wakamatsu ~ Katsuragawa
	Omura Line	47.6	14.8		Takematsu ~ Isahaya
	Kashii Line	25.4	25.4		
	Karatsu Line	42.5	2.2		Karatsu ~ Nishi-Karatsu
	Hitahikosan Line	68.7	0.0		
	Gotouji Line	13.3	0.0		
	Kyudai Line	141.5	26.4		Oita ~ Mukainoharu, Zendoji ~ Kurume

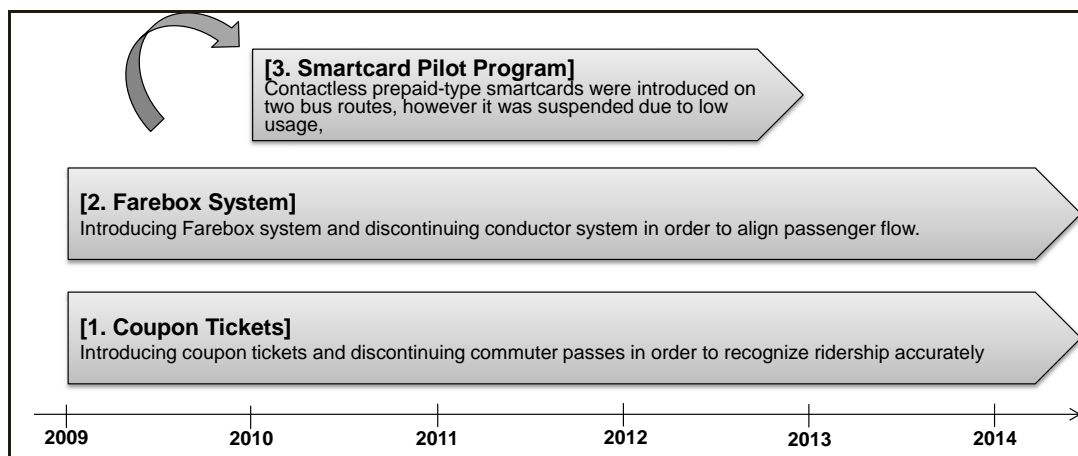
Operator	Line	Length ( Km )	Length (IC-compliant area) (Km)	IC- compliant stations	Notes
	Touhi Line	148.0	22.6		Higo-Ozu ~ Kumamoto
	Hisatsu Line	124.2	0.0		
	Misumi Line	25.6	0.0		
	Ibusuki-makurazaki Line	87.8	26.6		Kagoshima-Chuo ~ Kiire
	Kitto Line	61.6	0.0		
	Nichinan Line	88.9	0.0		
	Subtotal	2,273.0	763.8	271	
JR total		20,130.8	8,566.7	1,702	
Private operators total		4,179.3	4,147.3	2,826	
Total		24,310.1	12,714.0	4,528	

Private Operators

Operator	Line	Length ( Km )	Length (IC-compliant area) (Km)	IC-compliant stations	Notes
Sapporo City Transportation Bureau	Total	48.0	48.0	69	
Sendai Airport Transit Co., Ltd	Total	7.1	7.1	3	
Saitama Shintoshin Kotsu	Total	12.7	12.7	13	
Izuky Corporation	Total	45.7	45.7	15	
Tokyo Monorail Co., Ltd	Total	17.8	17.8	11	
Tokyo Waterfront Area Rapid Transit ,Inc	Total	12.2	12.2	7	
IzuHakone Railway Co., Ltd.	Total	9.6	9.6	12	
Enoshima Electric Railway Co., Ltd	Total	10.0	10.0	15	
Odakyu Electric Railway Co., Ltd.	Total	120.5	120.5	70	
Kanto Railway Co., Ltd	Total	55.6	55.6	27	not covered by nationwide interoperability
Keio Corporation	Total	84.7	84.7	68	
Keisei Electric Railway Co., Ltd.	Total	152.3	152.3	65	
Keikyu Corporation	Total	87.0	87.0	72	
Saitama Railway Corporation	Total	14.6	14.6	7	
Sagami Railway Co., Ltd.	Total	35.9	35.9	24	
Metropolitan Intercity Railway Company	Total	58.3	58.3	20	
Shin-Keisei Electric Railway Co., Ltd.	Total	26.5	26.5	23	
Seibu Railway Co., Ltd.	Total	176.6	176.6	91	
Tokyo Tama Intercity Monorail	Total	16.0	16.0	19	not covered by nationwide interoperability
Chiba Urban Monorail Co., Ltd.	Total	15.2	15.2	18	not covered by nationwide interoperability
Tokyu Corporation	Total	104.9	104.9	97	
Tokyo Metro Co., Ltd.	Total	195.1	195.1	137	
Bureau of Transportation Tokyo Metropolitan Government	Total	130.9	130.9	139	
Tobu Railway Co., Ltd.	Total	463.3	463.3	196	
Toyo Rapid Railway	Total	16.2	16.2	8	
Hakone Tozan Railway Co., Ltd.	Total	15.0	15.0	10	
Hokuso-Railway Co., Ltd.	Total	32.3	32.3	14	
Maihama Resort Line	Total	5.0	5.0	4	
Yurikamome Inc	Total	14.7	14.7	16	
Yokohama Minatomirai Railway Company	Total	4.1	4.1	5	
Transportation Bureau, City of Yokohama	Total	53.4	53.4	40	
Yokohama Seaside Line Co., Ltd	Total	10.6	10.6	14	not covered by nationwide interoperability
Transportation Bureau, City of Nagoya	Total	93.3	93.3	85	
Nagoya Railroad Co., Ltd.	Total	444.8	419.8	246	Unavailable in Gamagori Line and part of Hiromi Line
Toyohashi Rail Road Co., Ltd.	Total	23.4	23.4	30	
Nagoya GuideWay-bus Co., Ltd.	Total	6.5	6.5	9	not covered by nationwide interoperability
Nagoya Waterfront Area Rapid Transit ,Inc	Total	15.2	15.2	11	not covered by nationwide interoperability
Osaka Municipal Transportation Bureau	Total	137.8	137.8	108	
Kintetsu Corporation	Total	504.8	497.8	247	Unavailable in part of Hachioji Line, Utsube Line and Shima Line
Hankyu Corporation	Total	143.6	143.6	86	
Keihan Electric Railway Co., Ltd.	Total	91.1	91.1	86	
Nankai Electric Railway Co., Ltd.	Total	154.8	154.8	100	
Hanshin Electric Railway Co., Ltd.	Total	48.9	48.9	49	
Kyoto City Transportation Bureau	Total	31.2	31.2	31	
Kobe City Transportation Bureau	Total	30.6	30.6	25	
Sanyo Electric Railway Co., Ltd.	Total	63.2	63.2	49	not covered by nationwide interoperability
Kobe Electric Railway Co., Ltd.	Total	69.6	69.6	45	not covered by nationwide interoperability
Osaka Monorail Co., Ltd	Total	16.7	16.7	18	
Osaka Prefectural Urban Development Co., Ltd.	Total	14.3	14.3	5	
Kobe New Transit Co., Ltd	Total	15.3	15.3	18	not covered by nationwide interoperability
Kita-Osaka Kyuko Railway Co., Ltd.	Total	5.9	5.9	3	
Nose Electric Railway Co., Ltd.	Total	14.8	14.8	14	not covered by nationwide interoperability
Hokushinkyuko Railway Co., Ltd.	Total	7.5	7.5	1	not covered by nationwide interoperability
Mizuma Railway Co., Ltd.	Total	5.5	5.5	10	
Keifuku Electric Railroad Co., Ltd	Total	11.0	11.0	21	
Shizuoka Railway Co., LTD.	Total	11.0	11.0	15	
Hankai Tramway Co., Ltd	Total	18.7	18.7	43	
Nishi - Nippon Railroad Co., Ltd.	Total	106.1	106.1	72	
Fukuoka City Transportation Bureau	Total	29.8	29.8	35	
Kumamoto City Transportation Bureau	Total	12.1	12.1	35	
<b>Total</b>		<b>4,179.3</b>	<b>4,147.3</b>	<b>2,826</b>	



## Appendix - 3    Actions toward Smartcard Implementation for HCMC Bus

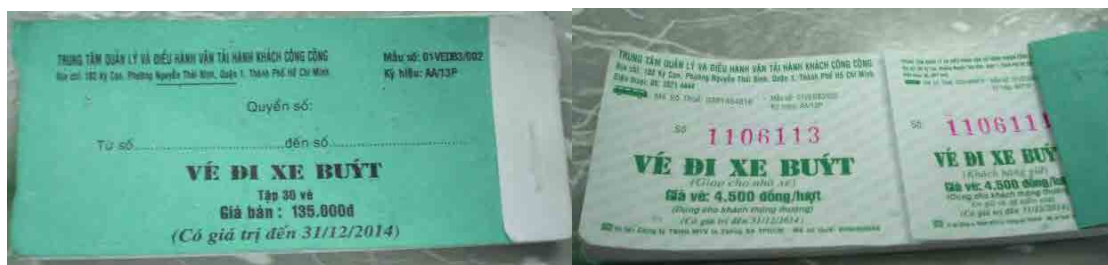


**Fig. Actions toward Smartcard Implementation for HCMC Bus System**

Source: Study team based on interview with MOCPT dated Apr 17, 2014

### [1. Coupon Tickets]

In order to recognize the ridership accurately, DOT decided to change their ticket system: discontinuing commuter passes and introducing coupon tickets. It is quite similar to the system which had been used during the high economic growth era in Japan (1970s – 80s’). Coupon ticket is a kind of prepaid ticket (booklet type). In advance of taking bus services, a passenger has to pay 135,000VND for 30 trips, single trip tickets cost 5,000VND. These tickets can be bought at ticket stations operated by MOCPT. A passenger enjoys 10% discount. When a passenger takes a bus, he/she has to show a booklet to a conductor, and then the conductor will tear off one coupon from the booklet. Based on the received coupons, MOCPT can recognize the ridership accurately. It may contribute to their future planning such as reconsidering time-table and fare level, and introducing new system.



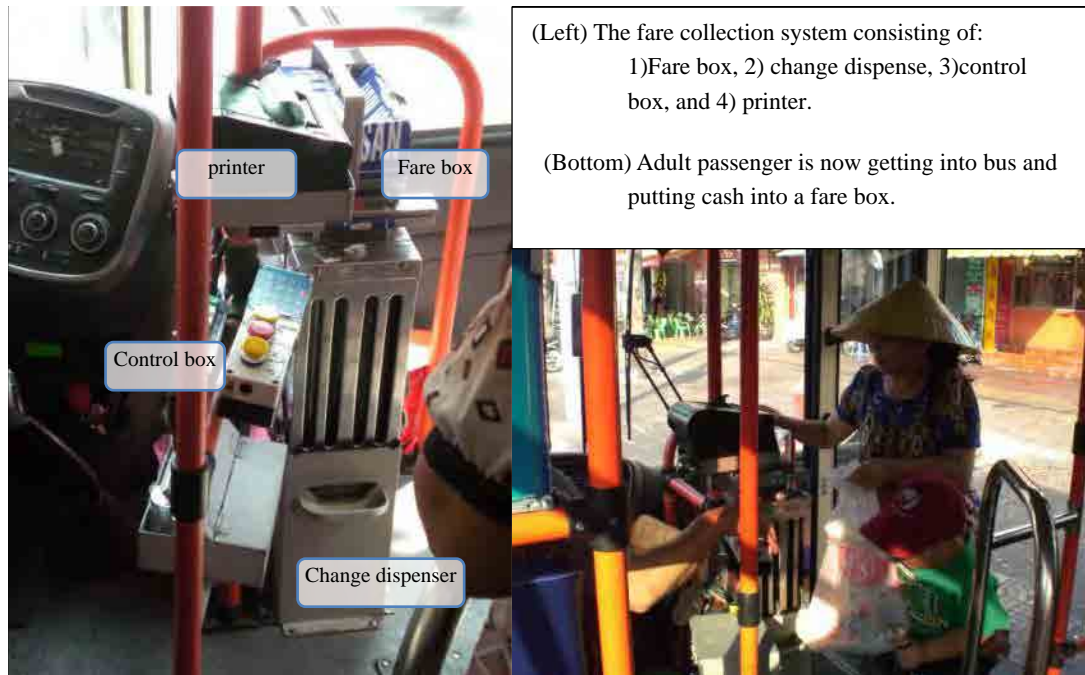
**Fig. Coupon Ticket**

Left side: cover of coupon booklet, Right side: coupons inside booklet

Source: MOCPT

### [2. Farebox System]

This system was started in 2009, in order to reduce conductors and align passenger flow. At the moment, the city has installed around 500 of this system on 35 bus routes. The system is also quite similar to the one which had been used during the high economic growth era in Japan (1970s – 80s’). A passenger boards the bus at the front and puts cash into a fare box. After paying the cash, the driver presses the button, and then a receipt will be printed. When students take a bus, they should show their ID to the driver, who then presses the button for student fare (2,000VND), and a receipt for student fare will be printed. Passenger identification is now being carried out manually. If they do not have exact fare, they should ask the driver to provide change (coins). Thanks to the fare collecting system, bus operators can run their operation without conductors.



(Left) The fare collection system consisting of:

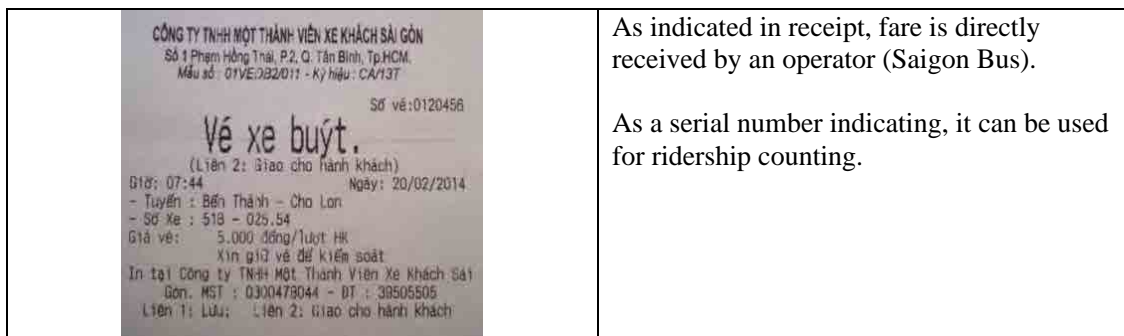
1)Fare box, 2) change dispense, 3)control box, and 4) printer.

(Bottom) Adult passenger is now getting into bus and putting cash into a fare box.

**Fig. Fare Collection System**

Source: Study team (Feb. 20, 2014)

At this moment, MOCPT has no plan to expand this system to other lines due to safety reason. Based on regulations, a driver must stop a bus for receiving passengers, however, practically they receive a passenger on slow-speed operation to keep a time-table.

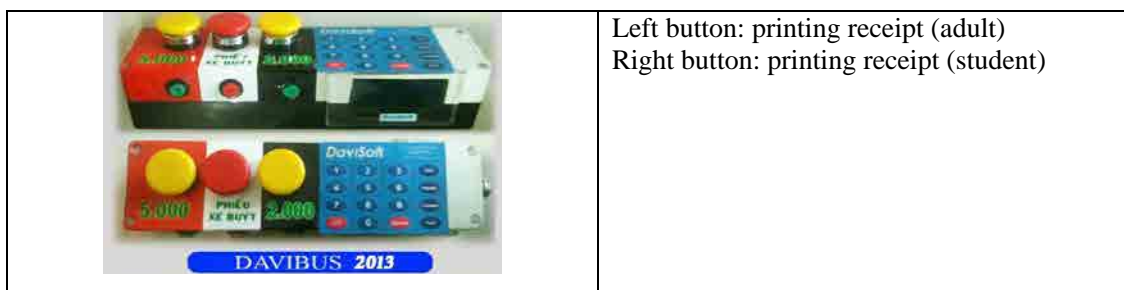


As indicated in receipt, fare is directly received by an operator (Saigon Bus).

As a serial number indicating, it can be used for ridership counting.

**Fig. Receipt printed by the fare collection system**

Source: Study team (Feb. 20, 2014)



Left button: printing receipt (adult)

Right button: printing receipt (student)

**Fig. Control Box**

Source: DaviSofts Web site ([http://www.davisoft.com.vn/Content.aspx?news\\_id=329](http://www.davisoft.com.vn/Content.aspx?news_id=329))

The fare collecting system together with GPS was developed by a local company, namely “Davisoft”. According to their website, they are the first company to deploy the system automatically issues bus tickets on the bus. They spent 3 years for the system development, 2009 to 2011.

### [3. Smartcards Pilot Program]


As described in the table below, there were two stories for transport smartcards in HCMC.

**Table: Stories for Transport Smartcard in HCMC**

Duration	Related parties	Description
2010 to 2 012	MOCPT and ELINCO (SOE under Ministry of Defense)	This was a pilot program implemented by the city. It is now suspended due to low usage. It may be due to lack of charge points (only 3) and benefit for passengers. (For the details, see the table below.)
2012	MOCPT, DOST and VietinBank	This is a VietinBank's proposal which applies 121 buses on 5 routes. However, DOT suspended this proposal to keep the city's independency.

Source : Interview with MOCPT dated Apr 17, 2014 and Saigon times web dated Oct 10- 2012 (<http://english.thesaigontimes.vn/Home/business/other/25974/>)

**Table Overview of Smartcard Program in HCMC**

Items	Description
Trial duration	2010 to 2012 (Line 1 in January 2010, 27 in March 2010 respectively)
Applied routes	bus routes 1 (Ben Thanh – Cho Lon Bus Station) and 27 (Ben Thanh -Au Co - An Suong Bus Station).
Card issuing:	Issuing fee was VND30,000. Passengers must register their personal information to the MOCPT. In this program, MOCPT issued 160 cards.
Ticket Type:	There are three types of cards:  A monthly student card: It can be purchased for a minimum of VND63,000, equivalent to 60 trips or VND1,050 per trip.  Monthly cards for adults: It cost a minimum of VND90,000 equivalent to 60 trips or VND1,500 per trip.  Yearly cards (reusable): Passengers must add at least VND69,000 to their cards each time, equivalent to 30 trips or VND2,300 per trip.
Top-up Points:	Passengers can add money to their cards at 3 top-up points only: Saigon Bus Station, Le Lai Street (District 1) and Cho Lon Bus Station.
Card Management	The blacklist function was implemented.
Image	

Source: Sai Gon Giai Phong newspaper website(<http://www.saigon-gpdaily.com.vn/Hochiminhcity/2010/1/78190/>)  
Interview with MOCPT dated on Apr 17, 2014.

## Appendix - 4 The Cost for Upper System





HCMC

Unit: Million JPY

Breakdown of Cost	Foreign Portion								Local Portion								Total		
	Total	-2	-1	0 (Go Live)	1	2	JICA Portion	Others	Total	-2	-1	0 (Go Live)	1	2	JICA Portion	Others	Total	JICA Portion	Others
<b>I. IT System Implementation</b>																			
1 Hardware	51	-	22	29	-	-	51	-	52	-	25	27	-	-	20	32	103	71	32
2 Software(Including license fees)	261	-	109	152	-	-	261	-	47	-	22	25	-	-	18	29	308	279	29
3 Implementation costs	287	-	91	196	-	-	287	-	-	-	-	-	-	-	-	-	287	287	-
<b>II. IT System Operation and Maintenance (O&amp;M)</b>																			
1 Hardware vendor maintenance	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-	1	1	-	1
2 Software vendor maintenance	-	-	-	-	-	-	-	-	14	-	-	14	-	-	5	9	14	5	9
<b>III. Training Services, Test Support</b>																			
1 Training Services	16	-	-	16	-	-	16	-	-	-	-	-	-	-	-	-	16	16	-
2 Test Support	9	-	-	9	-	-	9	-	-	-	-	-	-	-	-	-	9	9	-
<b>IV. Machine room construction costs</b>																			
Expansion of air-conditioning and power 1 capacity, security equipment, network equipment, Chair and desk for workstation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>V. Contingency</b>																			
1 Price Escalation	29	-	8	21	-	-	29	-	15	-	5	10	-	-	6	9	44	35	9
2 Physical Contingency	33	-	12	21	-	-	33	-	7	-	3	4	-	-	3	4	40	36	4
<b>VI. Consulting Service</b>																			
Basic Design, Tendering Assistance including 1 tender document preparation, Supervision for Implementation & Training	120	40	50	30	-	-	120	-	30	10	10	10	-	-	30	-	150	150	-
<b>VII. Administration Cost</b>																			
VIII. Tax and Duties	-	-	-	-	-	-	-	-	64	-	23	41	-	-	-	64	64	-	64
<b>IX. Total</b>	<b>806</b>	<b>40</b>	<b>292</b>	<b>474</b>	<b>-</b>	<b>-</b>	<b>806</b>	<b>-</b>	<b>230</b>	<b>10</b>	<b>88</b>	<b>132</b>	<b>-</b>	<b>-</b>	<b>82</b>	<b>148</b>	<b>1,036</b>	<b>888</b>	<b>148</b>

38% | 85.7% | 14.3%

Price Escalation (foreign)	1.7%
Price Escalation (local)	4.9%
Physical Contingency	5.0%
Administration	8.0%