THE PEOPLE'S REPUBLIC OF BANGLADESH
MINISTRY OF ROAD TRANSPORT AND BRIDGES
DHAKA TRANSPORT COORDINATION AUTHORITY (DTCA)

THE PEOPLE'S REPUBLIC OF BANGLADESH
PROJECT FOR ESTABLISHMENT OF CLEARING HOUSE FOR INTEGRATING TRANSPORT TICKETING SYSTEM IN DHAKA CITY AREA
PROJECT FINAL REPORT

AUGUST 2018

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

KATAHIRA & ENGINEERS INTERNATIONAL (KEI)
NEC CORPORATION (NEC)

バン事
JR
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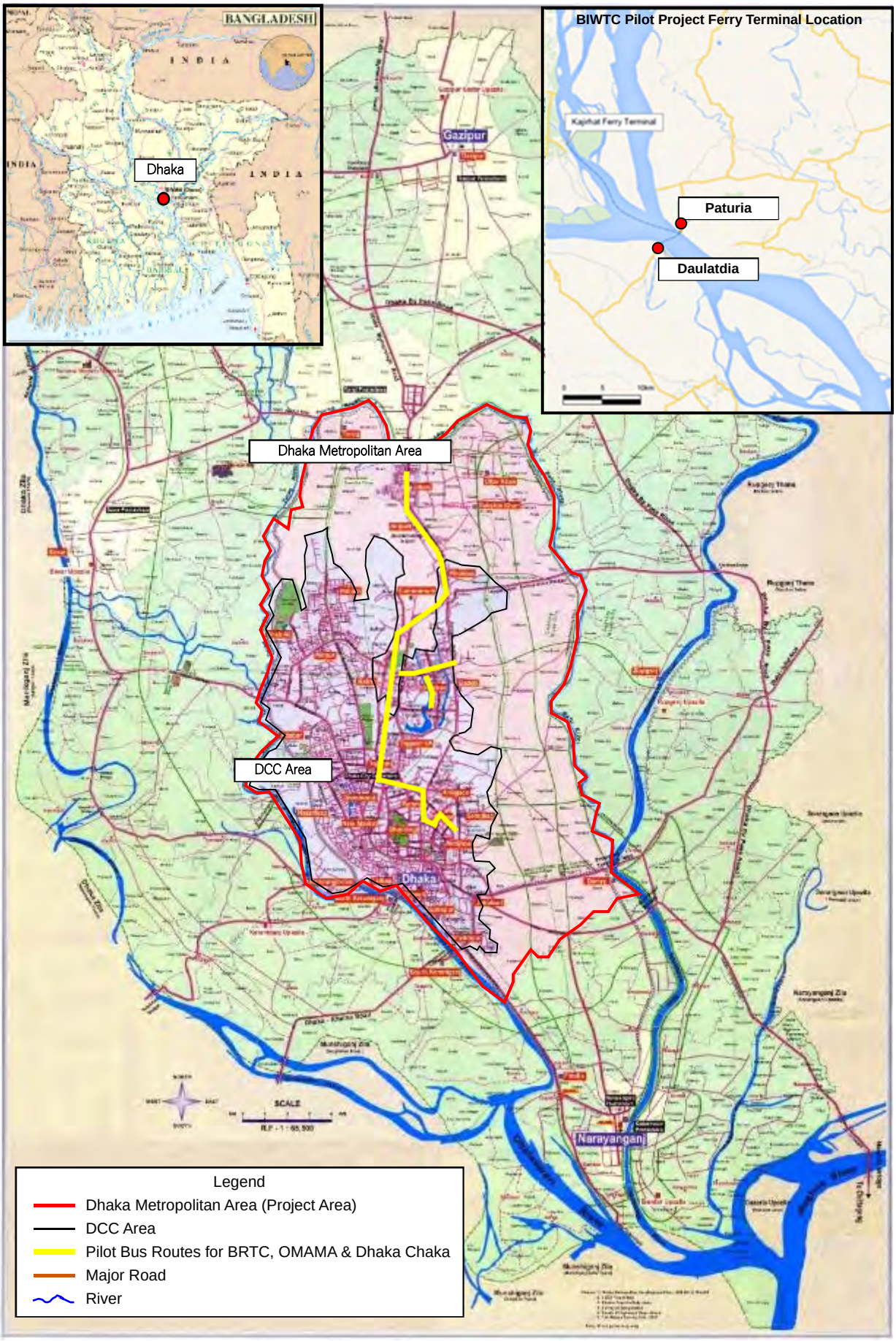


Map source: Page S-18, Executive Summary of STP

Project Location Map

Major Activities and Achievements of the Project

Rapid Pass Card Design

Rapid Pass Inaugurated by Honorable Prime Minister*

Clearing House Bank Signing Ceremony

OD Data Seminar

Project Implementation Committee (PIC) Meeting

Steering Committee (SC) Meeting

Data Server Installed in the Data Center of CH Bank

PTO Server Installed in DTCA

*: Picture is a courtesy of Bangladesh Sangbad Sangstha to DTCA

Rapid Pass Card Campaign

Rapid Pass Campaign in Manarat University

Rapid Pass Campaign at Gulshan Area

Ticket Office along BRTC Bus Route

Rapid Pass Card Counter in CH Bank

Pilot Project with Bangladesh Railway (BR)

BR Kamalapur, Dhaka Station

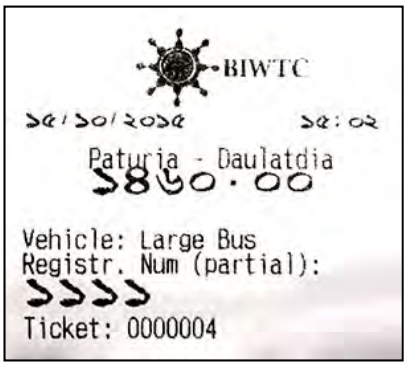
Introductory Training to Station Staff

Ticket Counter at Tejgaon Station

Ticket Counter at Kamalapur , Dhaka Station

Pilot Project with BIWTC

MOU Signing Ceremony



Paper Ticket Printed Out by R/W Device

Introductory Training to Ticket Counter Staff

Ticket Counter Staff with Red Jacket

Pilot Project with BRTC

Moijiheel Ticket Shop with Rapid Pass Banner

Live Training Inside the Bus

Fixed Type R/W Device in the Bus

Handy R/W Operation upon Getting off the Bus

Pilot Project with OMAMA

OMAMA Bus with Rapid Pass Campaign Banner

Fixed Type in OMAMA Bus

TVC Camping inside OMAMA Bus

Fixed Rapid Pass Operation upon Boarding

Pilot Project with Dhaka Chaka

Introductory Training to Dhaka Chaka Staff

Rapid Pass Ticket Office at Natum Bazar

Rapid Pass Campaign T Shirt at Banani Bus Stop

Queuing Passengers during Rush Hours at Natum Bazar

Training in Hong Kong

Discussion with Octopus Card Ltd. Officials

Company Visit to Octopus Holding Ltd.

Live Riding in a Subway

Operation Control Center of MTR Corporation

Training in Japan

Courtesy Call to JICA Head Office

Briefing Session

Live Riding on City Bus

Card Manufacturer Factory

Post Project Activities

PTO and Agent Agreement with HR Transport

PTO Agreement with BRTC

Introductory Training to Bus Drivers and Conductors

Conduct the Introductory Training to BRTC Staff by DTCA-CHU Staff

Fixed Type R/W Device Inside the Bus of HR Transport

Pilot Operation with HR Transport W/O JICA Assistance

Campaign at the HR Transport Route Area

Campaign at the HR Transport Route Area by DBBL

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List of Abbreviations

Abbreviations	Full Form
ADB	Asian Development Bank
AES	Advanced Encryption Standard
AFC	Automatic Fare Collection
API	Application Programming Interface
ATM	Automatic Teller Machine
BBA	Bangladesh Bridge Authority
BCBL	Bangladesh Commerce Bank Limited
BD	Bangladesh
BDT	Bangladesh Taka
BIWTA	Bangladesh Inland Water Transport Authority
BIWTC	Bangladesh Inland Water Transport Corporation
BOT	Build Operate Transfer
BPDB	Bangladesh Power Development Board
BR	Bangladesh Railway
BRF	Bus Route Franchise
BRT	Bus Rapid Transit
BRTC	Bangladesh Road Transport Corporation
BSEC	Bangladesh Steel and Engineering Corporation
CEO	Chief Executive Officer
CH	Clearing House
CHCI	Clearing House and Card Issuer
CHU	Clearing House Unit
CPU	Central Processing Unit
CP7	Construction Package Seven
CSUTMP	Chittagong Strategic Urban Transport Master Plan
CSV	Comma-Separated Values
DAE	Department of Agricultural Extension
DBBL	Dutch Bangla Bank Ltd.
DBRT	Dhaka Bus Rapid Transport
DCRC	Dhaka Chaka Recharge and Issue Center
DES	Data Encryption Standard
DGM	Deputy General Manager
DMA	Dhaka Metropolitan Area
DMP	Dhaka Metropolitan Police
DMRTDP	Dhaka Mass Rapid Transit Development Project
DMTCL	Dhaka Mass Transit Company Limited
DNCC	Dhaka North City Corporation
DNP	Dainippon Printing Company Ltd.
DTCA	Dhaka Transport Coordination Agency
DVR	Digital Video recorder
EOI	Expression of Interest
ERD	Economic Relation Division
ERQ	Employer’s Requirement
ETC	Electronic Toll Collection

Abbreviations	Full Form
GDSUTP	Greater Dhaka Sustainable Urban Transport Project
GOB	Government of Bangladesh
GOJ	Government of Japan
HSM	Hardware Security Module
IC	Integrated Circuit
ICT	Information and Communication Technology
IDMS	Identification (ID) Management Server
IOM	International Office Machines Ltd.
IRR	Internal Rate of Return
IT	Information Technology
JCC	Joint Coordination Committee
JETRO	Japan External Trade Organization
JICA	Japan International Cooperation Agency
JP	Japan
JR East	Japan Railway East
JREM	JR Mechatronics
JV	Joint Venture
KEI	Katahira & Engineers International
KNJV	Katahira & Engineers International and NEC Corporation Joint Venture
LGED	Local Government Engineering Department
LTO	Linear Tape-Open
MB	Mercantile Bank
MBS	Monitoring Backup Server
MIST	Military Institute of Science and Technology
MLIT	Ministry of Land, Infrastructure, Transportation and Tourism (Japan)
MOC	Ministry of Communication
MOF	Ministry of Finance
MOU	Memorandum of Understanding
MRT	Mass Rapid Transport
MRTB	Ministry of Road Transport and Bridges
MTRC	Mass Transit Rail Corporation
NDA	Non-Disclosure-Agreement
NFC	Near Field Communication
NKDM	Nippon Koei-NK India-DMRC-MOTT UK-MOTT India-DDC
OD	Origin and Destination
ODBM	Operational Design for Business Model
OJT	On the Job Training
PC	Public Corporation
PD	Project Director
PDM	Project Design Matrix
PIC	Project Implementation Committee
PM	Project Manager
POS	Point of Sales
PPP	Public Private Partnership
PPPA	Public Private Partnership Authority
PR	Public Relations

Abbreviations	Full Form
PTO	Public Transport Operator
PTOS	PTO Server
QCBS	Quality and Cost Based Selection
R/D	Record of Discussion
REOI	Request for Expression of Interest
RFID	Radio Frequency Identifier
RFP	Request for Proposal
RHD	Roads and Highways Department
RTC	Regional Transport Corporation
RTHD	Road Transport and Highway Division
R/W	Reader and Writer
SAM	Secured Application Module
SC	Steering Committee
SIM	Subscriber Identity Module
SOC	State Own Company
SOP	Standard Operation Procedure
SPC	Special Purpose Company
SS	Settlement Server
STP	Strategic Transport Plan
SWO	Special Working Organization
TAPP	Technical Assistance Project Proposal
TOM	Ticket Office Machine
TOR	Terms of Reference
TOT	Training of Trainers
UPS	Uninterruptible Power Supply
USD	United States Dollar
VPN	Virtual Private Network
WB	World Bank

Chapter 1 Project Outline

1.1 Project Background

The Government of Bangladesh (GOB) formulated the "Strategic Transport Plan 2005-2025 (STP)" as a national policy on a long-term transport network development plan in the Dhaka Metropolitan Area (DMA), approved by the cabinet in March 2008. According to STP, the population in the DMA will be 19.5 million by the year 2024. To cope up with growing traffic demand brought about by the increasing population, the STP proposed the construction of a mass transit system such as Mass Rapid Transport (MRT) and Bus Rapid Transit (BRT).

The Construction of above public transport systems such as MRT Line 6 and BRT Line 3 extensions have started recently but it will take a considerable amount of time to complete these projects. On the other hand, traffic congestion in Dhaka City is becoming increasingly serious especially during morning and evening peak hours; therefore, efficient utilization of existing transportation facilities to ease traffic congestion is the most imminent task in the short to medium term.

As part of efficient bus use, the introduction of a common ticket system using an "Information and Communication Technology (ICT) Fare System" that can be used by bus operators is, among others, seen as an effective mitigation measure for traffic congestion. Moreover, an ICT Fare System can be expected to improve the level of service by introducing discount services and timely/demand responsive operation. Furthermore, it also shows the potential to increase the fare revenue of bus operators through Automatic Fare Collection (AFC) by eliminating pilferage and mishandling of ticket sales.

The operation of BRT is expected to start in 2019 with the financial assistance of World Bank (WB) and Asian Development Bank (ADB) whereas the operation of MRT will start in 2021 with Japanese funding. Considering the convenience of the public transport for passengers, a common ICT Fare System is proposed to be introduced to these newly constructed mass transit systems.

However, it is important that the ICT Fare System must be fully operational prior to the opening of new transportation systems to ensure smooth system operation without any system trouble adopting the following measures:

i) The fare distribution system (Clearing House: CH) must be established,

ii) The established Clearing House must be tested and system errors to be eliminated,

iii) Training of the related personnel must be conducted.

Therefore, necessary preparatory works, including the establishment of Clearing House must be started as soon as possible, so that it can be completed before the opening of BRT in the 4th quarter of 2019. This project should be implemented in order to formulate the initial stage of a Clearing House that has the potential functions for future full-fledged operation covering not only several Public Transport Operators (PTO), but also e-cash (e-money) services.

1.2 Project Description

Table 1.2-1 shows Project Design Matrix (PDM) version 2.0 for the project. The original PDM had following revisions during the implementation of the project.

1. Cooperation Timeline
   Original PDM: April 2014 ~ March 2017
   Revised PDM: June 2014 ~ June 2018
2. Target Area
   Original PDM: Dhaka Metropolitan Area
   Revised PDM: Dhaka Metropolitan Area and BIWTC Ferry Terminal Area along Padma River
3. Additional Output
   Original PDM: Not included
   Revised PDM: Activities related to counterpart training were segregated from Output A~C and included in the newly created Output-D

Detailed project description indicated in the PDM is discussed in the following sections.

(1) Name of the Project

Project for Establishment of Clearing House for Integrating Transport Ticketing System in Dhaka City Area.

(2) Overall Goal of the Project

Effective and efficient public transport system with variety of transport modes in Dhaka Metropolitan Area will be established through ICT Fare System to facilitate transport in Dhaka.

(3) Purpose of the Project

A self-reliant, strategically stable Clearing House with improved ICT fare collection capacity is developed.

(4) Project Target Area

Dhaka Metropolitan Area and BIWTC ferry terminal at Paturia/Daulatdia.

The project target area was initially set as Dhaka Metropolitan Area but in the course of the project implementation, Bangladesh Inland Water Transport Corporation (BIWTC) expressed their interest to join IC card fare collection system and subsequently Pilot Project was carried out at Paturia and Daulatdia ferry terminal.

(5) Project Outputs and Activities

【Output A】DTCA's Clearing House strategy is developed.

(Activities)

A.1 Self-reliant management plan (include operation and outsourcing) is developed.

A.2 Business plan (include fare, service charge, and deposit) is developed.

Table 1.2-1 Project Design Matrix (PDM) ver. 2.0

Project Title : Project for Establishment of Clearing House for Integrating Transport Ticketing System in Dhaka City Area **Cooperation timeline :** June 2014 ~ June 2018

Implementing Organization in Japan : JICA

Implementing Agency in Bangladesh : Dhaka Transport Coordination Authority

Target area : Dhaka Metropolitan Area and BIWTC Ferry Terminal Area along Padma River **Target people : Direct beneficiaries** : DTCA and other transport operators

Indirect beneficiaries : Citizens of Dhaka Metropolitan Area

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
Overall Goal			
Effective and efficient public transport system with variety of transport modes in Dhaka Metropolitan Area will be established through ICT Fare System to facilitate transport in Dhaka.	ICT fare system is introduced to all major transport modes such as BRT and MRT.	Number of operators, increased ratio of public transport system user.	
Project Purpose			
A self-reliant, strategically stable Clearing House with improved ICT Fare Collection capacity is developed.	1. Clearing House is well operated based on formulated strategy.	1. Number of customers, record of fare collection, customer satisfaction.	
Outputs			
A. DTCA's Clearing House strategy is developed	A.1 Long and short term business management plan is prepared A.2 Framework/guideline for operators is prepared A.3 Additional transport services are started A.4 Awareness/PR activities are appropriately conducted	A.1 Documents related to business management A.2 MOU format, outsourcing policy A.3 Transport services list (monthly pass, etc.) A.4 Seminar/workshops/media coverage report	
B. Integrated Clearing House is established in DTCA	B.1 Rules and Regulations of Clearing House become apparent B.2 Clearing House's IT systems is developed B.3 Operational flow is developed	B.1 Rules and Regulations of Clearing House B.2 System structure B.3 Operational flow chart	
C. Existing operations of ICT Fare Collection are improved	C.1 No. of IC card and card reader are increased C.2 IC card procurement process is settled C.3 Operation manuals are prepared C.4 DTCA and operator staffs trainings are conducted sufficiently C.5 Passenger satisfaction is ensured	C.1 No. of IC card and card reader C.2 Card procurement results C.3 Operation manuals C.4 No. of DTCA staff and No. of transport operator staff attend training C.5 Yearly survey report on passenger satisfaction	
D. Capacity of GOB counterpart personnel developed to run and maintenance of Clearing House after completion of the project.	D.1 GOB counterpart trainings were conducted. D.2 Training for management related personnel were conducted.	D.1 No. GOB personnel attended the training. D.2 No. of staff and number of days attended the training	
Activities			
Output A (Clearing House strategy is developed) A.1 Self-reliant management plan (include operation and outsourcing) is developed. A.2 Business plan (include fare, service charge and deposit) is developed. A.3 Basic framework for operators and contractor (MOU, etc.) is formulated. A.4 PR strategy is developed and implemented. A.5 Long term expansion plan (include BRT, MRT, etc.) is developed. A.6 Additional transport service (monthly pass, discount ticket, online recharge) is considered. A.7 Data analysis strategy for future transportation plan is developed. A.8 Future expansion idea (apply to other sectors such as e-Money, mobile phone) is considered. **Output B (Integrated Clearing House is established)** B.1 Rules and regulation of Clearing House is prepared. B.2 Regulation of technical specification (AFC) is decided. B.3 Relations to rules and regulations of MRT are clarified. B.4 IT system structure (server, security, back-up, etc.) is designed and specifications are developed. B.5 Clearing House IT system (software, hardware) is developed. B.6 Relationship with agent bank (money transaction, interest rate, etc.) is reconsidered. B.7 Card issuance management (Security key installation etc.) is considered. B.8 IC Card design strategy is prepared. **Output C (Operation of IC Fare Collection is improved)** C.1 Analysis for existing services (effect, challenges). C.2 Support for transport operators (equipment, value-added service, business model). C.3 Incentive strategy for operating company staffs is developed. C.4 Resettlement strategy for affected staffs is developed. C.5 IC Card procurement procedure of Clearing House is prepared. C.6 Collaboration with concerned parties (especially BRT, MRT) is strengthened. C.7 Operation manuals are prepared. C.8 Appropriate trainings are conducted. **Output D (Capacity of GOB Personnel is enhanced)** D.1 Train GOB counterpart personnel related to operation of Clearing House properly. D.2 Train counterpart personnel adequately on different aspects for running and maintaining Clearing House.	Inputs 【Japanese Side】 **Dispatch of Experts** • Team leader/Urban Transport Planner • ICT Clearing House Expert • ICT System Development Expert • Institutional Expert • Private Project Expert • Coordinator/Project Monitoring Assistant **Equipment** • ICT equipment and software, Vehicle for JICA experts. **Training** • In Japan/third country (Hong Kong) • Local Training for transport operators • Training for GoB counterpart	【Bangladesh Side】 **Assignment of Personnel** • Project Director • Project Manager • Counterparts • System analyst/ ICT expert, MRTB **Facilities** • Office Space (including office furniture) • Project vehicle **Local Cost** • Utility costs • Tax • VAT • Cost for buying additional cards	• Government policy on Clearing House is unchanged. • Budget for project operation is secured by the Bangladesh side. **Prerequisite** • Counterparts are assigned without much delay

Source: JICA Project Team updated by Steering Committee

A.3 Basic framework for operators and contractor (MOU, etc.) is formulated.

A.4 PR strategy is developed and implemented.

A.5 Long term expansion plan (include BRT, MRT, etc.) is developed.

A.6 Additional transport service (monthly pass, discount ticket, online recharge) is considered.

A.7 Data analysis strategy for future transportation plan is developed.

A.8 Future expansion idea (apply to other sectors such as e-Money, mobile phone) is considered.

【Output B】Integrated Clearing House is established in DTCA.

(Activities)

B.1 Rules and regulation of Clearing House is prepared.

B.2 Regulation of technical specification (AFC) is decided.

B.3 Relations to rules and regulations of MRT are clarified.

B.4 IT system structure (server, security, back-up, etc.) is designed and specifications are developed.

B.5 Clearing House IT system (software, hardware) is developed.

B.6 Relationship with agent bank (money transaction, interest rate, etc.) is reconsidered.

B.7 Card issuance management (Security key installation etc.) is considered.

B.8 IC Card design strategy is prepared.

【Output C】Existing operations of ICT fare collection are improved.

(Activities)

C.1 Analysis for existing services (effect, challenges).

C.2 Support for transport operators (equipment, value-added service, business model).

C.3 Incentive strategy for operating company staffs is developed.

C.4 Resettlement strategy for affected staffs is developed.

C.5 IC Card procurement procedure of Clearing House is prepared.

C.6 Collaboration with concerned parties (especially BRT, MRT) is strengthened.

C.7 Operation manuals are prepared.

C.8 Appropriate trainings are conducted.

【Output D】Capacity of GOB counterpart personnel is enhanced to run and maintain CH.

(Activities)

D.1 Train GOB counterpart personnel related to operation of Clearing House properly.

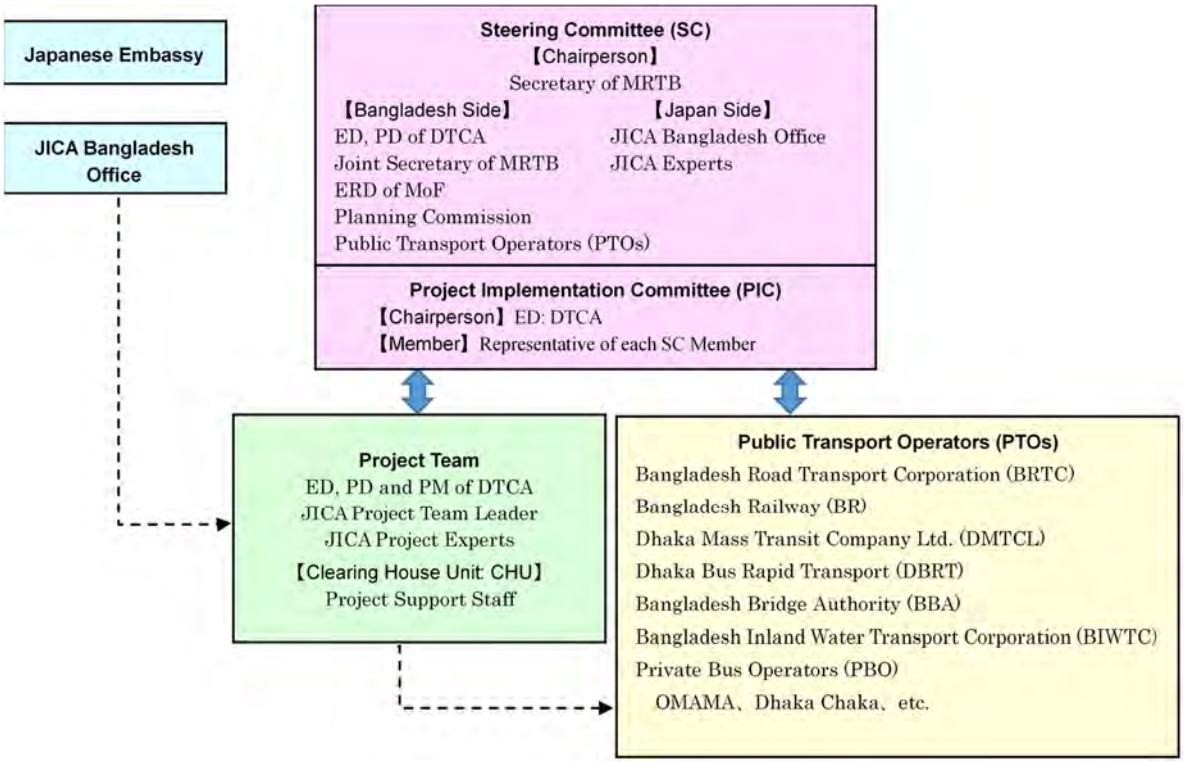
D.2 Train counterpart personnel adequately on different aspects for running and maintaining Clearing House.

1.3 Project Organization

Project Organization is shown in **Figure 1.3-1**.

1.3.1 Steering Committee (SC)

The SC is the committee to confirm the progress of the project, discuss important matters and make decisions for better implementation of the project or countermeasures if necessary. It shall be held at the timing of the Project's milestone or whenever the necessity arises in order to fulfill function as described below.



Source: JICA Project Team

Figure 1.3-1 Project Organization

(1) Function

1. To discuss and approve the annual work plan of the Project formulated under the framework of Record of Discussion (R/D) between Japan International Cooperation Agency (JICA) and Ministry of Road Transport and Bridges (MRTB), Ministry of Finance (MOF) and Dhaka Transport Coordination Agency (DTCA).
2. To evaluate the achievement of the annual work plan and overall progress of the Project.
3. To review and exchange opinions on major issues arising during implementation of the Project.

(2) Member

Table 1.3-1 shows outline of the Steering Committee members including their roles and responsibilities.

Table 1.3-1 Outline of Steering Committee (1/2)

Position	Name and Title	Role and Responsibilities
Chairman	Secretary Road Transport and Highway Division, Ministry of Road Transport and Brides (MRTB)	・ Decide official formulation of SC. ・ Announce formulation of SC to members. ・ Announce date, venue and agenda of SC meeting. ・ Preside SC meeting and make wrap up collusion of the meeting.
Members of Bangladesh Side		
Member	Executive Director, Dhaka Transport Coordination Agency (DTCA)	・ Function as the chief of counterpart and Project Implementation Committee (PIC). ・ Decide date, venue and agenda of SC meeting and advise chairperson for announcement. ・ Assist chairperson for holding SC meeting. ・ Act as secretariat of SC and arrange all technical and administrative matters related to the Project.
Member	Project Director of Clearing House, Dhaka Transport Coordination Agency (DTCA)	・ Function as the technical chief of counterpart and Project Implementation Agency. ・ Work closely with JICA expert team for day to day project implementation.
Member	Chairman, Bangladesh Road Transport Corporation (BRTC)	・ Function as a chief of public transport operator (PTO) which is sole PTO currently involved in ICT Fare System. ・ Join implementation of Pilot Project with system developed by the Project Team.
Member	Director General, Bangladesh Railway (BR)	・ Function as a chief of public transport operator (PTO) which is one of the candidate PTOs that may join ICT Fare System of the project. ・ Join implementation of Pilot Project with system developed by the Project Team.
Member	Managing Director, Dhaka Mass Transit Company Limited (DMTCL)	・ Function as a chief of public transport operator (PTO) which is one of the candidate PTOs that may join ICT fare System in the future. ・ Develop its own ICT Fare System that will be compatible with one developed by the Project.
Member	Managing Director, Dhaka Bus Rapid Transit (BRT)	・ Function as a chief of public transport operator (PTO) which is one of the candidate PTOs that may join ICT fare system in the future. ・ Develop its own ICT Fare System that will be compatible with one developed by the Project.
Member	Representative of Bangladesh Inland Water Transport Corporation (BIWTC)	・ Function as a representative of public transport operator (PTO) which is one of the candidate PTOs that may join ICT fare system in the future. ・ Develop its own ICT Fare System (with external financial /technical assistance) that will be compatible with one developed by the Project.
Member	Representative from Private Transport Owners Association	・ Function as a representative of public transport operator (PTO) which is one of the candidate PTOs that may join ICT fare system in the future. ・ Expected to join the implementation of Pilot Project with system developed by the project Team.
Member	Joint Secretary, Budget, Road Division, Ministry of Communication (MOC)	・ Attend SC meeting and make comments in the field of budgetary requirement of the project implementation.
Member	Representative of Economic Relations Division, Ministry of Finance (MOF)	・ Attend SC meeting and make comments in the field of effectiveness and impacts of the Project.
Member	Representative of Planning Commission	・ Attend SC meeting and make comments in the field of effectiveness and impacts of the Project.

Source: JICA Project Team

Table 1.3-1 Outline of Steering Committee (2/2)

Position	Name and Title	Role and Responsibilities
Members of Japanese Side		
Member	Representative of JICA Bangladesh Office	・ Oversee the overall project implementation by the Project Team. ・ Coordinate with relevant agencies and make necessary arrangements for efficient implementation of the Project.
Member	JICA Experts of the Project led by the Team Leader	・ Implement the Project with close coordination with DTCA and SC members. ・ Provide necessary technical information to C/P and SC members for their review and approval. ・ Prepare annual work plan for review and approval of SC.

Source: JICA Project Team

1.3.2 Project Implementation Committee (PIC)

PIC was formed and announced in January 26, 2015 to oversee activities of the Project.

(1) Function

1. To examine and approve the annual Plan of Operations formulated by the Project;
2. To review the progress and achievement of the Project activities;
3. To exchange views on major issues, arising from or in connection with the project implementation and corrective measures against these issues to be proposed; and
4. To facilitate coordination with other relevant authorities

(2) Member

The PIC consists of representatives of SC members as shown in **Table 1.3-2**.

Table 1.3-2 Members of Project Implementation Committee (PIC)

No.	Post and Organization	Position in the Committee
1	Executive Director, Dhaka Transport Coordination Agency (DTCA)	Chairman
2	Project Director, Clearing House	Member Secretary
3	Secretary, Monitoring & Evaluation Division, Ministry of Planning	Member
4	Member, Physical Infrastructure Division, Planning Commission	Member
5	Chairman, Bangladesh Road Transport Corporation (BRTC)	Member
6	Chairman, Bangladesh Inland Water Transport Corporation (BIWTC)	Member
7	Director General, Bangladesh Railway (BR)	Member
8	Managing Director, Dhaka Mass Transit Company Limited (DMTCL)	Member
9	Deputy Chief, (Planning & Programming), Road Transport and Highway Division (RTHD), Ministry of Road Transport and Bridges (MRTB)	Member
10	Deputy Secretary/Senior Assistant Secretary, Donor Fund for Development Program, Road Transport and Highway Division (RTHD), Ministry of Road Transport and Bridges (MRTB)	Member
11	Senior Assistant Chief, Road Transport and Highway Division (RTHD), Ministry of Road Transport and Bridges (MRTB)	Member
12	Programmer, Road Transport and Highway Division (RTHD), Ministry of Road Transport and Bridges (MRTB)	Member
13	Chairman, Bangladesh Bus Truck Owners Association	Member
14	Chief Representative, JICA Bangladesh	Member
15	Team Leader, Clearing House (CH) Project	Member
16	Project Director, Greater Dhaka Sustainable Urban Transport Project (GDSUTP)	Member

Source: JICA Project Team

1.3.3 Project Counterpart Team

Table 1.3-3 shows list of counterpart members in DTCA. Establishment of Clearing House Unit (CHU) took almost two years from beginning of the Project due to delay in approval of Technical Assistance Project Proposal (TAPP). Therefor deployment of counterpart staff from CHU has started only in August 2017.

Table 1.3-3 Counterpart Members

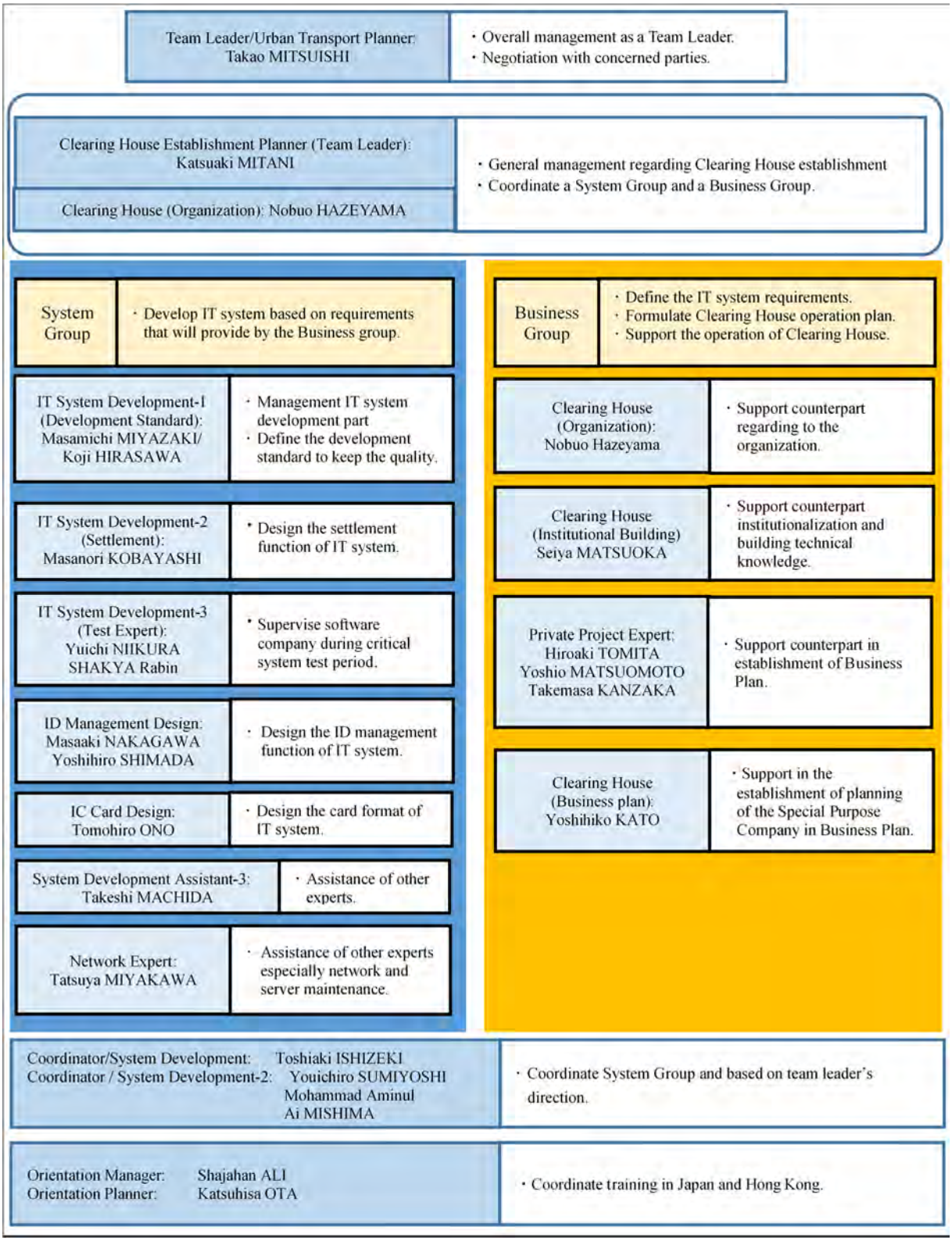
No.	Name	Designation	Role in Project	Duration
C/P in DTCA				
1	Md. Kaikobad Hossain	Additional Secretary & Executive Director	Chairman of PIC	16.03.2014 to 28.12.2016
2	Syed Ahmed	Additional Secretary & Executive Director	Chairman of PIC	19.02.2017 to 9.05.2018
3	Khondoker Rakibur Rahman	Additional Secretary & Executive Director	Chairman of PIC	24.05.2018 to present
4	AKM Zulfikar Islam	Senior Traffic Engineer	Project Director	25.02.2014 to 04.01.2015
5	Md. Rafiqul Islam	Additional Executive Director	Project Director	05.01.2015 to 27.06.2016
6	Md. Zakir Hossain Mazumder	Additional Executive Director	Project Director	04.08.2016 to present
7	Md. Anisur Rahman	Deputy Secretary & Traffic Engineer	Project Manager	01.07.2014 to 08.12.2016
8	Ahsan Uddin Ahmed	Traffic Engineer	Project Manager	08.12.2016 to 18.12.2017
9	Mohammad Rokibul Hasan	Traffic Engineer	Project Manager	24.12.2017 to present
CHU Staff				
1	Md. Mehedi Hassan	Project Staff	Programmer	17.12.2017 to Present
2	Manjur Ahammed	Project Staff	Assistant Programmer	07.12.2017 o Present
3	Mubassher Ali Bhuiyan	Project Staff	Assistant Programmer	19.12.2017 to Present
4	Rashida Sultana	Project Staff	Assistant Programmer	21.12.2017 to present
5	Md. Rabiul Alam	Project Staff	Office Assistant cum Computer Operator	03.08.2017 to Present
6	Md. Abdul Momen	Project Staff	Office Assistant cum Computer Operator	17.10.2017 to Present
7	Md. Ruhul Amin	Project Staff	Office Assistant cum Computer Operator	08.08.2017 to Present
8	Md. Kamruzzaman	Project Staff	Accounts Keeper	08.08.2017 to Present

Source: JICA Project Team

1.3.4 JICA Project Team

Figure 1.3-2 shows organizational structure of JICA Project Team. The project team consists of two expert groups with a total of 24 experts, categorized in two classes i.e. system development group and business promotion group. The system development group is in charge of developing Information Technology (IT) software, including the development of a Clearing House System and a fare collection system for some PTOs as well as selection, procurement and installation of IT equipment such as data servers and handy Reader and Writer (R/W).

The business promotion group is responsible for the formulation of a self-reliant and strategically stable Clearing House and business model from the point of view of long-term business development perspectives including a plan for public information campaigns.



Source: JICA Project Team

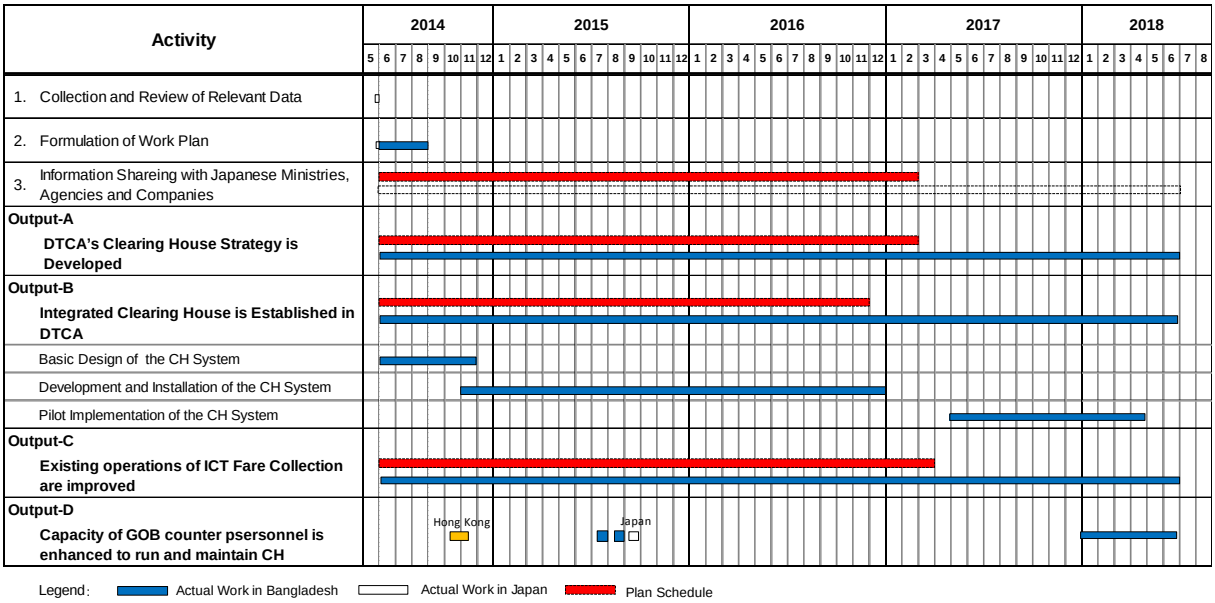
Figure 1.3-2 JICA Project Team Members

Chapter 2 Project Flow and Sequence

2.1 Overall Project Schedule

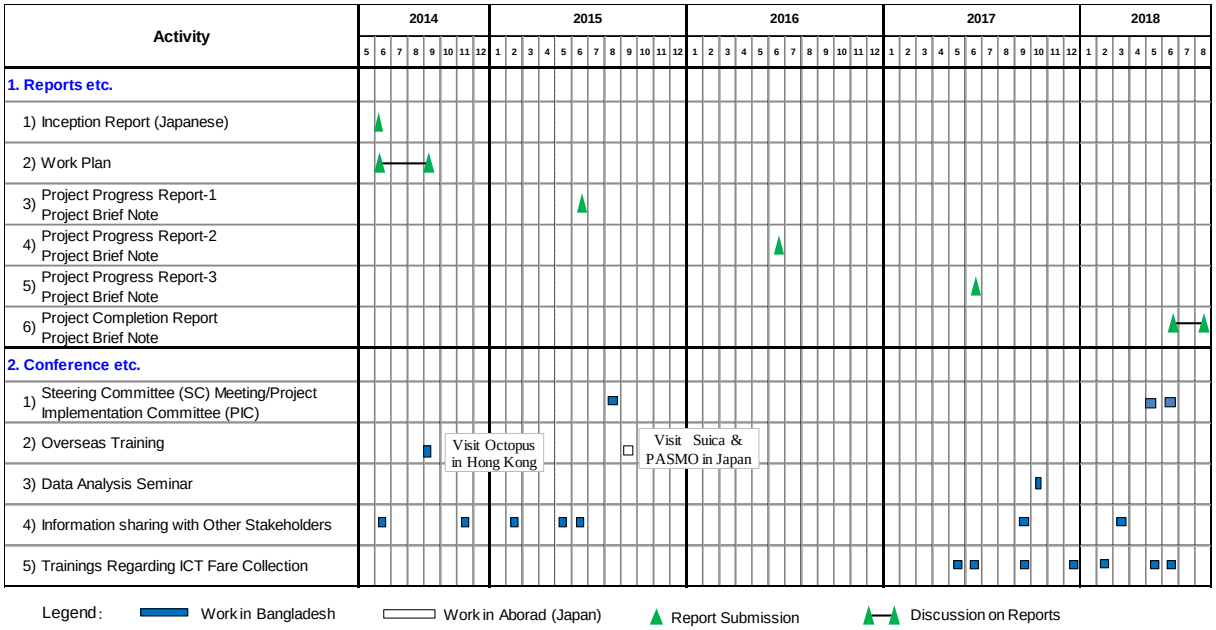
Overall project schedule is presented in **Table 2.1-1** while schedule of reporting, trainings and committee/coordination meetings are presented in **Table 2.1-2**. The project started in June 2014 and completed in June 2018. The Project period was extended for 15 months as the consultants of the project could not come to Bangladesh over security issues.

Table 2.1-1 Overall Project Schedule



Source: JICA Project Team

Table 2.1-2 Schedule of Reporting, Trainings, Committee/Coordination Meetings



Source: JICA Project Team

2.2 Project Implementation Flow

The implementation flow of the Project was revised because of the incorporation of the additional Pilot Projects and related activities and extension of the Project period. The final version of the Project implementation flow is shown in **Figure 2.2-1**.

2.3 Plan of Operation

The plan of Operation was also revised with the same reason stated above following PDM version 1.1 in **Table 1.2-1** in Chapter 1 as well as Project Implementation Flow in **Figure 2.2-1**. The final version of Plan of Operation is shown in **Table 2.3-1**.

2.4 Assignment Schedule

The assignment Schedule of JICA short-term experts was also revised with the same reasons stated above. The final version of assignment schedule of JICA experts is presented in **Table 2.4-1** comparing planned and actual schedule. The dispatch of JICA experts to Bangladesh was temporarily suspended between July and December in 2016 due to security situation. JICA experts assisted the Bangladesh staff from Japan through remote control during this period.

2.5 Reports

Reports shown in **Table 2.5-1** were prepared during implementation of the Project.

Table 2.5-1 Reports of the Project

No	Reports	Date of Submission
1	Work Plan	September 2014
2	Monthly Progress Report	Every Month
3	Quarterly Progress Report	Every Quarter
4	Project Progress Report-1 Project Brief Note	June 2015
5	Project Progress Report-2 Project Brief Note	June 2016
6	Project Progress Report-3 Project Brief Note	June 2017
7	Project Completion Report Project Brief Note	August 2018

Source: JICA Project Team

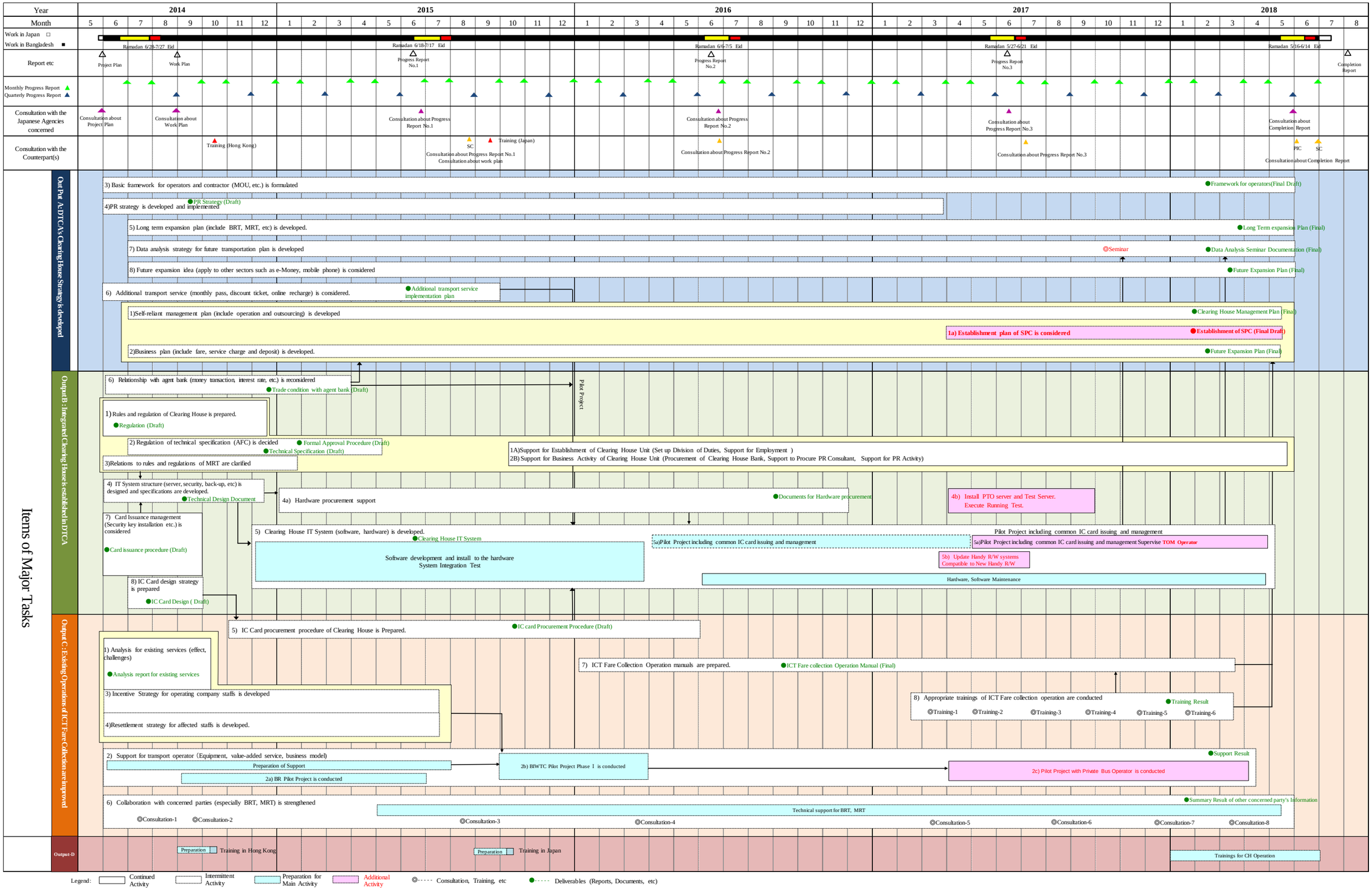
2.6 Technical Cooperation Materials

Technical Cooperation materials shown in **Table 2.6-1** were prepared during implementation of the project.

Table 2.6-1 Technical Cooperation Materials

No	Name of Material	Number of Files	Confidential Classification
1	Final Report of Pilot Project	4	Open
2	Operation Report	1	Open
3	System Test Report	390	Secret
4	Technical Design & Specification	104	Secret
5	Technical SOP Training Manuals	35	Secret partially
6	Training Report	6	Open

Source: JICA Project Team



Source: JICA Project Team

Figure 2.2-1 Project Implementation Flow

Table 2.3-1 Plan of Operation

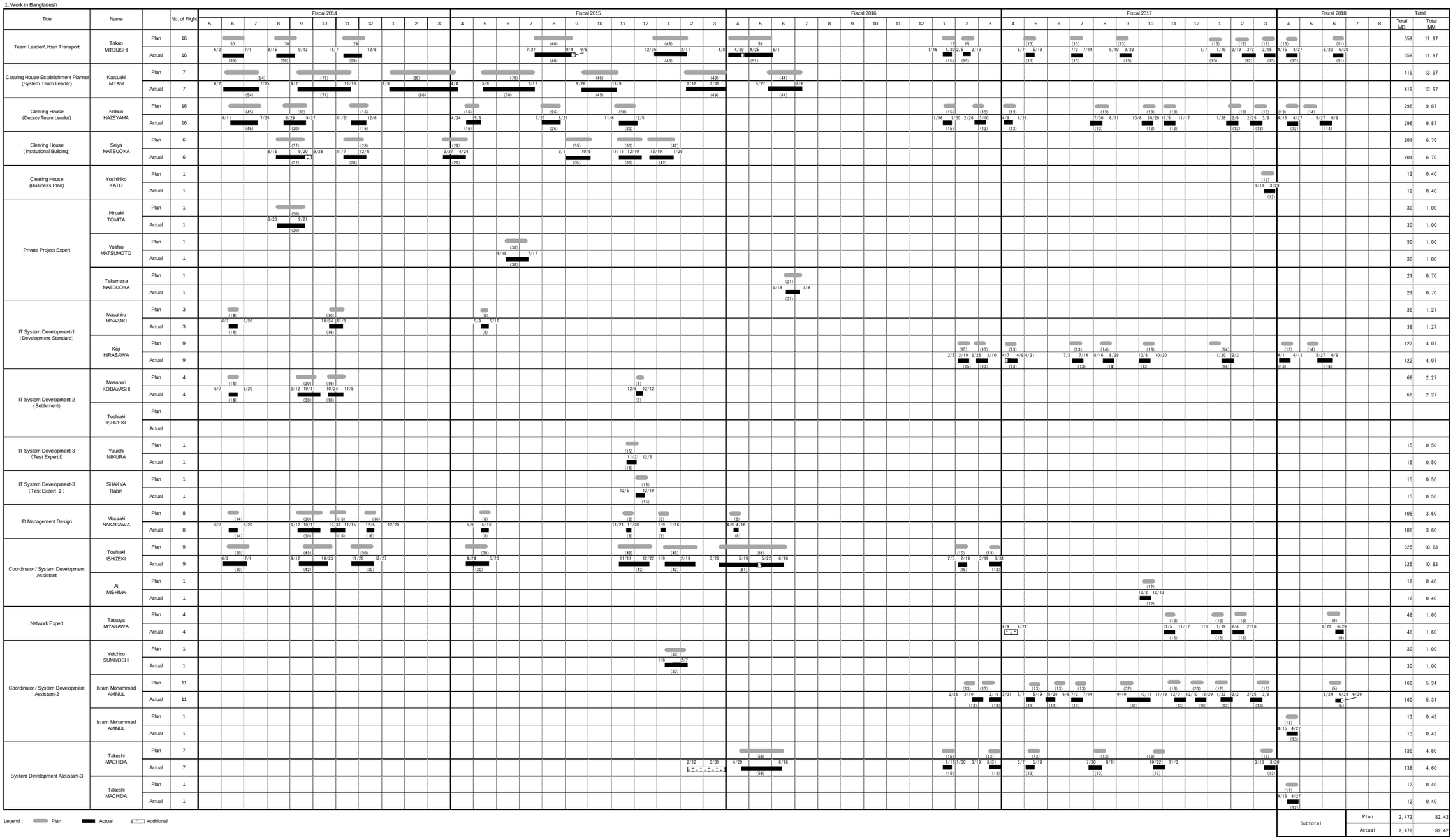
	Activity		2014												2015												2016												2017												2018							
			5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8
0	Obtaining Approval of TAPP	Plan																																																			
		Actual																																																				
1	Review of Previous Studies	Plan																																																				
		Actual																																																			
2	Preparation of Work Plan	Plan		Draft Submitted											Approval by SC																																							
		Actual																																																			
3	Information Sharing with Japanese ministries, agencies and companies	Plan																																																		
		Actual		JR East					MLIT																																											
Output A: DTCA's Clearing House Strategy is Developed																																																			
A-1	Self-reliant management plan (include operation and outsourcing) is developed.	Plan																																																		
		Actual																																																			
A-1a	Establishment of Special Purpose Company (SPC) is considered and prepared.	Plan																																																		
		Actual																																																			
A-2	Business plan (include fare, service charge and deposit) is developed.	Plan																																																		
		Actual																																																			
A-3	Basic framework for operators and contractor (MOU, etc.) is formulated.	Plan																																																		
		Actual																																																			
A-4	PR strategy is developed and implemented.	Plan																																																		
		Actual																																																			
A-5	Long term expansion plan (include BRT, MRT, etc.) is developed.	Plan																																																		
		Actual																																																			
A-6	Additional transport service (monthly pass, discount ticket, online recharge)is considered	Plan																																																		
		Actual																																																			
A-7	Data analysis strategy for future transportation plan is developed.	Plan																																																		
		Actual																																																			
A-8	Future expansion idea (apply to other sectors such as e-Money, mobile phone) is considered.	Plan																																																		
		Actual																																																			
Output B: Integrated Clearing House is Established in DTCA																																																			
B-1	Rules and regulation of Clearing House is prepared.	Plan																																																		
		Actual																																																			
B-2	Regulation of technical specification(AFC) is decided	Plan																																																	
		Actual																																																			
B-3	Relations to rules and regulations of MRT are clarified.	Plan																																																	
		Actual																																																			
B-4	IT system structure (server, security, back-up, etc.) is designed and specifications are developed.	Plan																																																		
		Actual																																																			
B-4a	Supporting the procurement of hardware.	Plan																																																		
		Actual																																																			
B-4b	PTO Server, Test Server installation. Final test after server relocation.	Plan																																																	
		Actual																																																			
B-5	Clearing House IT system (software, hardware) is developed.	Plan		Software						Hardware																																											
		Actual		Software						Hardware																																											
B-5a	Pilot Project including common IC card issuance and management. Managing TOM operator.	Plan																																																		
		Actual																																																			
B-5b	System replacement to cope with new Handy Reader Writer	Plan																																																	
		Actual																																																			
B-6	Relationship with agent bank (money transaction, interest rate, etc.) is reconsidered.	Plan																																																		
		Actual																																																			
B-7	Card issuance management (Security key installation etc.) is considered.	Plan																																																	
		Actual																																																			
B-8	IC Card design strategy is prepared	Plan																																																		
		Actual																																																			
Output C: Existing Operations of ICT fare Collection are Improved																																																			
C-1	Analysis for existing services (effect, challenges)	Plan																																																		
		Actual																																																			
C-2	Support for transport operators (equipment, value-added service, business model).	Plan																																																	
		Actual																																																			
C-2a	Execution of Pilot Project (2nd Pilot Project for Bangladesh Railways)	Plan																																																		
		Actual																																																			
C-2b	Study for introduction of ICT fare system into ferry operated by BIWTC	Plan																																																		
		Actual													Studyon Pilot Project for BIWTC																																					
C-2c	Pilot Projects with (private) bus companies are conducted	Plan																																																	
		Actual																																																			
C-3	Incentive strategy for operating company staffs is developed.	Plan																																																	
		Actual																																																			
C-4	Resettlement strategy for affected staffs is developed.	Plan																																																	
		Actual																																																			
C-5	IC Card procurement procedure of Clearing House is prepared.	Plan																																																	
		Actual																																																			
C-6	Collaboration with concerned parties (especially BRT, MRT) is strengthened.	Plan																																																		
		Actual																																																			
C-7	Operation manuals are prepared.	Plan																																																		
		Actual																																																			
C-8	Appropriate trainings are conducted.	Plan																																																	
		Actual																																																			
Output D: Existing Operations of ICT fare Collection are Improved																																																			
D-1	Train counterpart technical personnel adequately	Plan										Hong Kong																																									
		Actual																																																			
D-2	Train management related personnel adequately	Plan																																																		
		Actual																																																			
4	**Reports etc.**																																																			
4-1	Work Plan (For JICA in Japanese)	Plan																																																	
		Actual																																																			
4-1	Work Plan	Plan																																																		
		Actual																																																			
4-2	Project Progress Report (1st) •Project Brief Note	Plan																																																	
		Actual																																																			
4-3	Project Progress Report (2nd) •Project Brief Note	Plan																																																	
		Actual																																																			
4-4	Project Progress Report (3rd) ・Project Brief Note	Plan																																																	
		Actual																																																			
4-5	Project Completion Report •Project Brief Note	Plan																																																	
		Actual																																																			
5	**Conference etc.**																																																			
5-1	Steering Committee (SC)	Plan																																																		
		Actual																																																			
5-2	Counterpart training	Plan																																																		
		Actual										Visit Octopus in Hong Kong																																								
5-3	Data analysis seminar	Plan																																																		
		Actual																																																			
5-4	Information sharing with others stakeholders	Plan																																																		
		Actual																																																			
5-5	Trainings regarding ICT fare collection	Plan																																																	
		Actual																																																			

Legend: Plan: Actual: Work in Bangladesh; Work in Bangladesh (Intermittent); Work in Japan; Work in Japan (Intermittent); Reports etc.; Discussion on Reports etc.

Source: JICA Project Team

Table 2.4-1 Assignment Schedule of JICA Expert (1/2)

1. Work in Bangladesh



Title	Name		No. of Flight	Total MD	Total MM
Team Leader/Urban Transport	Takao MITSUISHI	Plan	16	359	11. 97
		Actual	16	359	11. 97
Clearing House Establishment Planner (System Team Leader)	Katsuaki MITANI	Plan	7	419	13. 97
		Actual	7	419	13. 97
Clearing House (Deputy Team Leader)	Nobuo HAZEYAMA	Plan	16	296	9. 87
		Actual	16	296	9. 87
Clearing House (Institutional Building)	Seiya MATSUOKA	Plan	6	201	6. 70
		Actual	6	201	6. 70
Clearing House (Business Plan)	Yoshihiko KATO	Plan	1	12	0. 40
		Actual	1	12	0. 40
Private Project Expert	Hiroaki TOMITA	Plan	1	30	1. 00
		Actual	1	30	1. 00
	Yoshio MATSUMOTO	Plan	1	30	1. 00
		Actual	1	30	1. 00
	Takemasa MATSUOKA	Plan	1	21	0. 70
		Actual	1	21	0. 70
IT System Development-1 (Development Standard)	Masahiro MIYAZAKI	Plan	3	38	1. 27
		Actual	3	38	1. 27
	Koji HIRASAWA	Plan	9	122	4. 07
		Actual	9	122	4. 07
IT System Development-2 (Settlement)	Masanori KOBAYASHI	Plan	4	68	2. 27
		Actual	4	68	2. 27
	Toshiaki ISHIZEKI	Plan			
		Actual			
IT System Development-3 (Test Expert Ⅰ)	Yuuichi NIIKURA	Plan	1	15	0. 50
		Actual	1	15	0. 50
IT System Development-3 (Test Expert Ⅱ)	SHAKYA Rabin	Plan	1	15	0. 50
		Actual	1	15	0. 50
ID Management Design	Masaaki NAKAGAWA	Plan	8	108	3. 60
		Actual	8	108	3. 60
Coordinator / System Development Assistant	Toshiaki ISHIZEKI	Plan	9	325	10. 83
		Actual	9	325	10. 83
	Ai MISHIMA	Plan	1	12	0. 40
		Actual	1	12	0. 40
Network Expert	Tatsuya MIYAKAWA	Plan	4	48	1. 60
		Actual	4	48	1. 60
Coordinator / System Development Assistant-2	Yoichiro SUMIYOSHI	Plan	1	30	1. 00
		Actual	1	30	1. 00
	Isram Mohammad AMINUL	Plan	11	160	5. 34
		Actual	11	160	5. 34
	Isram Mohammad AMINUL	Plan	1	13	0. 43
		Actual	1	13	0. 43
System Development Assistant-3	Takeshi MACHIDA	Plan	7	138	4. 60
		Actual	7	138	4. 60
	Takeshi MACHIDA	Plan	1	12	0. 40
		Actual	1	12	0. 40
Subtotal		Plan		2, 472	82. 42
		Actual		2, 472	82. 42

Legend : Plan Actual Additional

Source: JICA Project Team

Table 2.4-1 Assignment Schedule of JICA Expert (2/2)

2. Work in Japan

Title	Name		No. of Flight	Fiscal 2014 (5 6 7 8 9 10 11 12 1 2 3)	Fiscal 2015 (4 5 6 7 8 9 10 11 12 1 2 3)	Fiscal 2016 (4 5 6 7 8 9 10 11 12 1 2 3)	Fiscal 2017 (4 5 6 7 8 9 10 11 12 1 2 3)	Fiscal 2018 (4 5 6 7 8)	Total MD	Total MM
Team Leader/Urban Transport	Takao MITSUISHI	Plan		(4)				(4)	8	0.40
		Actual		5/28 – 31 (4)				6/12 - 15 (4)	8	0.40
Clearing House Establishment Planner (System Team Leader)	Katsuaki MITANI	Plan		(4)				(6)	10	0.50
		Actual		5/28 – 31 (4)					4	0.20
Clearing House (Institutional Building)	Seiya MATSUOKA	Plan		(14) (12)					26	1.30
		Actual		ダッカの情勢により国内作業に振替 3/9 – 22 (14)	国内で入札図書作成を継続 10/13 – 28 (12)				26	1.30
Clearing House (Business Plan)	Yoshihiko KATO	Plan						(5) (5)	10	0.50
		Actual						4/19 – 21 (5) 23 - 24 (5) 5/7 - 11 (5)	10	0.50
Private Project Expert	Hiroaki TOMITA	Plan		(20)					20	1.00
		Actual		ダッカの情勢により国内作業に振替 1/23 2/20 (20)					20	1.00
IT System Development-1 (Development Standard)	Masahiro MIYAZAKI	Plan			(142)				142	7.10
		Actual		11 22 16 21 8 5 5 3 3 4 4 3 4 3 3	5 6 10 6 (2) (10) (8) (8)	(7) (3) (2) 日付について別添-3参照			142	7.10
	Koji HIRASAWA	Plan				(10) (10) (10) (10) (10) (10)			60	3.00
		Actual				7/15 7/24 (10) 8/15 8/24 (10) 9/2 9/11 (10) 10/17 10/26 (10) 11/7 11/16 (10) 12/5 12/14 (10)		6/14 - 15 (6) 6/18 - 21	66	3.30
IT System Development-2 (Settlement)	Masanori KOBAYASHI	Plan			(200)				200	10.00
		Actual		11 22 16 9 8 14 15 12 10 10 9 10 4 5 7	5 7 10 6 10 (6) (12) (16)	(15) (13) (8) (4) 日付について別添-3参照			200	10.00
	Toshiaki ISHIZEKI	Plan				(10) (10) (10) (7) (10) (10)			57	2.85
		Actual				7/15 7/24 (10) 8/15 8/24 (10) 9/2 9/11 (10) 10/17 10/23 (7) 11/7 11/16 (10) 12/5 12/14 (10)			57	2.85
ID Management Design	Takeshi MACHIDA	Plan				(10) (10) (10) (8) (10) (10)			58	2.90
		Actual				7/15 7/24 (10) 8/15 8/24 (10) 9/2 9/11 (10) 10/17 10/24 (8) 11/7 11/16 (10) 12/5 12/14 (10)			58	2.90
	Yoshihiro SHIMADA	Plan			(84)				84	4.20
		Actual		13 16 21 22 5 5 2 (7) (12) (16) (15)	日付について別添-3参照				84	4.20
IC Card Design	Tomohiro ONO	Plan		(30)					30	1.50
		Actual		13 16 1 (20) 日付について別添-3 参照					30	1.50
Coordinator / System Development Assistant	Toshiaki ISHIZEKI	Plan			(14)				14	0.70
		Actual			1/26 – 30 (5) 2/23 – 27 (5)	6/25 – 30 (4)			14	0.70
Training Course Management	Katsuhisa OTA	Plan				(20.6)			20.6	1.03
		Actual				8/7 9/18 (20.6)			20.6	1.03
Training Program Management	Shahjahan Ali	Plan				(7)			7	0.35
		Actual				9/7 9/13 (7)			7	0.35
								Subtotal Plan	746.6	37.33
								Subtotal Actual	746.6	37.33
								Total Plan	119.75	
								Total Actual	119.75	

Legend : Plan Actual Additional

Source: JICA Project Team

Chapter 3 Activities for Output-A

3.1 General

Main task of Activity-A is the establishment of strategically stable business model in order to formulate financially, institutionally and managerially self-reliant CH. The main tasks of Clearing House are issuance of the Integrated Circuit (IC) cards, implementation of clearing and settlement of transport fares for PTOs with cooperation of Clearing House Bank (CH Bank).

To attain financially sustainable CH operation, DTCA and Dutch Bangla Bank Ltd. (DBBL) signed the "Contract for Clearing House Bank for Clearing, Settlement and Related Services of Rapid Pass System" on 25th January 2017. DBBL is assuming Clearing House Bank roles and providing services including maintenance of related bank accounts and bank transfer upon instruction of DTCA.

To attain managerially sustainable CH, DTCA established CHU and commenced Clearing House operation through Pilot Project under the Memorandum of Understanding (MOU) among JICA, DTCA and BRTC concluded on 11th April 2017.

Source: JICA Project Team

Photo 3.1-1 Contract Signing between DTCA and DBBL

Source: JICA Project Team

Photo 3.1-2 MOU Signing between JICA, DTCA and BRTC

Due to DTCA's delay in CHU staff recruitment, CHU operation was managed by JICA Project Team and its local service provider, N-Wave-ECL-3BL-[1] Joint Venture (NE3JV), at the early phase of the Pilot Project. DTCA employed CHU staff in November 2017 and they joined CHU operation in December 2017 by receiving On-the-Job Training by JICA Project Team.

The IC card used for the transport fare payment was named "Rapid Pass card" by Honorable Prime Minister Sheikh Hasina on 4th August 2015. And Rapid Pass card was formally inaugurated by Honorable Prime Minister on 4th January 2018.

Source: www.pmo.gov.bd

Photo 3.1-3 Inauguration of Rapid Pass Card

[1] N-Wave Co. (Bangladesh) LTD., ECL: Electro Craft Corporation. Ltd., and 3BL: Best Business Bond Ltd.

3.2 [A-1]: Self-reliant Management Plan (including operation and outsourcing) is Developed

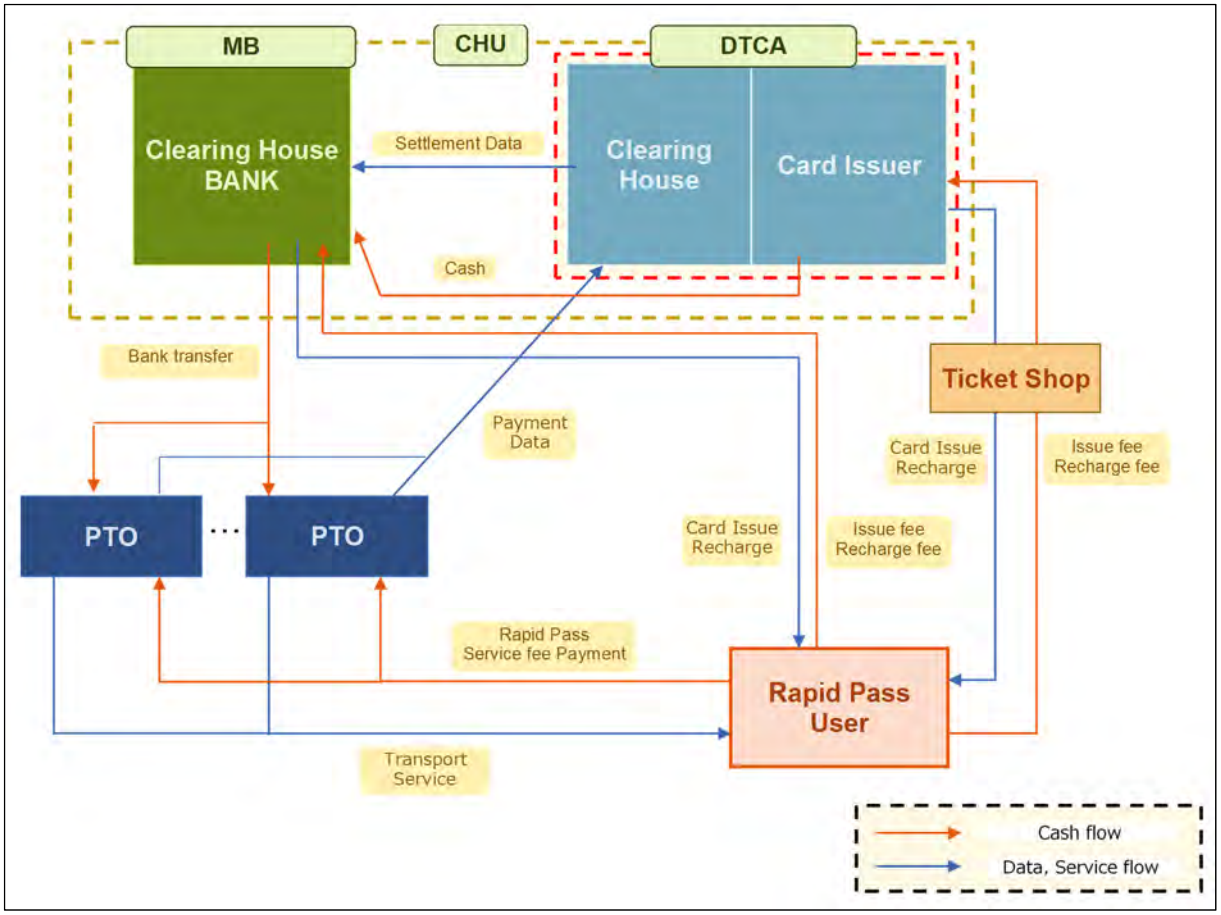
Development of self-reliant management plan was devised in three steps. First, initial plan of CHU establishment was prepared and incorporated in the Work Plan. The Work Plan was presented to the first Steering Committee Meeting and approved together with Employer's Requirement (ERQ) on 15th June 2015. In the second step, the initial plan was revised / updated in order to reflect requirements from DTCA and PTOs and experiences learned from the Pilot Projects. Finally, CHU was formally approved by the Ministry on 25th March 2018. Although regular nine engineers will be recruited for CHU, it will take at least one year at minimum. Therefore, DTCA decided to procure three engineers as consultants of CHU and they are working on CHU operation. After acquiring feedbacks from the Pilot Projects, JICA Project Team commenced the study for establishment of Special Purpose Company (SPC) and suggested DTCA to establish the most suitable form of SPC for sustainable operation and expansion of CHU business. The study report for establishment of the SPC is presented in **Appendix A1-1**.

CHU consists of three components i.e. Clearing House, Card Issuer and Clearing House Bank. The role of the Clearing House is clearing and settlement of fare collected from PTOs by using IC cards. The role of Card Issuer is issuance of IC cards and recharge of monetary data into IC cards. The role of Clearing House Bank is to maintain the necessary bank accounts and bank transfer under instruction of DTCA.

Detailed explanation of development of self-reliant management plan by each step is discussed in succeeding sections.

3.2.1 Initial Plan of Clearing House Unit

Figure 3.2-1 shows CHU set-up plan prepared by the JICA Project Team at the initial stage of the Project.



Source: JICA Project Team

Figure 3.2-1 Proposed CHU Set-up Plan at Initial Stage of the Project

(1) Clearing House

Development of Clearing House IT system (Rapid Pass System) would be executed through technical assistance of JICA. DTCA was proposed to be a direct operator for Rapid Pass System and actual clearing and settlement services to be provided through outsourcing.

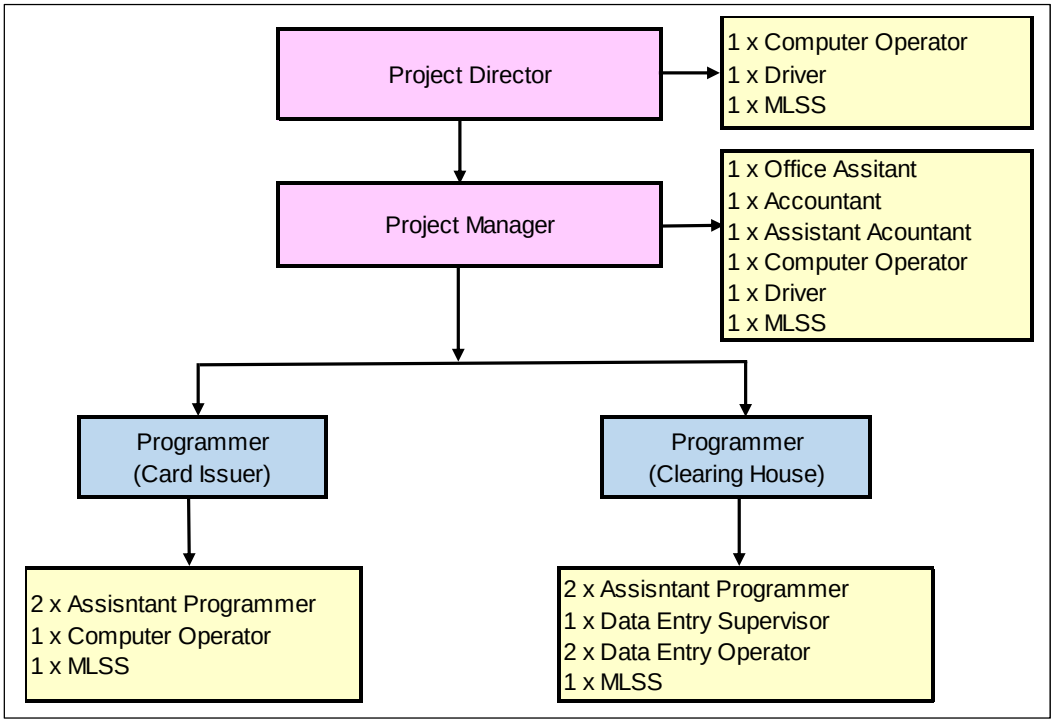
(2) Card Issuer

DTCA was proposed to be a sole issuer of Rapid Pass card as well as carry out the recharge operation.

(3) Clearing House Bank

Mercantile Bank (MB), an Agent Bank for SPASS card operation (former BRTC fare collection system), was planned to be a Clearing House Bank until BRT operation would commence. After commencement of BRT operation, a tender for Clearing House Bank would be held.

To secure above CHU components at the initial stage when neither MRT nor BRT had not operational yet, substantial part of daily operation of CHU was proposed to be outsourced and number of CHU staff to be kept minimal as shown in **Figure 3.2-2**.



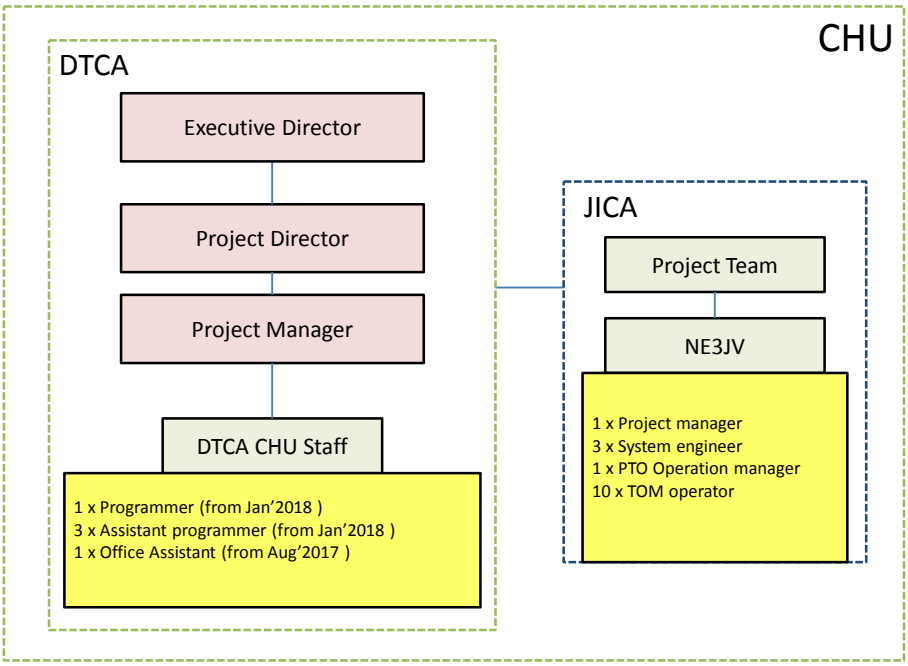
Source: JICA Project Team

Figure 3.2-2 Initial Plan for CHU

3.2.2 Revised/Update Plan of CHU during Pilot Project Implementation

TAPP was approved by Planning Commission on 15th June 2015 and first Steering Committee Meeting was held on 18th August 2015. Revised TAPP was approved on 20th April 2016. However, TAPP fund was released only in January 2017. Due to delay in fund release and entailing delay in CHU staff recruitment, the Pilot Projects with the CHU were obliged to be commenced without any inputs from DTCA.

Figure 3.2-3 shows organizational set-up of CHU during Pilot Project implementation period. JICA Project Team including outsourced local service provider (NE3JV) functioned as part of CHU.



Source: JICA Project Team

Figure 3.2-3 Transient CHU Organization during Pilot Project Implementation

The following sections describe how CHU was operated during the Pilot Project implementation period.

(1) Clearing House

DTCA initially planned to recruit IT engineers for operation of clearing and settlement and maintenance of Rapid Pass System. Although role of JICA Project Team and its local service provider (NE3JV) was supposed to focus on assistance and trainings for sustainable operation by DTCA at the planning stage, NE3JV was obliged to take over Clearing House tasks by itself due to DTCA's delay in CHU staff recruitment.

Two system operators and one settlement and clearing operator joined CHU in August 2017, whose main task is sending daily report and settlement report to PTOs. Four IT engineers joined in December 2017 and received training from NE3JV. Proposal for the permanent CHU organization was officially approved by MRTB on March 25, 2018.

(2) Card Issuer

DTCA is the sole entity for Rapid Pass issuance. It has limited human resources and fund as a card issuer that has to deploy Ticket Office Machine (TOM) operators at ticket shops. Hence, TOM operation was contracted out to Clearing House Bank (DBBL) under Agent Agreement.

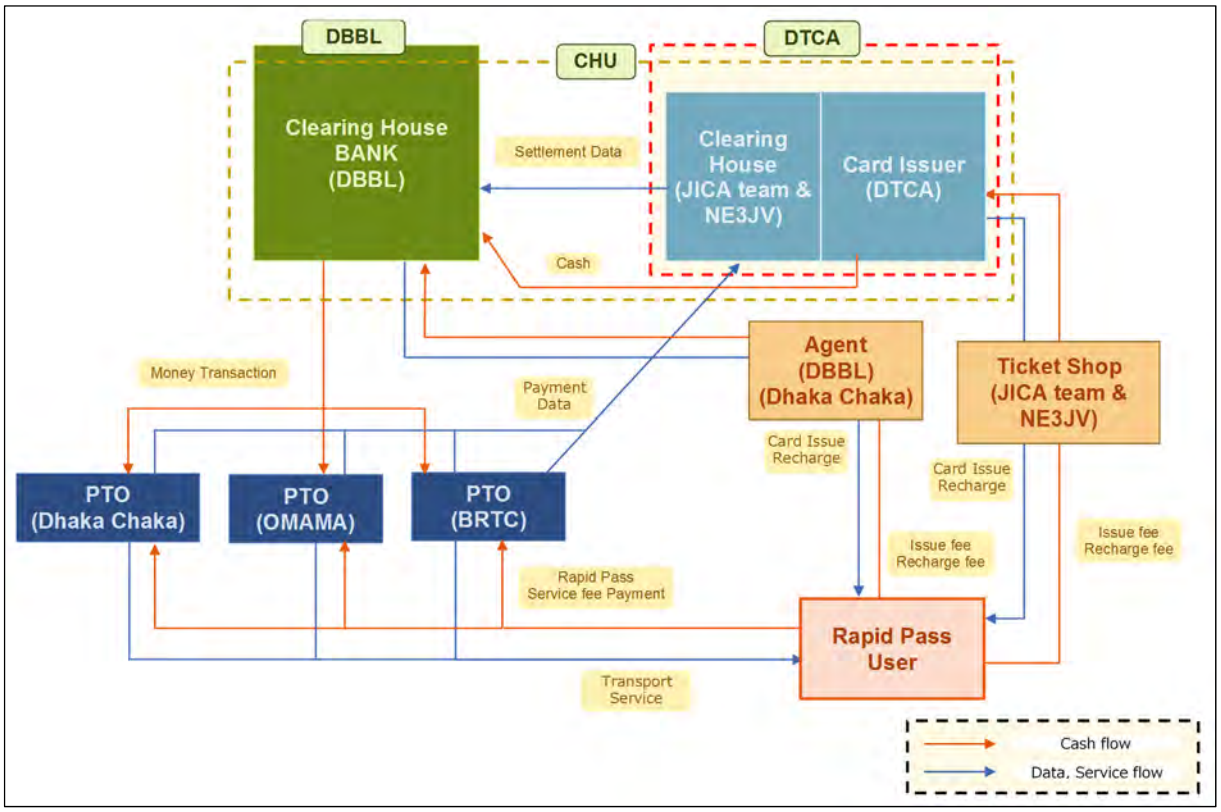
DTCA was originally procured IC cards and TOM and planned to lease out to the Card Issuer Agent for the issuance and recharge of Rapid Pass Card. DBBL is one of these Agents under the DTCA and was expected to provide the issuance and recharge of Rapid Pass Card services along BRTC route. However harsh environment without securing power supply and safety in ticket shops compelled DBBL to abandon its service along BRTC route. As a result, JICA Project Team decided that its service along the route should be carried out by PTOs. JICA Project Team appointed TOM operators along BRTC bus route until BRTC signs Agent agreement.

Dhaka Chaka, one of the PTOs in Gulshan 1 area, concluded Agent Agreement with DTCA together with MOU for Pilot Project along its routes on December 18th, 2017.

(3) Clearing House Bank

DTCA decided to select the Clearing House Bank through public tender as described in Section 4.8.2. Its process commenced on 12th July 2015. DBBL was awarded the contract on 22nd February 2016. DTCA and DBBL signed the Contract for Clearing House Bank for clearing, settlement and related services of Rapid Pass System on 25th January 2017.

Figure 3.2-4 shows the implementation set-up of Rapid Pass System during the Pilot Project period.



Source: JICA Project Team

Figure 3.2-4 Implementation Set-up of Rapid Pass System during Pilot Project

Main tasks of Clearing House Bank are maintenance of necessary accounts and implementation of bank transfer under instruction of DTCA. These tasks are processed without major troubles except delay in transactions. In addition, DBBL provides the location and operation cost for servers of Rapid Pass System and cash collection service using a mobile banking named Rocket Service.

3.2.3 Established CHU after Completion of the Pilot Project

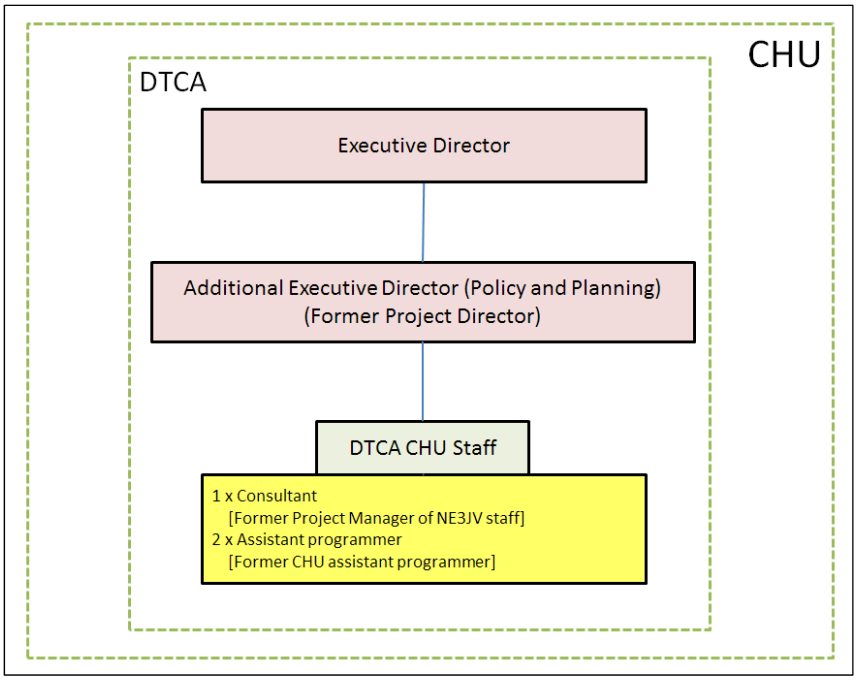
The Pilot Project completed on 31th May 2018. Since CHU establishment was approved by the Ministry on 25th March 2018, The Project Director of DTCA decided to continue CHU operation while his contractual CHU staff were dismissed upon expiration of the contract period. However, recruitment of regular nine engineers of CHU shown in **Table 3.2-1** that are included in the approved organogram may take at least one year.

Table 3.2-1 DTCA's New Organogram

Name of the Position	Grade & Salary Scale	No. of Staff
1. Senior Programmer (CH)	Grade-5: (43,000-69,850)	1
2. Programmer	Grade-6: (29,000-63,410)	1
3. Programmer (Database)	Grade-6: (29,000-63,410)	1
4. Programmer (CH administrator)	Grade-6: (29,000-63,410)	1
5. Programmer (CH Operation & Maintenance)	Grade-6: (29,000-63,410)	1
6. Assistant Programmer	Grade-9: (22,000-53,060)	1
7. Assistant Programmer (Database)	Grade-9: (22,000-53,060)	1
8. Assistant Programmer (CH administrator)	Grade-9: (22,000-53,060)	1
9. Assistant Programmer (CH Operation & Maintenance)	Grade-9: (22,000-53,060)	1

Source: JICA Project Team

Therefore, CHU decided to procure three engineers who were involved in the JICA CH Project as local consultants. The three engineers consist of one senior engineer from NE3JV and two engineers from CHU contractual staff who were recruited by DTCA for this Project. **Figure 3.2-5** shows CHU organization during interim period.

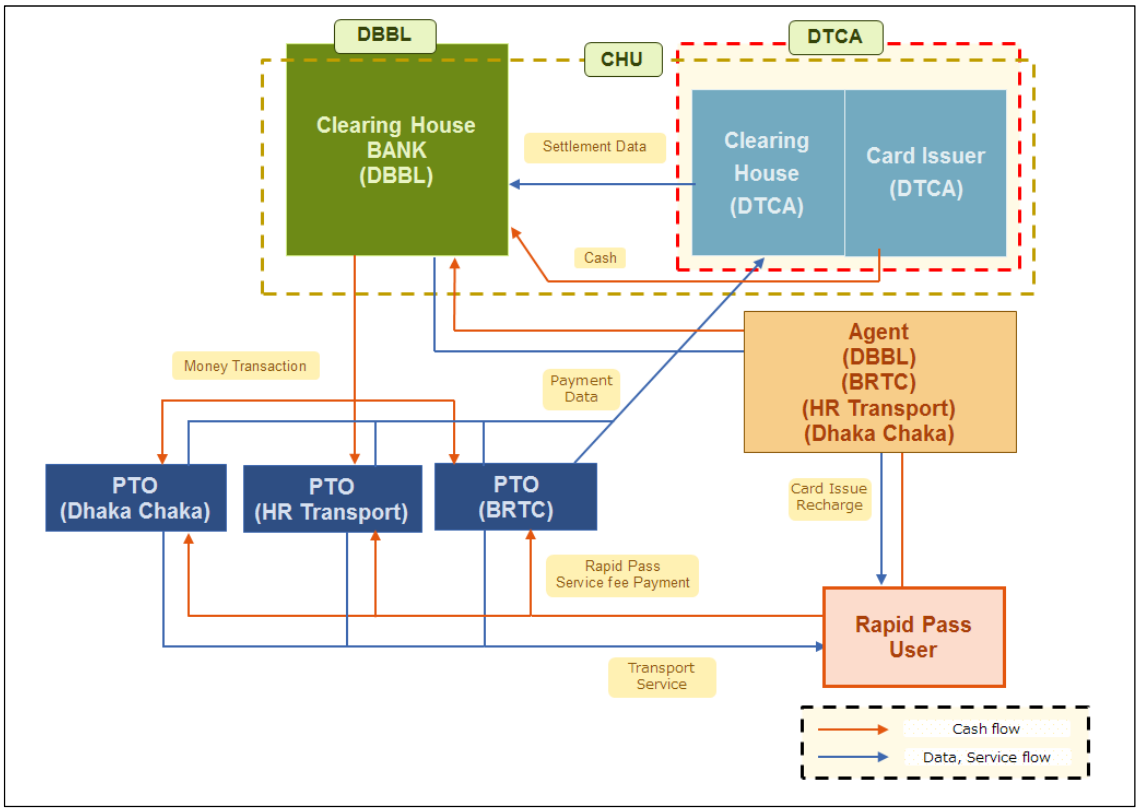


Source: JICA Project Team

Figure 3.2-5 CHU Organization during Interim Period

In addition, since CHU has limited human resources direct management of ticket shop by DTCA is not feasible. DTCA made decision to transfer to BRTC the management of ticket shops operated by this Project. On the other hand, DTCA and HR transport concluded PTO agreement and Agent agreement on 17th April 2018 and commenced R/W operation and TOM

operation at their 16 buses and two ticket shops. **Figure 3.2-6** shows CHU set-up at the completion of the Pilot Project.



Source: JICA Project Team

Figure 3.2-6 CHU Set-Up at the Completion of Pilot Project

3.2.4 Issues on Self-Reliant CHU

In the course of the Pilot Project implementation some issues on self-reliant Clearing House were identified and discussed in the following sections.

(1) Financial Issue

Basically, Clearing House under DTCA means that Clearing House is operated by public funds and financial self-reliance is not highly required. Revenue of Clearing House Unit is mainly Clearing House fee collected from PTOs for clearing and settlement services. This means card issue service does not provide income to Clearing House Unit. In order to increase revenue from clearing and settlement service, CHU has to increase usage rate of Rapid Pass card and increase in payment amount per transaction of Rapid Pass card use which requires DTCA to develop new members of Rapid Pass card such as PTOs outside Dhaka City area and retailers other than PTOs.

However, DTCA's mission is restricted on coordination of transport issues in Dhaka district along with 6 adjacent districts and coordination with PTOs and retailers outside DTCA area are beyond mandate of DTCA. Activity A-2 shows the necessity of expansion of Rapid Pass card to PTOs and retailers outside DTCA area for business model sustainability of current Clearing House Unit.

(2) Institutional Issue

1) DTCA Function

In accordance with "Dhaka Transport Coordination Authority Act, 2012", the aim and objectives are focused on the planning, information provision and coordination for transport matter. The Act stipulates that "Formulation of planning, implementation and approval strategy for transport operational activities, fare fixing and for other related activities for transportation operated by government, non-government or public-private partnership to operate Bus Rapid Transit, Metro Rail, and bus or rail (metro/mono/circular/commuter) or expressway (including high capacity lane or vehicles) through route rent or lease (route franchise) under Mass Rapid Transit system to provide rapid and improved service."

Therefore, regarding fare collection, it may be difficult to interpret this article, which includes provision of service for fare collection, clearing and settlement. The CHU could implement Pilot Project because no PTOs outside Dhaka and no entrepreneurs other than transport services joined the Project, but it may be difficult for DTCA to be a permanent CHU as long as DTCA is bound to this Act except assigned by the government in accordance with the provision that "Carry out any other duty assigned by government."

(3) Management Issue

Since DTCA is a regulatory organization for transport it does not have enough resources to amass the latest technical know-how related to Rapid Pass System. Therefore, although DTCA is able to sustain current operation such as Rapid Pass System monitoring and clearing and settlement operation for limited number of PTOs with limited number of IC cards and transaction, DTCA will face difficulty to manage Rapid Pass System with large number of IC cards and huge amount of card transactions of MRT and BRT.

3.2.5 Suggestion for Establishing (SPC)

Considering issues on self-reliant CHU mentioned above, JICA Project Team made a proposal to DTCA for establishment of new organization to sustain and expand business of Rapid Pass card on 27th February 2018 based on the Team's case study and business model. In the meeting seven types of organizations were proposed to wit;

Plan 1a: Direct operation by DTCA-CHU,

Plan-1b: Outsourcing operation by DTCA-CHU,

Plan-2a: Direct operation by Public Corporation (PC)/State Own Company (SOC),

Plan-2b: Outsourced operation by PC/SOC,

Plan-3: Operation by Public-Private JV: 50% public, 50% private,

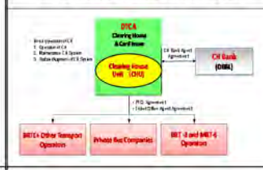
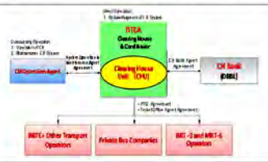
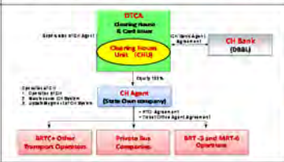
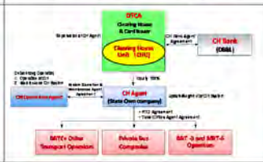
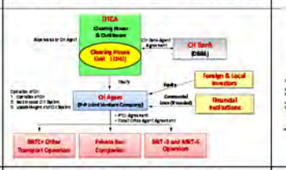
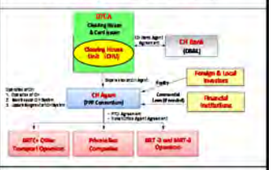
Plan-4: DMTCL, Dhaka Bus Rapid Transport (DBRT) operates IC card service, and

Plan-5: Operation by Public-Private Partnership (PPP) Investor(s): 100% private.

The conclusion of the first meeting for new organization was that it may be suitable to establish SPC as State Owned Company which is owned by 100% government or by public sector (Plan-2a and 2b) and public-private sector (Plan-3) at initial stage of the SPC.

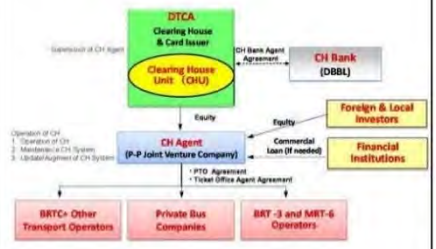
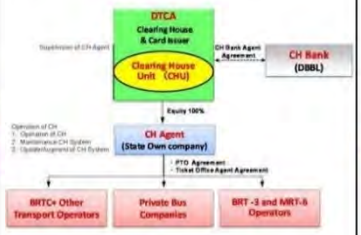
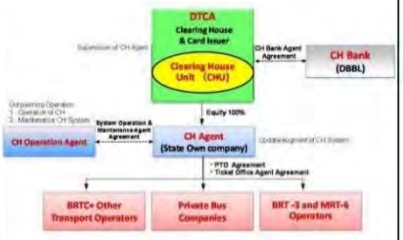
Table 3.2-2 shows comparison table of seven SPC alternatives prepared by JICA Project Team for further discussion with DTCA while **Figure 3.2-7** shows preferable and reasonable SPC types selected by DTCA for further study and discuss with stakeholders and higher authority to determine the most competitive SPC organization.

Table 3.2-2 Seven Proposals for First Meeting Regarding New Organization

	Plan-1a: Direct Operation by DTCA/CHU	Plan-1b: Outsourcing to Private Firm by DTCA/CHU	Plan-2a: Direct Operation by SOC under DTCA/CHU	Plan-2b: Outsourcing to Private Firm by SOC	Plan-3: Operation by P-P Joint Venture Company	Plan-4: CH Business to be Delegated to DMTCL	Plan-5: Operation of PPP Investor
Type of Operation							
Description of the Plan	・DTCA/CHU will directly operate CH by employing and managing all necessary staff.	・DTCA/CHU will not operate CH directly, but it will outsource all necessary services to private firm. ・DTCA/CHU will remain as implementing agency	・State own company (SOC) will be established under DTCA/CHU. ・The SOC will directly operate CH by employing and managing all necessary staff.	・State own company (SOC) will be established under DTCA/CHU. ・The SOC will not directly operate CH but will outsource all necessary tasks to private firm for operation of CH.	・Public-Private Joint Venture Company will be stablished under DCTA/CHU. ・The PP JV Company will operate CHU by employing and managing all necessary staff. ・Private investor may be either local or foreign consortium.	・DTCA-CHU remains as Card Issuer. ・DMTCL operates Clearing House by direct operation , outsourcing or subsidiary company. ・DMTCL is responsible for procurement of CH equipment and software.	・CH will be operated by PPP Investors under PPP contract with DTCA/CHU. ・The PPP Investors may be either local or foreign consortium.
Type of Organization	Government Agency	Government Agency	State Own Company	State Own Company	Public-Private Joint Venture Company	DMTCL: State Own Company	PPP Consortium
Operation Scheme	Direct Operation by Government Agency	Outsourced operation by private firm	Direct Operation by State Own Company	Outsourced operation by private firm	Direct Operation by P-P JV	Business Delegation to DMTCL	Direct Operation by PPP Consortium
Procurement of ICT Equipment	DTCA/CHU	DTCA/CHU	State Own Company	State Own Company	P-P JV Company	DMTCL	PPP Consortium
System Development/ Maintenance	DTCA/CHU	DTCA/CHU	State Own Company	State Own Company	P-P JV Company	DMTCL	PPP Consortium
Clearing House Operation	DTCA/CHU	Outsourced Private Firm	State Own Company	Outsourced Private Firm	P-P JV Company	DMTCL	PPP Consortium
Assessment Item	**Description**	**Description**	**Description**	**Description**	**Description**	**Description**	**Description**
1.Institutional Aspect	・Procedure to establish new organization can be eliminated. ・Employment, training and management of newly recruited staff will be required. ・Government agency (DTCA/CHU) may not suitable for commercial operation because commercial operation requires prompt decision making without bureaucratic process.	・Procedure to establish new organization can be eliminated. ・Procurement of outsourcing company is required. ・Government agency (DTCA/CHU) may not suitable for commercial operation because commercial operation requires prompt decision making without bureaucratic process.	・Procedure to establish new organization is required but lengthy process may not be required. ・Employment, training and management of newly recruited staff will be required for SOC. ・The newly established State Own Company can engage in public service related commercial activities.	・Procedure to establish new organization is required but lengthy process may not be required. ・Procurement of outsourcing company is required. ・The newly established State Own Company can engage in public service related commercial activities.	・Procedure to establish new organization is required and lengthy process may be required since foreign investors are involved. ・The newly established P-P Joint Venture Company can engage in public service related commercial activities.	・Procedure to establish new organization is not required but creation of new section in DMTCL is required. ・Following three alternatives to be decided. 1. Direct operation 2. Outsourcing 3. Subsidirary company	・Procedure to select PPP Consortium is required and lengthy process may be required since PPP Scheme is relatively new in Bangladesh. ・The PPP Consortium can engage in public service related commercial activities.
2. Technical Aspect	・Procurement of foreign expatriate who can install, maintain and update of IC card system may be difficult.	・International competitive bidding to procure competent outsourcing company who can manage IC card system may be difficult.	・Procurement of foreign expatriate who can install, maintain and update of IC card system may be difficult.	・International competitive bidding to procure competent outsourcing company who can manage IC card system may be difficult.	・Foreign expatriate staff who has IC card system management can be involved.	・Involvement of foreign expatriate staff who has IC card system management may be difficult.	・Foreign expatriate staff who has IC card system management can be involved.
3. Financial Aspect	・Stable financial resources can be secured if government fund can be utilized. ・On time fund disbursement may be difficult if government fund will be utilized. ・Revenue from CH operation may not be directly used for reinvestment. The revenue shall be levied in government treasury first.	・Government subsidy may required during initial stage of CH Operation because revenue from CH Operation may not enough to maintain outsourced business. ・Revenue from CH operation may not be directly used for reinvestment. The revenue shall be levied in government treasury first.	・Government subsidy may required during initial stage of CH Operation because revenue from CH Operation may not enough to maintain outsourced business. ・Revenue from CH operation may directly used for reinvestment.	・Government subsidy may required during initial stage of CH Operation because revenue from CH Operation may not enough to maintain outsourced business. ・Revenue from CH operation may directly used for reinvestment.	・Initial investment can be shared by Public and Private dependent on share of holdings. ・Revenue from CH operation may directly used for reinvestment.	・Initial investment can be secured from government equity or loan ・Revenue from CH operation may directly used for reinvestment.	・Initial investment can be shouldered by PPP Consortium. ・Revenue from CH operation may directly used for reinvestment.
4. Managerial Aspect	・Flexible staff deployment may be difficult because of government staff regulation.	・Flexible staff deployment may be possible since all related tasks will be undertaken by outsourced company.	・Flexible staff deployment may be partly possible since all related tasks will be undertaken by State Own Company.	・Flexible staff deployment may be possible since all related tasks will be undertaken by outsourced company.	・Flexible staff deployment may be possible since all related tasks will be undertaken by P-P JV Company	・Overlap of authority between DTCA and DMTCL shall be avoided by careful study on area of responsibility.	・Flexible staff deployment may be possible since all related tasks will be undertaken by PPP Consortium
5. Rapid Pass Expansion Aspect	・DTCA's Area of responsibility is limited to Metropolitan Dhaka City Area. ・Nationwide deployment of Rapid Pass Card may be difficult.	・DTCA's Area of responsibility is still limited to Metropolitan Dhaka City Area. ・Nationwide deployment of Rapid Pass Card may be difficult.	・State Own Company can engage in business beyond mandated area of DTCA. ・Nationwide deployment of Rapid Pass Card is possible since SOC can engage in business beyond DCTA area.	・State Own Company can engage in business beyond mandated area of DTCA. ・Nationwide deployment of Rapid Pass Card is possible since SOC can engage in business beyond DCTA area.	・P-P JV can engage in business beyond mandated area of DTCA. ・Nationwide deployment of Rapid Pass Card is possible since P-P JV can engage in business beyond DCTA area.	・DMTCL can engage in business beyond mandated area of DTCA. ・Nationwide deployment of Rapid Pass Card is possible DMTCL can engage in business beyond DCTA area.	・PPP consortium can engage in business beyond mandated area of DTCA. ・Nationwide deployment of Rapid Pass Card is possible since PP Consortium can engage in business beyond DCTA area.
Evaluation Item	**Description** **Score**	**Description** **Score**	**Description** **Score**	**Description** **Score**	**Description** **Score**	**Description** **Score**	**Description** **Score**
1. Business Efficiency	・Government Agency is not suitable to engage in commercial activities. 1	・Government Agency is still not suitable to engage in commercial activities although substantial part of CH operation will be outsourced. ・Business efficiency may increase by outsourcing CH operation to private firm. 2	・Formulation of SOC may be against government policy on privatization of SOC. ・Business efficiency of SOC may still low compare with private firms. 2	・Formulation of SOC may be against government policy on privatization of SOC. ・Business efficiency of SOC may be still low compare with private firms. ・If private firm will be procured, what is a use of SOC? 3	・Business efficiency of P-P JV may be high compare with SOC ・Demarcation of public and private is not clear 4	・Business efficiency may not be high if DMTCL will directly operate CH ・Business efficiency may increase by outsourcing CH operation to private firm. 3	・Business efficiency of PPP may be high if PPP contract with government will adequately made. ・Lots of uncertainties are expected since this type of PPP project quite new in Bangladesh. 3
2. Business Independency	・Substantial part of decision making shall need endorsement of higher authority. 1	・Substantial part of decision making shall be required endorsement of higher authority. 1	・Substantial part of decision making can be made by SOC itself. 4	・Substantial part of decision making can be made by SOC itself. 4	・Substantial part of decision making can be made by P-P JV Company. 4	・Substantial part of decision making can be made by DMTCL itself. 4	・Substantial part of decision making can be made by PPP Consortium. 4
3. Business Sustainability	・Business may not be sustainable if revenue from CH operation will be levied to government treasury. 1	・Business may not be sustainable if revenue from CH operation will be levied to government treasury. 2	・Business may not be sustainable without government subsidy as observed in other state own companies. 2	・Business may not be sustainable without government subsidy as observed in other state own companies. 2	・Business may be more sustainable than SOC because of involvement of private sector. 5	・Business may not be sustainable without government subsidy as observed in other state own companies. 4	・Business may be more sustainable than SOC but risks involved in PPP Scheme is not foreseeable. 4
4. Business Expendability	・Nationwide deployment of Rapid Pass Card may be difficult due to restriction of DTCA's mandate. 1	・Nationwide deployment of Rapid Pass Card may be difficult due to restriction of DTCA's mandate. 1	・Nationwide deployment of Rapid Pass Card is possible beyond DTCA's mandate area. 5	・Nationwide deployment of Rapid Pass Card is possible beyond DTCA's mandate area. 5	・Nationwide deployment of Rapid Pass Card is possible beyond DTCA's mandate area. 5	・Nationwide deployment of Rapid Pass Card is possible beyond DTCA's mandate area. 5	・Nationwide deployment of Rapid Pass Card is possible beyond DTCA's mandate area. 5
5. Technical Reliance	・Procurement of competent foreign expatriate may be difficult 2	・Procurement of competent foreign expatriate may be difficult. 2	・Procurement of competent foreign expatriate may be difficult. 2	・Procurement of competent foreign expatriate may be difficult. 2	・Procurement of competent foreign expatriate may be possible. 4	・Procurement of competent foreign expatriate may be difficult. 3	・Procurement of competent foreign expatriate may be possible. 4
Total Score	6	8	15	16	**Most Appropriate Plan** 22	**Third Appropriate Plan** 19	**Second Appropriate Plan** 20

Score of Adequacy 1: Low, 2: Relatively Low, 3: Medium, 4: Relatively High, 5: High

Source: JICA Project Team

<table>
<tr><td colspan="3">Ultimate form = Establishment of SPC</td></tr>
<tr><td><u>Plan-3</u>: Public-private joint-venture firm
 
</td><td><u>Plan-2a</u>: 100% Public firm operates the CH
 
</td><td><u>Plan-2b</u>: 100% Public firm will outsource the CH operation
 
</td></tr>
<tr><td><u>Shareholding:</u>
- There will be minority participation of private sector (up to 49%).</td><td colspan="2"><u>Shareholding:</u>
- Similar to DMTCL, DBRT, BRTC and BIWTC, 100% share will be owned by the public sector.</td></tr>
<tr><td colspan="2"><u>Role of SPC:</u>
- SPC will own asset, hire staffs and operate by itself, becoming a self-sustaining entity.
- SPC may outsource a part of its function as necessary.
<u>Cost:</u>
- Large amount of initial cost will be required at start up.
- Cost will be fixed.</td><td><u>Role of SPC:</u>
- Size and function of SPC is kept to minimum (planning and management).
- SPC will not possess any operating function.
<u>Cost:</u>
- Constant payment from SPC</td></tr>
<tr><td colspan="2"><u>Technical Assistance:</u>
- Technical Assistance may be extended from international development partners</td><td><u>Technical Assistance:</u>
Technical assistance may not be extended as the operator is a private firm.</td></tr>
<tr><td><u>Business development:</u>
- Innovative use may lead to boost in number of users.</td><td colspan="2">Business development:
There is likely to be more limitation with the public sector business development capacity.</td></tr>
</table>

Source: JICA Project Team

Figure 3.2-7 Three Competitive Plans for SPC Establishment

Second meeting for new organization establishment was held on 25th March 2018. JICA Project Team studied the effect for private sector participation to Clearing House Unit and found public-private companies of Clearing House would be suitable for expansion of its operation from one city to all over the country. The concept of SPC operated by public sector and private sector is;

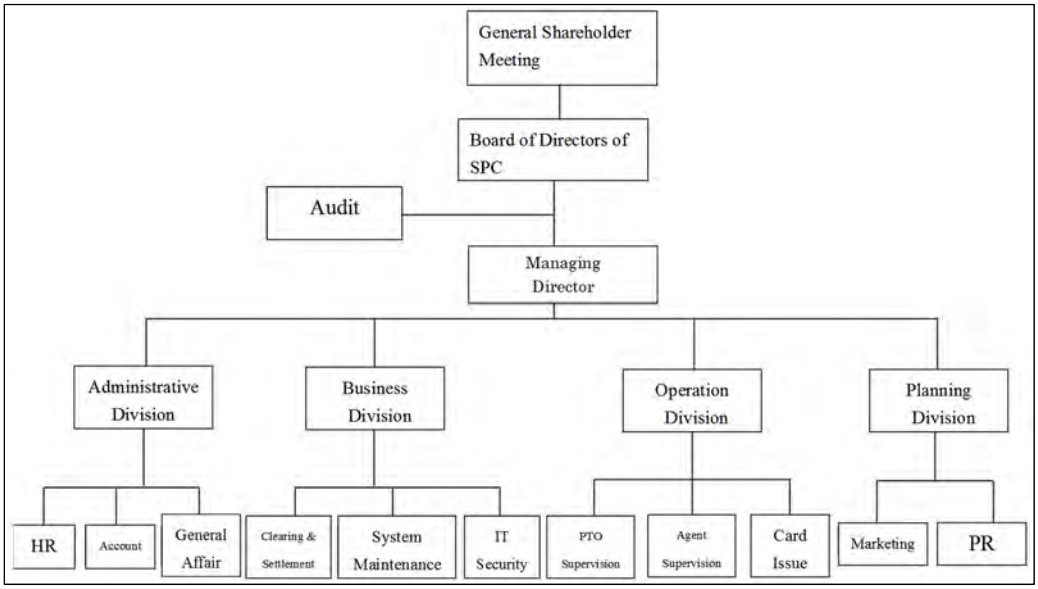
1. Flexible and business oriented private sector shall lure more Rapid Pass card users and PTOs and
2. Exclusive provision of Rapid Pass service to be guaranteed as part of the public sector services.

Proposed organogram and staff of SPC are shown in **Table 3.2-3** and **Figure 3.2-8** respectively. More detailed explanation is presented in **Appendix A1-2**.

Table 3.2-3 Expected Members of SPC

Position	Public	Private
Board of Directors of SPC	3	2
Managing Director	1	0
Administrative division	2	0
Business division	3	4
Operation division	2	3
Planning division	0	2
Total	**11**	**11**

Source: JICA Project Team



Source: JICA Project Team

Figure 3.2-8 Expected Organogram for SPC

3.3 [A-2]: Business Plan (include fare, service charge and deposit) is Developed

Preparation of Business Plan was also made in three steps in the accordance with three steps of Self-reliant Management Plan in Activity A-1. In the first step, the initial Business Plan was made based on the experiences and feedbacks of Hong Kong Octopus study. In the second, step several simulations for deposit and clearing house fee were conducted.

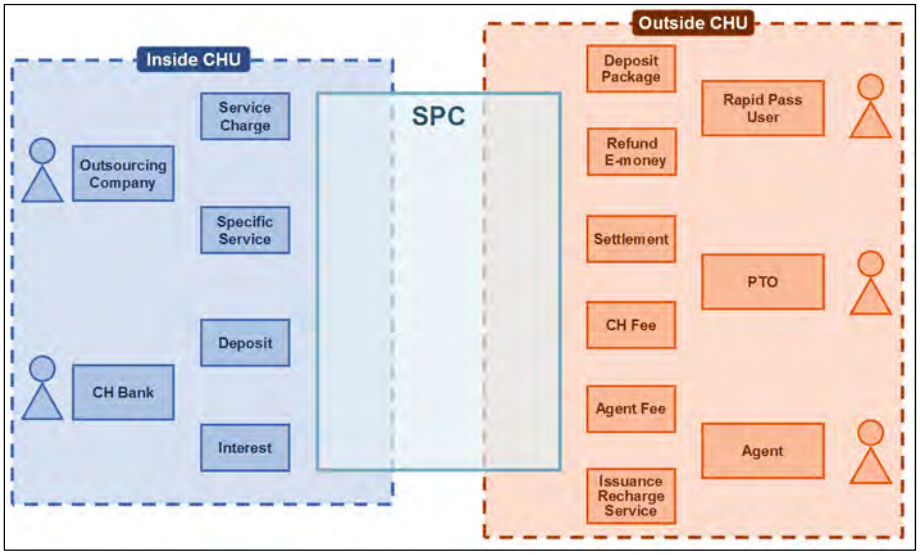
In the third step, the final Business Plan was prepared focusing on comparison of 100% government own and public-private corporation during study on establishment of SPC. The Business Plan made by the JICA Project Team is shown in **Appendix A2-1**.

Initial business model used for preparation of Business Plan for CHU was patterned from SPASS model developed in 2013. N-Wave (Japan (JP) and Bangladesh (BD)) developed SPASS system for fare collection service to BRTC. N-Wave provided not only fare payment services using SPASS card but also E-ticket issuance service, which means N-Wave BD was able to collect service charge from all revenues from PTOs. N-Wave BD recruited more than 100 staff for operating fare collection and E-ticketing devices and supervising operation.

However, DTCA is a regulatory organization, and has little resources for supervising TOM operators[2]. On the other hand, most PTOs have their own ticket shops and ticket checkers (conductors). Therefore, in order to reduce Rapid Pass operation cost, handy R/ W operations shall be the responsibility of PTOs, subject to discount for Service charge (Clearing House fee) compared to SPASS system and Ticket Office Machine operations shall be the responsibility of Agent, subject to receiving Agent fee from CHU.

As shown in **Figure 3.3-1**, CHU business model has three main external actors, namely Rapid Pass card users, PTOs and Agents. On the other hand, CHU business model has three main internal actors, Clearing House itself, CH Bank and outsourcing companies such as IT development companies and data entry companies. Each external and internal actor are discussed in detail in the following sections.

[2] A Ticket Office Machine (TOM) operator for issuance and recharge of Rapid Pass card



Source: JICA Project Team

Figure 3.3-1 CHU Stakeholders

3.3.1 Rapid Pass Card Users

Rapid Pass card users shall obtain Rapid Pass card at ticket shops operated by either CHU or its Agent including DBBL branches. TOM operators at the ticket shops shall provide issuance of Rapid Pass card, recharge, refund, reissue and other necessary services. Rapid Pass card users pay their fare by tapping fixed handy R/W. Therefore, giving and receiving cash between CHU and Rapid Pass card users occur only when CHU directly operates TOM**.**

Card deposit is collected upon issuance of Rapid Pass card and this means CHU reserves Rapid Pass card ownership. When a Rapid Pass card user wants to stop using Rapid Pass card, he/she shall surrender the card to CHU and deposit shall be returned to the Rapid Pass card user with deduction of refund fee. Refund fee is collected as a transaction fee for payment to Agent.

Table 3.3-1 shows amount of card deposit and transaction fee currently adopted by CHU.

Table 3.3-1 Deposit and Fee for Ticket Shop Service

Service	Deposit (BDT)	Fee (BDT)	Remarks
Issue	200	0	Another 200 BDT is required as an initial recharge. Total 400 BDT is needed for first issuance
Recharge	0	0	
Refund	-200	10	In case of negative value returned deposit is deducted.
Reissue (damaged)	0	200	
Reissue (lost)	200	200	
Lost card found	-200	10	Negative value data is transferred to newly issued card when re-issue (lost).

Source: JICA Project Team

Card damage due to misuse of the card was often observed during SPASS operation period. Reissue to replace the damaged card was required. Since 100 Bangladesh Taka (BDT) negative value function[3] is installed, there is a chance that remaining amount of card deposit (200 BDT) becomes 100 BDT and not enough to recover cost of Rapid Pass card procurement (225 BDT). Therefore, reissue fee of 200 BDT to be imposed.

[3] Negative Value Function: Users can exit ticket checker gate even if recharge amount in the card is not enough to pay the fare by temporarily borrowing money from card deposit amount. With this function hustling at exit gated during peak hour can be avoided.

3.3.2 PTOs

PTO Agreement includes two services i.e. 1) clearing and settlement service and 2) lease service of handy R/W and its accessories. Cost of R/W operators[4] shall be borne by PTOs. PTOs are allowed to fix the handy R/W in their buses or other vehicles at their own cost.

(1) Clearing and Settlement Service

CHU provides clearing and settlement service for PTOs. This service fee (CH fee) is basically decided through negotiation between CHU and each PTO considering each PTO's business practices and financial capabilities and is not decided considering total cost of CHU operation. Therefore, CH fee of some PTOs is higher than the other. However, CH fee shall not go below 1% in order to avoid deficit (Agent fee is 0.83%). As of June 2018, average CH fee is 3% and this 3% shall be reduced 2% in the future when CHU becomes financially stable in order to be competitive comparing to credit card rate and other means of payment service fees.

(2) Lease Service

Lease service is provided to mainly bus companies because mass transit companies such as MRT and BRT will procure their own AFC equipment at their own cost. CHU leases handy R/W and their accessories required for fare collection. Cost for handy R/W and related accessories spent in this Project is shown in **Table 3.3-2**.

The economic life of this equipment was set as three years considering handling conditions of inside/outside buses in Bangladesh. Therefore, three years lease period was applied. Though monthly lease installment amount shall be needed 910 BDT, DTCA decided to lower the amount of 500 BDT initially in order to increase number of PTOs.

Table 3.3-2 Cost of Handy R/W and Other Related Equipment

Description	Price (BDT)/ Unit	Life Span	Remarks
Handy R/W	14,706	3 Years	DTCA Procurement (150 units)
Battery	1,548	3 Years	DTCA Procurement (150 units)
Thermal Printer	1,006	3 Years	DTCA Procurement (150 units)
Power Supply Cable	155	3 Years	DTCA Procurement (150 units)
Stand for Battery Charger	2,709	3 Years	DTCA Procurement (150 units)
External Battery	2,477	3 Years	DTCA Procurement (150 units)
Carry Bag for handy R/W	1,238	3 Years	DTCA Procurement (150 units)
Software	5,579	10 Years	Developed by JICA Project Team Total cost (4,184,124(BDT)) is divided by 150 units for two years
Production	250	1 time	80,000(BDT)/20(working day)/16(units)
Total (VAT excluded)	29,668		

Source: JICA Project Team

3.3.3 Agent

Agent Agreement includes two major clauses i.e.1) agent service provided by the Agent to Rapid Pass card users and 2) lease service provided by CHU to the Agent regarding TOM and other related equipment. Cost of TOM operators and ticket shops shall be borne by the Agent. PTO is expected to be an Agent because they have ticket shops near their operation routes. In

[4] An Operator of the handy R/W for fare collection

accordance with the contract of CH Bank, the bank also can be an Agent.

(1) Agent Service

Agent provides the issuance and recharge of Rapid Pass card to the users. The service fee paid by CHU as an Agent fee is fixed at 0.83% for five years. If CH fee paid by PTOs to CHU is below 1%, the CHU will not have source of fund to pay the Agent. This is a reason why the CH fee cannot be lower than 1%.

(2) Lease Service

CHU leases to the Agents with TOM and its accessories required for issuance and recharge of Rapid Pass card. Cost for TOM and its accessories procured this Project is presented in **Table 3.3-3**.

Table 3.3-3 Cost of Ticket Office Machine

Description	Price (BDT)/Unit	Remarks
POS Terminal	51,000	DTCA Procurement (50 units)
Mouse	354	DTCA Procurement (50 units)
Cable security Device	171	DTCA Procurement (50 units)
SAM Reader	3,180	DTCA Procurement (50 units)
SAM	2,148	DTCA Procurement (50 units)
D-Link USB Modem	1,500	DTCA Procurement (50 units)
Antivirus Software	600	DTCA Procurement (50 units)
IC Card Reader/writer	3,739	DTCA Procurement (50 units)
Monitor for Customer	9,500	DTCA Procurement (50 units)
Thermal Printer	10,500	DTCA Procurement (50 units)
Software	20,000	JICA Project Team (Package 2) Total cost (5,000,000 BDT) is divided by 50 units for two years
Production	500	80,000 BDT/20(working day)/8(units)
Total (VAT excluded)	103,462	

Source: JICA Project Team

The economic life of TOM is set at five years considering ticket shop condition in Bangladesh. Therefore, three years lease period is applied. Although based on the above condition, monthly lease installment was set as 3,200 BDT, DTCA decided to lower the lease amount to 3,000 BDT initially in order to expand Rapid Pass users.

3.3.4 CH Bank

In accordance with the contract for Clearing House Bank, after issuance of 10,000 Rapid Pass cards or two million BDT amount of deposit are collected, CHU will open new fixed deposit account and transfer 50% of deposits to this new account.

CHU will receive interest and this interest will be used for improvement of customer services for Rapid Pass card users. In this Project period total amount of deposits did not reach 500,000 BDT. Therefore, new fixed deposit account was not opened.

3.3.5 Outsourced Company

CHU may outsource some specific works such as system development that requires special

technical knowledge that CHU does not possess and tasks that require extensive number of human resources in short period of time. Basically, these costs shall be estimated whenever needs of outsource arises. In this Project, data entry or other tasks are outsourced by DTCA. In addition, JICA Project Team outsourced system development.

3.3.6 CHU/SPC

The major income sources of CHU are CH fee collected from PTOs and lease installment fee collected from PTOs and Agents. On the other hand, major expenditure items are cost of human resources (CHU staff), equipment cost, Agent fee and outsourcing fee.

Table 3.3-4 shows required number CHU staffs. Cost of staff at initial year is estimated at 25,453,404 BDT per year.

Table 3.3-4 CHU Staff Estimated Cost

Title	Persons	Ave.Salary / Month (BDT)	Yearly Cost (BDT) including One Month Bonus
General Manager	1	250,000	3,250,000
Accounting Manager	1	180,000	2,340,000
Public Relation Manager	1	180,000	2,340,000
Operation Manager	1	180,000	2,340,000
ditto Staff	3	100,000	3,900,000
Programmer (CH)	1	113,444	1,474,766
Programmer (Card Issuer)	1	113,444	1,474,766
Programmer (Data base, Security)	1	113,444	1,474,766
Maintenance Engineer	1	113,444	1,474,766
Assistant Programmer/Maintenance Engineer	6	69,030	5,384,342
Total	17		25,453,404

Source: JICA Project Team

3.3.7 Business Plan

Development of Business Plan was made three times during the Project.

(1) First Business Plan

First Business Plan was developed in 2015 based on the study result of Octopus which is one of the most successful IC cards in the world. In the first Business Plan three deposit cases (300 BDT, 250 BDT and 200 BDT) were compared using number of passengers estimated by MRT passenger demand forecast which Nippon Koei-NK India-DMRC-MOTT India-DDC (NKDM) provided to JICA Project Team. Deposit amount analysis was crucial because once deposit amount is fixed, it is difficult to revise the amount. Deposit amount can be increased in the accordance with inflation indicator by decision of DTCA. In that case, additional system development for functions that rewrite deposit data inside Rapid Pass card and for measures to collect additional deposit amount from existing Rapid Pass users are required.

The Business model was made based on revenue from MRT only. Clearing House fee (3%) from MRT was the main source of revenue. On the other hand, the main costs were staff cost and Agent fee (2%). Since SPASS project required many human resources, CHU have to recruit 100 staff in this model. In addition, this model assumed that 80% of Rapid Pass card holders use Rapid Pass card every day and initial recharge will not be used and retained in the card.

Internal Rate of Return (IRR)s for 20 years are 8% in 200 BDT, 6% in 250 BDT, 5% in 300 BDT based on an assumption that 400,000 Rapid Pass cards will be issued within the year

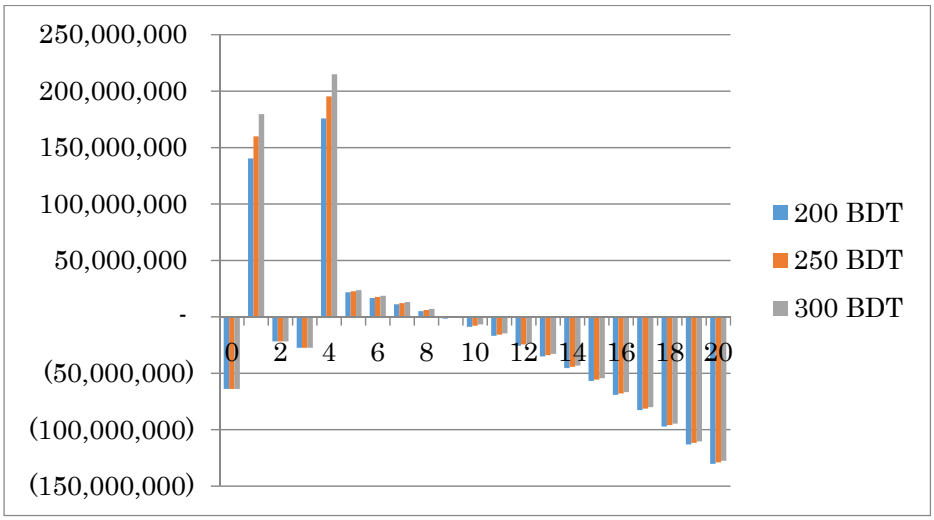
when MRT commence operation. Assumptions adopted in the first Business Plan is shown in **Table 3.3-5**.

Table 3.3-5 Assumptions of First Business Plan

Item	MRT Partial Operation	MRT Whole Operation
Increase Transaction per day	No. No revenue increase to achieve conservative results.	
Transaction by SVC per day	0.32 million (partial)	0.64 million (whole)
Transactions per day/Card circulation %	80%	
Card Circulation	0.40 million (partial)	0.80 million (whole)
Average BDT/Transaction	45 BDT/transaction	
Cost of Card	160 BDT/pcs	
Card deposit at the time of Issue	3 cases, 300 BDT, 250 BDT or 200 BDT	
Stored Value Limit	2,000 BDT	
Negative Value limit	100 BDT	
Clearing House Fee (CH Fee)	3.0%	

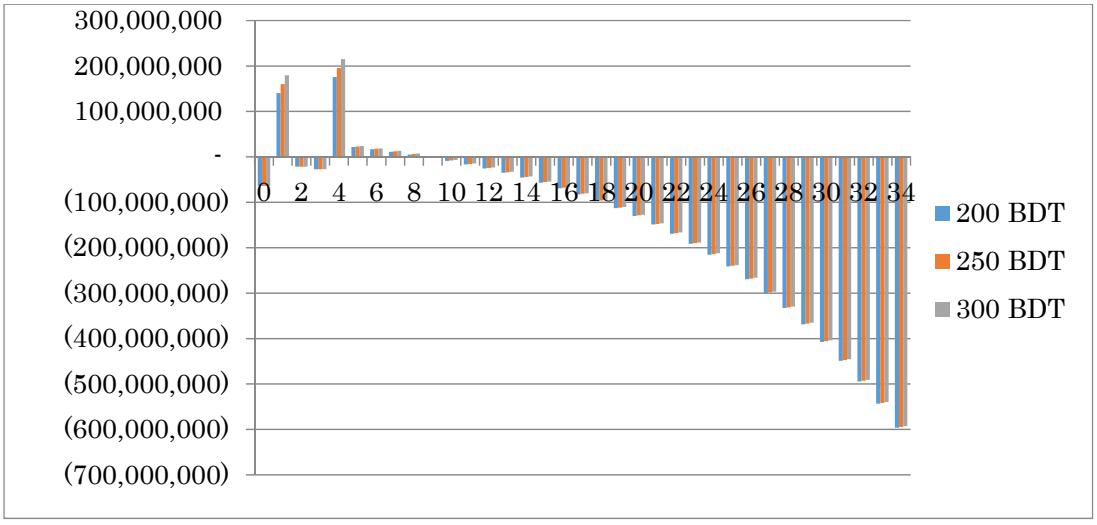
Source: JICA Project Team

Figure 3.3-2 and **Figure 3.3-3** show estimated cash flows of first Business Plan for 20 years and for 34 years with comparison of deposit amount for 200 BDT, 250 BDT and 300 BDT.



Source: JICA Project Team

Figure 3.3-2 Cash Flow by Deposit Amount (20 years)



Source: JICA Project Team

Figure 3.3-3 Cash Flow by Deposit Amount (34 years)

As shown in the above figures, cash flow will be negative after 10 years. This Business Plan is not practical.

(2) Second Business Plan

Second Business Plan was formulated in 2016 with the feedback of the first Business Plan. In the second Business Plan, three types of Clearing House fee (CH fee) and card usage were examined based on the assumptions shown in **Table 3.3-6**.

Table 3.3-6 Assumptions of Second Business Plan

Item	Quantity/Amount
Increase Transaction per day	7.7%
MRT passengers per day	Based on MRT passenger demand forecast.
Card usage rate %	2 cases 90-70%, 70%
Average BDT/Transaction	30 to 65 BDT/transaction
Cost of Card	280-290 BDT/pcs
Card deposit at the time of Issue	200 BDT
Stored Value Limit	2,000 BDT
Negative Value limit	100 BDT
Clearing House Fee (CH Fee)	4 cases 3.0%, 3.5%, 4.0-3.5-3.0%, 5.0-4.0-3.0%

Source: JICA Project Team

This model also focused on MRT revenue only. Furthermore, Clearing House fee is also the main source of revenue and human resource cost and agent fee are among the main costs. Since human resource cost shares large percentage of CHU cost, CHU recruits only system engineers who take care of Rapid Pass System, clearing and settlement operation and TOM operators in MRT stations. TOM operators for fare collection and TOM operation other than MRT shall be borne by PTOs and Agents.

Figure 3.3-4 and **Figure 3.3-5** show estimated cash flows of second Business Plan for 20 years and for 26 years with comparison of variations of CH fee amount and card usage rate.

Six cases of card usage rate/CH fee were examined and corresponding IRR for 20 years were calculated as follows;

Case-1: Card usage rate/CH fee of 90-70%/3.0%, IRR=-16%

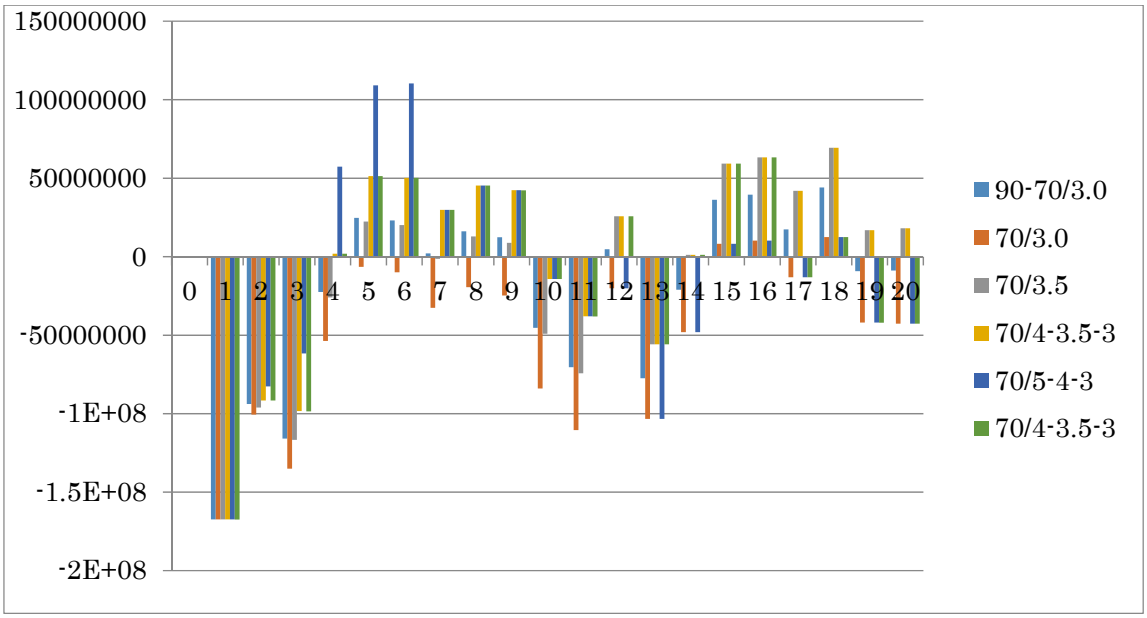
Case-2:, Card usage rate/CH fee of 70%/3.0%, IRR= not calculated

Case-3: Card usage rate/CH fee of 70%/3.5%, IRR=-5%

Case-4: Card usage/CH fee of 70%/4.0-3.5-3.0%, IRR=1%

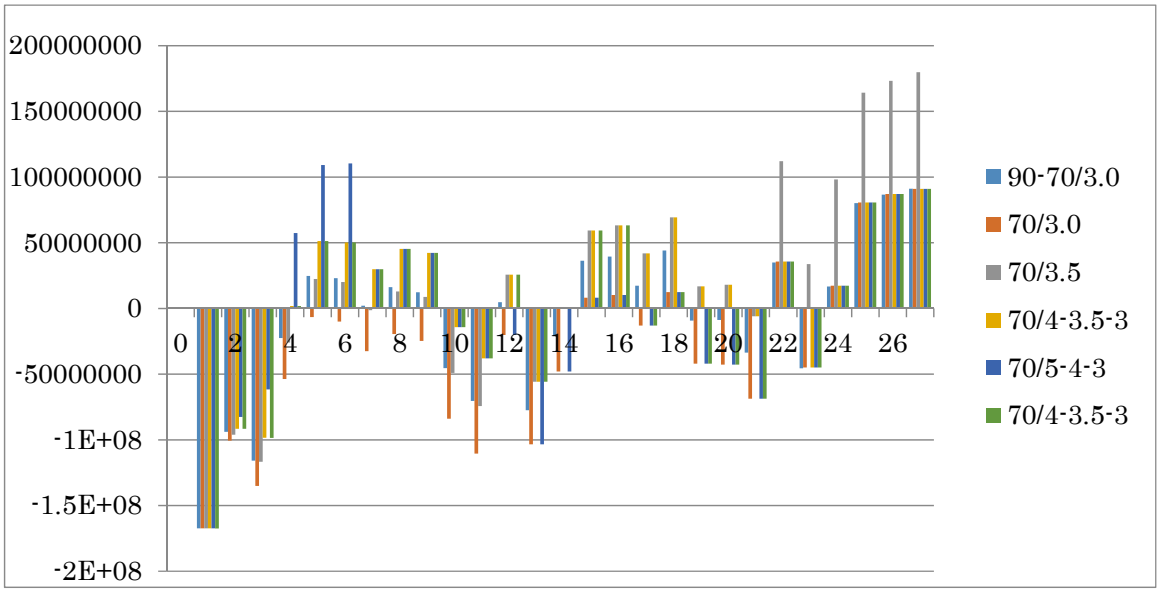
Case-5: Card usage/CH fee of 70%/5.0-4.0-3.0%, IRR not calculated

Case-6: Card usage/CH fee of and 70%/4.0-3.5-3.0%, IRR not calculated.



Source: JICA Project Team

Figure 3.3-4 Comparison of Cash Flow by Card Usage/CH Fee (20 years)



Source: JICA Project Team

Figure 3.3-5 Comparison of Cash Flow by Card Usage/CH Fee (26 years)

Profit of CHU will increase gradually. This figure implies that Clearing House fee and card usage rate are crucial factors for sustainability of CHU business.

(3) Third Business Plan

Third Business Plan was developed in 2018 with the feedback of the second Business Plan, result of the Pilot Project and the plan for establishment of SPC. In the third Business Plan, SPC that is 100% owned by government and Public-Private Joint Venture SPC are examined based on the assumptions shown in **Table 3.3-7**.

Table 3.3-7 Assumptions of Third Business Plan

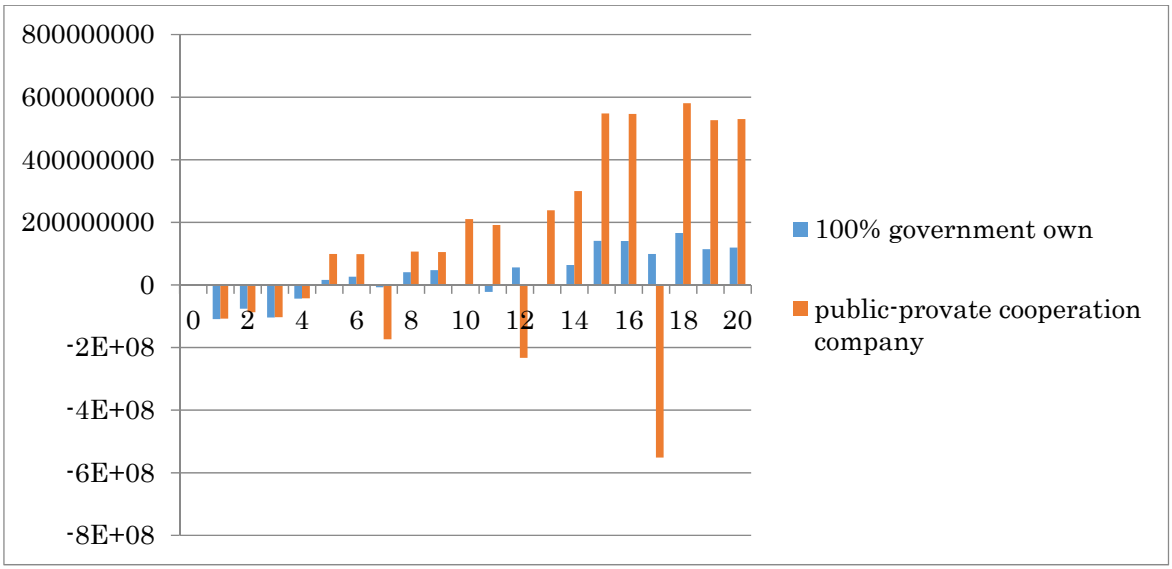
Item	100% Government Owned Company	Public-Private Cooperation Company
Increase Transaction per day	7.7%	
MRT/BRT passengers per day	Based on MRT passenger demand forecast. Based on BRT passenger demand forecast.	
Card usage rate %	10-50%	10-60%
Average BDT/Transaction	30 to 65 BDT/transaction	
Cost of Card	225 BDT/pcs	
Card deposit at the time of Issue	200 BDT	
Stored Value Limit	2,000 BDT	
Negative Value limit	100 BDT	
Clearing House Fee (CH Fee)	3.0%	

Source: JICA Project Team

In this model also Clearing House fee is the main source of revenue and human resource cost and Agent fee are among the main costs. This model focused on revenues from MRT, BRT and other PTOs. After acquiring feedback from Pilot Project, JICA Project Team realized that increasing card usage rate before commencement of BRT, MRT operation is difficult. JICA Project Team also found out from the experiences in foreign countries that card usage rate will increase slowly without participation of private sector in Clearing House operation.

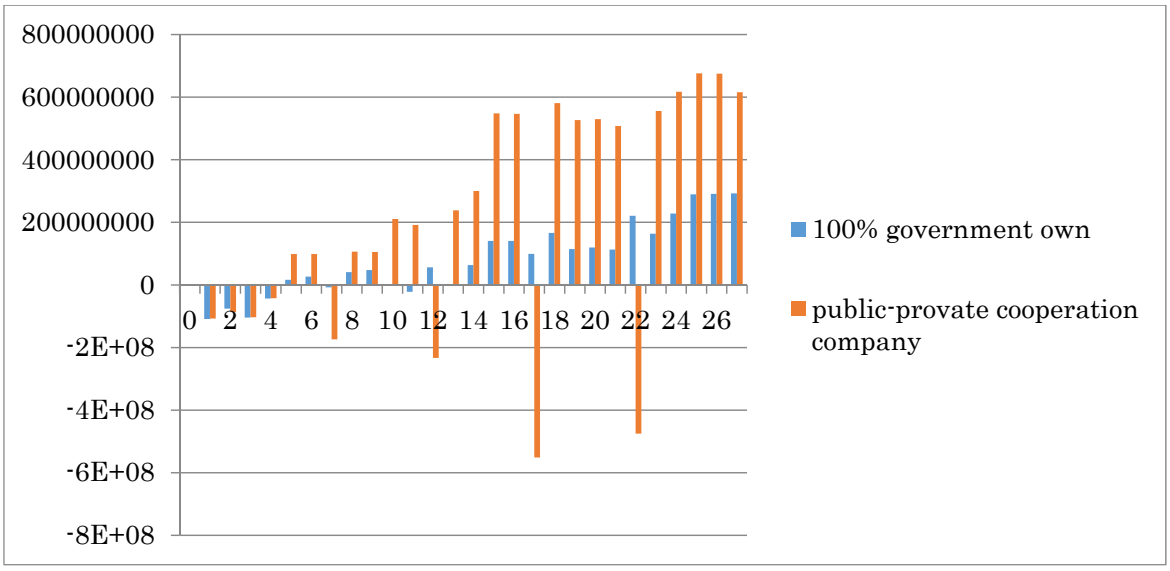
IRRs for 20 years are 8% in case SPC is 100% government owned and 20% in case SPC is Public-Private Joint Venture.

Figure 3.3-6 and **Figure 3.3-7** show estimated cash flows of Third Business Plan for 20 years and for 26 years with comparison of 100% government owned SPC and public-private company.



Source: JICA Project Team

Figure 3.3-6 Comparison of Cash Flow by Type of SPC (20 years)



Source: JICA Project Team

Figure 3.3-7 Comparison of Cash Flow by Type of SPC (26 years)

Breakeven point will come 5 years after commencement of operation on the assumption that BRT will start operation from 2019 and MRT commences partial operation from 2020. In case the private sector cooperates with the public sector, the investment will increase. However, revenue will also increase because card usage rate will increase in accordance with investment amount.

In the 21st century PPP for infrastructure will expand all over the world. Public service cannot sustain without private sector cooperation. Transport E-money requires both government guarantees for expanding Rapid Pass System to PTOs and sales know-how of private sector for expanding Rapid Pass card to PTO passengers.

If public-private company is established, Rapid Pass System will cover all over Bangladesh rapidly as it is named.

3.4 [A-3]: Basic Framework for Operators and Contractor (MOU, etc.) is Formulated

Formulation of Basic Framework was made also in three phases. First phase is trial operation under the SPASS Pilot Project with conclusion of MOU with BR and BIWTC as shown in **Appendix A3-1** to **A3-2** because Rapid Pass system was not developed at the initial stage of this Project. Second phase is trial operation under the Rapid Pass Pilot Project with conclusion of MOU as shown in **Appendix A3-3** to **A3-5**. Third phase is commercial operation under the Rapid Pass System with conclusion of PTO Agreement and Agent Agreement as shown in **Appendix A3-6** to **A3-8**.

In addition to above MOUs for Pilot Projects, DTCA concluded “Contract for Clearing House Bank for Clearing, Settlement and related Services of Rapid Pass System” (CH Bank Contract). When Rapid Pass users receive Rapid Pass cards from DTCA or its Agents, they are deemed to agree with conditions of issue for Rapid Pass card. Details of the MOU for above Pilot Projects are discussed in the following sections.

3.4.1 Pilot Project with SPASS Card and E-Ticket

In this Project, the Pilot Projects for SPASS card and E-ticket fare collection were implemented

for two PTOs which are Bangladesh Railways with SPASS card and E-ticket and BIWTC with E-ticket only. In this Pilot Project, JICA procured a local service provider (N-Wave BD) and conducted trainings for fare collection operation and ticket sales (IC card and E-ticket). Since SPASS system has E-ticket function, it could handle all fare collected by PTOs but SPASS card was not used by BIWTC because operation of SPASS card had been terminated before Pilot Project started with BIWTC and only E-ticket fare collection was implemented.

Basic framework of this SPASS Pilot Project is discussed in the following sections.

(1) BR Pilot Project Phase 2

SPASS system was first introduced to BR under the "Project for Improving Fare system of Mass Transportation in Dhaka City Area through ICT" in 2013 and Pilot Project Phase 1 was implemented. Upon request from BR, the MOU for Pilot Project Phase 2 by SPASS system was concluded among JICA, DTCA and BR on 17th November 2014 under the Basic Framework of SPASS Pilot Project. **Table 3.4-1** shows summary of Basic Framework of SPASS Pilot Project with BR.

Detailed course of BR Pilot Project is described in Activity C-1. Through the Pilot Project, JICA Project Team discovered 99% of fare payment was done by E-ticket payment and revision of SPASS system was required to print out E-tickets with required format of BR.

Table 3.4-1 Basic Framework of SPASS Pilot Project

Task	Responsible Agency
Clearing/Settlement function and card issuer function	DTCA
Equipment for fare collection operation	DTCA/JICA
Equipment for TOM operation	DTCA/JICA
SPASS system	JICA
Fare collection operation through SPASS system	PTO
TOM operation through SPASS system	PTO
E-ticket sales through SPASS system	PTO
SPASS system monitoring and maintenance	JICA (local service provider)
Training for PTOs	JICA (local service provider)
Training for DTCA	JICA (local service provider)
Provision of ticket shops	PTO

Source: JICA Project Team

Although records of fare collection by SPASS system was useful for BR management, reduction of workload was not significant since E-ticket fare collection was major transaction.

(2) BIWTC Pilot Project

MOU of Pilot Project for fare collection by E-ticket system was concluded among JICA, DTCA and BIWTC on 1st September 2015. In the BIWTC trial operation, many system revisions were required to print out E-tickets resembling the paper ticket currently BIWTC is using. Implementation of Pilot Project was terminated due to lack of readiness for introduction of E-ticketing system to BIWTC especially field staff who were responsible for fare collection.

3.4.2 Trial Operation under the Rapid Pass Pilot Project

In this Project, the Pilot Project for Rapid Pass card was implemented under MOU for three PTOs which are BRTC, Omama International (Pvt.) Ltd. (Omama) and Dhaka Chaka Co. Ltd.

(Dhaka Chaka). These PTOs were selected on the basis of criteria that PTOs had company registration, trade license and legal route permission, operated air-conditioning buses in the major routes in Dhaka city and had any route transit connectivity to BRTC Abdulahpur to Motijheel route which was selected at first time because of Rapid Pass user can use their card in different routes. Unlike SPASS Pilot Project, Rapid Pass System is more focused on transactions using Rapid Pass card and omitted E-ticket payment. In addition, JICA Project Team provided ticket shop security measures and TOM operators for easy introduction of Rapid Pass System by reducing extra burden to PTOs.

It was expected that PTOs would understand Rapid Pass System and would operate both fare collection by handy R/W and Rapid Pass card issuance and recharge by TOM by themselves with conclusion of PTO Agreement and Agent Agreement. In this Pilot Project, JICA procured local service provider (NE3JV) and conducted trainings for fare collection and Rapid Pass card issuance and recharge.

Summary of Basic Framework for this Rapid Pass Pilot Project is presented in **Table 3.4-2**. More detailed Pilot Project with each PTO is discussed in the following sections.

Table 3.4-2 Basic Framework of Rapid Pass Pilot Project

Task	Responsible Party
Clearing/Settlement function and card issuer function	DTCA
Equipment for fare collection operation	DTCA
Equipment for TOM operation	DTCA
Rapid Pass System	JICA
Fare collection operation through Rapid Pass System	PTO
TOM operation through Rapid Pass System	PTO/DBBL/JICA (local service provider)
Rapid Pass System monitoring and maintenance	DTCA
Training for PTOs	JICA (local service provider)
Training for Agent	JICA (local service provider)
Training for DTCA	JICA (local service provider)
Provision of ticket shops	PTO/DTCA
Ticket shop security measures	JICA

Source: JICA Project Team

(1) BRTC

MOU of trial operation for fare collection by Rapid Pass System was concluded among JICA, DTCA and BRTC on 11th April 2017 under the Basic Framework of Rapid Pass Pilot Project. Although BRTC had installed SPASS system under the previous project, BRTC had little knowledge of fare collection operation through IC card and issuance and recharge of IC card because these operations were implemented by N-Wave BD.

Therefore JICA, DTCA and BRTC decided JICA and JICA Project Team to bear costs for operation and security measures for issuance and recharge of Rapid Pass System and provision of assistance for operation of fare collection through Rapid Pass card by BRTC.

(2) Omama

MOU of trial operation for fare collection through Rapid Pass System was concluded between JICA, DTCA and Omama on 16th May 2017 under the Basic Framework of Rapid Pass Pilot Project. Since Omama operated almost the same route with BRTC, ticket shops for Rapid Pass issuance and recharge were shared with BRTC.

(3) Dhaka Chaka

MOU of trial operation for fare collection through Rapid Pass System was concluded among JICA, DTCA and Dhaka Chaka on 18th December 2017 under the Basic Framework of Rapid Pass Pilot Project except TOM operation. The TOM operation for Dhaka Chaka trial operation commenced after the conclusion of Agent Agreement. In this Agent Agreement lease installment was exempted during the Pilot Project period.

3.4.3 Agent Agreement

The Agent Agreement provides Basic Framework for Rapid Pass card issuance and recharge (TOM operation). This agreement is concluded between DTCA and Agent (not only PTOs). Agents provide Rapid Pass card issuance and recharge service, subject to receive 0.83% of deposit amount and recharge amount as an Agent fee. DTCA leases out TOM and related equipment to the Agent.

CH Bank is also one of the Agents. Basic framework of Agent Agreement is summarized in **Table 3.4-3**.

Table 3.4-3 Basic Framework of Agent Agreement

Task	Responsible Party
Clearing/Settlement function and card issuer function	DTCA
Equipment for TOM operation	PTOs (leased from DTCA)
Rapid Pass System	DTCA
TOM operation through Rapid Pass System	Agent
Cash transfer to CH Bank	Agent
Rapid Pass System monitoring and maintenance	DTCA
Training for Agent	DTCA
Provision of ticket shops	Agent
Agent fee payment	DTCA

Source: JICA Project Team

The PTOs which concluded Agent Agreement is shown in **Table 3.4-4**.

Table 3.4-4 List of Agent

Company Name	Signing Date
Dhaka Chaka	18th December 2017
HR transport Ltd.	17th April 2018

Source: JICA Project Team

3.4.4 PTO Agreement

PTO Agreement stipulates the Basic Framework for fare collection operation through Rapid Pass System (handy R/W operation). This agreement is concluded between DTCA and PTO. DTCA provides clearing and settlement service, subject to receive the CH fee from settlement amount. Amount of CH fee is determined by negotiation between DTCA and PTOs. DTCA leases handy R/W to PTOs.

Basic framework of PTO Agreement was shown in **Table 3.4-5**.

Table 3.4-5 Basic Framework of PTO Agreement

Task	Responsible Party
Clearing/Settlement function and card issuer function	DTCA
Equipment for fare collection operation	PTO
Rapid Pass System	DTCA
Fare collection operation through Rapid Pass System	PTO (leased from DTCA)
Rapid Pass System monitoring and maintenance	DTCA
Training for PTOs	DTCA
CH fee payment	PTO

Source: JICA Project Team

The companies which concluded PTO Agreement are shown in **Table 3.4-6**.

Table 3.4-6 List of PTO which Concluded PTO Agreement

Company Name	Signing Date
BRTC	17th April 2018
HR Transport Ltd.	17th April 2018

Source: JICA Project Team

3.4.5 CH Bank Contract

Six kinds of Bank accounts are necessary for Rapid Pass System as shown in **Table 3.4-7**.

Table 3.4-7 List of Accounts for CHU Operation

Bank Account	Explanation
Deposit Account	DTCA and Agent transfer deposit amount of cash collected from Rapid Pass users. In case recharge account is being shortage, money is transferred from Deposit Account to Recharge Account.
Recharge Account	DTCA and Agent transfer recharge amount of cash collected from Rapid Pass users. Settlement money is transferred from Recharge Account to Collection Account.
Collection Account	Settlement money is stored tentatively before sent to each PTO account with deduction of CH fee. CH fee is transferred to CH account upon the settlement.
CH Account	CH fee is transferred from Collection Account to CH Account upon the settlement. This amount is revenue of CHU. Agent fee is transferred from this account to each Agent Account.
PTO Account	This is a bank account each PTO prepares for receiving the settlement money.
Agent Account	This is a bank account each Agent prepares for receiving the Agent fee.

Source: JICA Project Team

CH Bank transfers money from a bank account to other bank account under instructions by DTCA. Deposit money shall be deposited to fixed account of CHU (SPC) and when large amount of deposit has been deposited, CH Bank shall offer the interest to CHU.

In addition, CH Bank will be the leader for the consortium of Agents and has a right to collect membership fee from Agents. However, this membership fee is not being applied currently and has to be reviewed in the future in case of no feasibility.

3.4.6 Condition of Issue of Rapid Pass Card

All Rapid Pass cards are personalized in this Project. When issuing Rapid Pass card, DTCA or Agents request Rapid Pass card users to fill in the registration form and submit to DTCA or Agent. Upon submitting the registration form, the Rapid Pass card user shall be deemed to agree to condition of issues, which is shown in Web page of Rapid Pass card in detail both in English and Bengali.

3.5 [A-4]: PR Strategy is Developed and Implemented

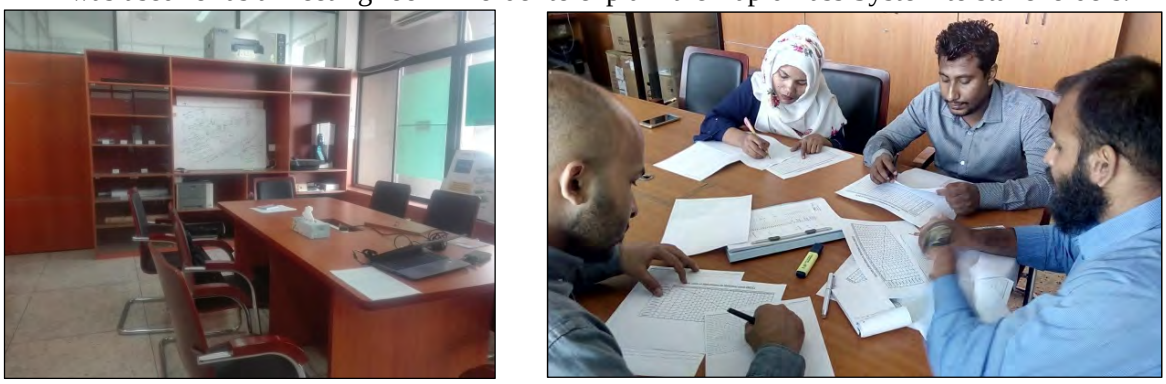
With the successful example of Hong Kong Mass Transit Railway Corporation (MTRC), DTCA planned to procure local Public Relation (PR) consultant before the operation of Rapid Pass card and JICA Project Team would support such information campaign engaged by CHU. However due to delay of TAPP approval, the procurement process of local PR consultant commenced only from 8th August 2017 by issuing first Expression of Interest (EOI) advertisement after the commencement of Rapid Pass Pilot Project. However, this procurement process was suspended because DTCA could not secure the sufficient contract period for the PR consultant due to lack of remaining period of the TAPP. Therefore, DTCA commenced information campaign by itself.

JICA Project Team contacted MRT and BRT regarding their own information campaign, but these two organizations do not have enough human resources to implement information campaign during the Project period. However, some stakeholders such as PTOs and DBBL has implemented information campaign for Rapid Pass.

Information campaign implemented by JICA, JICA Project Team, DTCA and other stake holders are discussed below.

3.5.1 Public Relation (PR) Strategy Room

On July 2014 JICA Project Team renovated DTCA room to PR Strategy Room. In this room Rapid Pass card and train models were exhibited. In addition to displaying purpose, this room was used for as a meeting room in order to explain the Rapid Pass System to stakeholders.



Source: JICA Project Team

Photo 3.5-1 PR Strategy Room

3.5.2 Rapid Pass Card Naming and Design

“Dhaka Card” was initially proposed to ministry as a name for a common IC card used by CHU. However, on 8th April 2015 Honorable Prime Minister Sheikh Hasina named “Rapid Pass” for this card. With this name, image of the IC card would be for nationwide use not used in particular area of “Dhaka”.

Meanwhile JICA Project Team held the card design competition with Department of Graphic Design of Dhaka University asking their students to submit their own card design samples. The competition was held on 18th May 2015. Numerous card designs were submitted to DTCA on 28th May 2015. The most attractive card design was selected and awarding ceremony was held during CH Bank signing ceremony.

Finally, Rapid Pass was inaugurated by Honorable Prime Minister Sheikh Hasina on 4th January 2018. In the inauguration, the first number of Rapid Pass card was presented to the

Prime Minister. This event was reported to all over Bangladesh, which spread reputation of Rapid Pass card across the country.

Source: JICA Project Team

Photo 3.5-2 Ceremony of Award for Design of Rapid Pass

Source: Bangladesh Sangbad Sangstha

Photo 3.5-3 Present Rapid Pass Card to PM

3.5.3 Procurement for PR Consultant

At the initial phase of this Project, DTCA planned and agreed to procure the local PR consultant before commencement of Rapid Pass Pilot Project and JICA Project Team would support information campaign by CHU of DTCA. JICA Project Team prepared TOR for procurement of local PR consultant and submitted to DTCA in July 2016. The fund of TAPP was released in January 2017 and first EOI advertisement for local PR consultant procurement was issued on 8th August 2017. However, the number of companies who submitted EOI was not sufficient. Therefore, second EOI advertisement was issued on 11th November 2017 only six months before the completion of Rapid Pass Pilot Project. This procurement process was cancelled because of insufficient remaining period for PR consultant contract. Therefore, DTCA commenced information campaign by itself.

3.5.4 Information Campaign by DTCA, JICA and JICA Project Team

(1) Media Session

DTCA held the media session of local TV companies on 20th June 2016 with cooperation of JICA. This increased the awareness of Bangladesh people.

(2) Information Campaign at Universities

One of the profitable users of Rapid Pass card is students. DTCA implemented Rapid Pass campaign at the international universities are shown in **Table 3.5-1**.

Table 3.5-1 Information Campaign at International Universities

Name	Date
Manarat International University	29th January 2018 30th January 2018
American International University Bangladesh	31st January 2018

Source: JICA Project Team

Ten cards were issued during these campaigns.

Source: My TV

Photo 3.5-4 Media Session at DTCA

Source: JICA Project Team

Photo 3.5-5 Campaign at Manarat International University

(3) Discount Campaign

During SPASS card period, discount sales were carried out several times. Sometimes, SPASS card was issued for free. However, discounted issue of Rapid Pass card by CHU was difficult because of lack of campaign fund. Therefore, JICA supported the discount campaign. The discounted amount for Rapid Pass card issue was 170 BDT instead of 200 BDT. **Table 3.5-2** shows the list of discount campaigns conducted by CHU with financial assistance from JICA Project Team.

Source: JICA Project Team

Photo 3.5-6 Campaign at Housebuilding, Uttara

Table 3.5-2 List of Discount Campaign Location

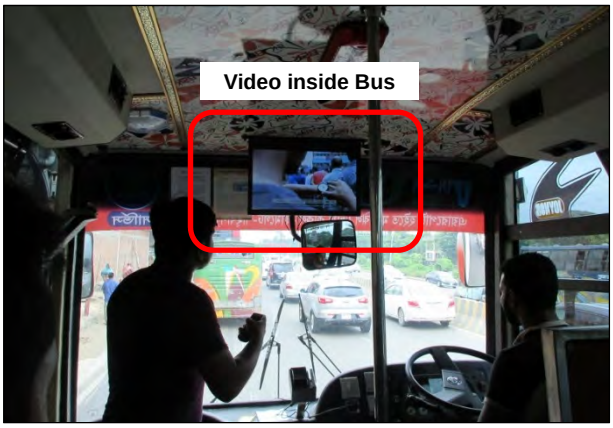
Date	Location	No. of Card Issued
27th Feb (Tue)	Kakoli Bus stop	4
28th Feb (Wed)	Natun Bazar	10
1st Mar (Thu)	Housebuilding	5
4th Mar (Sun)	Natun Bazar	7
5th Mar (Mon)	DNCC	11
6th Mar (Tue)	DNCC	6
7th Mar (Wed)	Natun Bazar	5
11th Mar (Sun)	Natun Bazar	11
12th Mar (Mon)	Natun Bazar	11
13th Mar (Tue)	Natun Bazar	6
14th Mar (Wed)	Kakoli/Banani	4
15th Mar (Thu)	Banani Up in BRTC route	3
18th Mar (Sun)	Banani Up in BRTC route	3
19th Mar (Mon)	Natun Bazar	5
20th Mar (Tue)	DAE, Khamarbari	3
21st Mar(Wed)	DAE, Khamarbari	3
27th Mar(Tue)	Petro Bangla	5
28th Mar(Wed)	Petro Bangla	20
2nd Apr (Mon)	Kakoli Bus stop	1
3rd Apr (Tue)	Bangladesh Power Development Board (BPDB), Motijheel	6
4th Apr (Wed)	Bangladesh Power Development Board (BPDB), Motijheel	2
5th Apr (Thu)	Bangladesh Power Development Board (BPDB), Motijheel	5
10th Apr (Tue)	TITAS Gas	8
11th Apr (Wed)	TITAS Gas	8
17th Apr (Tue)	BSEC Karwan bazar	4
18th Apr (Wed)	BSEC Karwan bazar	1
23rd Apr (Mon)	Circular Bus Route, Hatirjheel	31
24th Apr (Tue)	Circular Bus Route, Hatirjheel	44
Total		**232**

Source: JICA Project Team

3.5.5 Information Campaign by PTOs and Agents

(1) Omama

JICA created video program for Rapid Pass campaign with assistance of Omama. After completion of the video program, Omama broadcasted these videos in their buses.



Source: JICA Project Team

Photo 3.5-7 Rapid Pass Campaign Video in Omama Bus

Source: JICA Project Team

Photo 3.5-8 Campaign by DBBL

(2) DBBL

DBBL also implemented information campaign. Campaign staff wore T-shirts with Rapid Pass card image and distributed brochures to passengers. Locations of information campaign conducted by DBBL are shown in **Table 3.5-3**.

Table 3.5-3 List of Campaign by DBBL

Name	Date
Notun Bazar Bus Stoppage	14th Feb 2018 15th Feb 2018
Banani Bus Stoppage	14th Feb 2018 15th Feb 2018
Gulshan-2 Bus Stoppage	14th Feb 2018 15th Feb 2018
Hatirjheel area	23rd April 2018 24th April 2018

Source: JICA Project Team

3.5.6 Rapid Pass Web Page

For the purpose of promoting Rapid Pass card use, JICA Project Team created a Rapid Pass web page. The URL is printed on the back side of the card. Rapid Pass web page plays a role of sharing information to encourage using of Rapid Pass card. It provides an overview on Rapid Pass card, information of available bus routes and information on the location of the ticket shops. **Figure 3.5-1** shows image of Rapid Pass web page index.

Source: JICA Project Team

Figure 3.5-1 Image of Rapid Pass Web Page Index

JICA Project Team made a promotional sticker printed QR code that can access to Rapid Pass web page for contribution to promotional activity and increase page access. Some stickers distributed at JICA Bangladesh office. **Figure 3.5-2** shows the Image of sticker include QR code.

Source: JICA Project Team

Figure 3.5-2 Promotion Sticker Includes QR Code

3.5.7 Installation of Point System

Introduction of royalty point service or mileage service for frequent users of Rapid Pass card may be one of the most effective PR strategies as widely adopted in developed countries in retailing shops and transport services. However, transport fare in Dhaka is quite small amount compare to other cities in foreign countries. For example, Dhaka Chaka collects only 15 BDT per trip/ride. It may be financially not feasible for CHU to offer such point service to Rapid Pass card users with only CH fee of 2-3% of fare collected by PTOs.

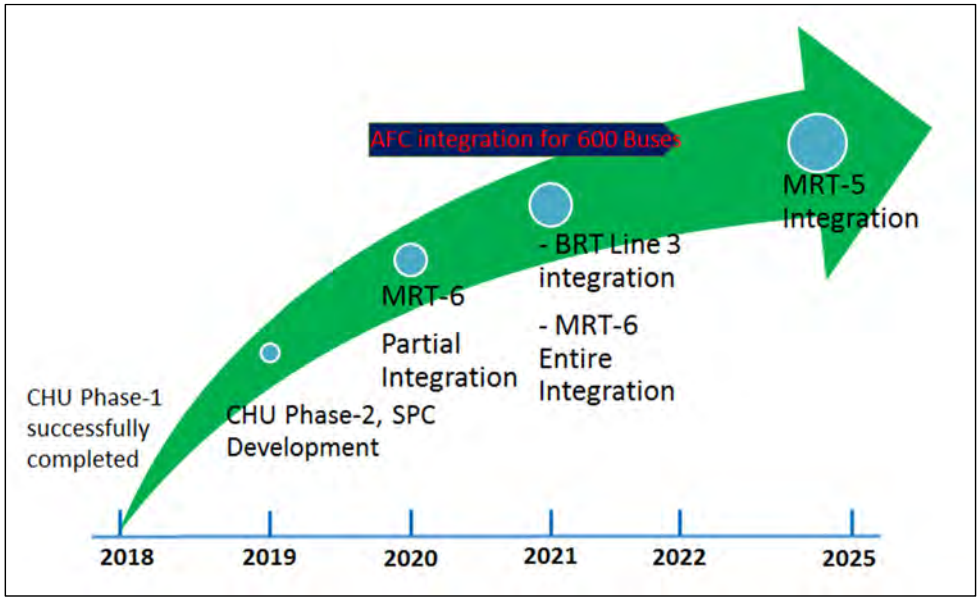
However, if Rapid Pass cards were introduced to relating stores and shops, CHU could consider introduction of point service system because amount used in retailing shops is much higher than the amount used in transport services.

3.6 [A-5]: Long Term Expansion Plan (including BRT, MRT, etc.) is Developed

The activities and achievements on long term expansion plan related to transport services are presented in this section. Activities and achievements on long term expansion plan other than transport services are presented in Activity A-8.

JICA Project Team continuously surveyed PTOs that may be suitable for introduction of Rapid Pass System during the Project period and implemented Pilot Project operation with some of the notable PTOs as described in Activity A-3. From the experiences of the Pilot Projects, it was found that revenue from PTOs other than MRT or BRT is important in order to expand Rapid Pass card to Bangladesh people although revenue from MRT and BRT is far more profitable than other PTOs as shown in Activity A-2. JICA Project Team prepared long term expansion plan which is shown in **Appendix A5-1**.

General view of the road map for expansion of Rapid Pass system is shown in **Figure 3.6-1**.



Source: JICA Project Team

Figure 3.6-1 Load Map for Expansion of Rapid Pass System

3.6.1 MRT

The most important task to secure self-reliant Clearing House operation is to introduce IC card to mass public transport systems such as BRT and MRT. Expected number of BRT and MRT passengers and corresponding fare revenue is significantly higher than that of current bus operators. This increased number of passengers and fare revenue will contribute to financially stable operation of the Clearing House.

JICA Project Team discussed with DMTCL many times in order to obtain information of MRT fare collection plan and arrange how to introduce Rapid Pass System. MRT will commence partial operation in 2019 and full operation in 2020.

An MOU for introduction of Rapid Pass System to MRT-6 which was formulated by JICA Project Team was concluded on March 2016 between DTCA and DMTCL with observation of JICA. This agreement also provided procurement and ownership transfer of Rapid Pass card.

After introduction of Rapid Pass on MRT-6, CHU is planning to introduce Rapid Pass System to MRT-5 which will commence its operation in 2025.

Source: https://www.dmtc.org.bd

Photo 3.6-1 Image of MRT

3.6.2 BRT

JICA Project Team also discussed with DBRT many times in order to obtain information of BRT fare collection plan and arrange how to introduce Rapid Pass System. According to BRT Project Director, operation of BRT would commence in 2019.

A letter was issued by the Project Director of DTCA to request DBRT to conclude MOU with DTCA as DTCA made the agreement with DMTC with consent of ADB. However, DBRT has not yet replied this letter due to internal issues. After response from DBRT, DTCA will commence negotiation for installation of Rapid Pass system.

Source: http://www.dtca.gov.bd/en/

Photo 3.6-2 Image of BRT

3.6.3 Other PTOs in Dhaka City

Prospective PTOs for introduction of Rapid Pass System are as follows.

(1) BRTC

Source: JICA Project Team

Photo 3.6-3 BRTC Bus

The Bangladesh Road Transport Corporation (BRTC) is the state-owned transport corporation of Bangladesh. BRTC was the first Public Transport Operator introduced Rapid Pass System along Motijheel to Abdulahpur. BRTC has many other routes and has intention to expand Rapid Pass card use to other routes.

The number of potential routes for introduction of Rapid Pass System is eight. And total number of required fare collection equipment is estimated at 257 and total number of TOM is 18. Introduction of Rapid Pass System to other routes will take place in between 2018 to 2021 gradually.

(2) Omama

Omama is a newly established private bus company and its commercial operation started in the middle of 2017. Omama was the second Public Transport Operator that introduced Rapid Pass System along Motijheel to Abdulahpur. It also has Ext. route up to Maoa.

Total number of required fare collection equipment is 58 and total number of TOM is 2. Introduction of Rapid Pass System is expected in between 2018 to 2019.

Source: JICA Project Team

Photo 3.6-4 Omama Bus

(3) Dhaka Chaka

Source: JICA Project Team

Photo 3.6-5 Dhaka Chaka Bus

Dhaka Chaka is a private bus company that provides transport service since 2016 in Gulshan area. Dhaka Chaka was the third Public Transport Operator that introduced Rapid Pass System on Kakoli to Natun Bazar and Gulshan 2 to Shooting Club. It also has two other routes.

Total number of required fare collection equipment is 131 and total number of TOM is 5. Introduction of Rapid Pass System will be in between 2018 to 2020.

(4) HR Transport Ltd.

Hatirjheel is a lakefront area in Dhaka that has been transformed into a transportation medium for mitigation of traffic congestion around the area. The area was constructed by Special Works Organization (SWO) under Bangladesh Army and the. HR Transport operated bus services in this area.

Total number of required fare collection equipment is 42 and total number of TOM is 3. Installation will be implemented in between 2018 to 2019.

Source: JICA Project Team

Photo 3.6-6 HR Transport Bus

(5) Sheetal Transport Ltd.

It operates Gulisthan inside Dhaka City to Narayonganj outside Dhaka City. Total number of required fare collection equipment is 47 and total number of TOM is 1. Installation will be implemented in between 2018 to 2019.

Source: JICA Project Team

Photo 3.6-7 Sheetal Transport Bus

(6) Water Bus Service

Water bus service is operated by Karim Group. Total bus stoppage is four.

Source: JICA Project Team

Source: Courtesy of Karim Group

Photo 3.6-8 Water Bus Service

Average passenger per day is 6,000 to 7,000 in weekdays and 3,000 to 5,000 in weekends Average sales per day is 150,000 BDT. Introduction of Rapid Pass System is expected to be in between 2018 to 2019.

(7) Bus Route Franchise (BRF) under DTCA

DTCA is working on Bus Route Franchise concept to minimize traffic jam and undisciplined driving manner. If BRF is commenced, Rapid Pass System will be installed along the route of Abdullahpur to Azimpur via Bijoyshoroni. Total number of required fare collection equipment is 105 and total number of TOM is 1. Expected installation year may be 2021.

3.6.4 PTOs Outside Dhaka City

World Bank Group held a work shop for “Chittagong Strategic Urban Transport Master Plan”. In the project of WB, the feasible study for installation of transport E-money was implemented and WB contacted with JICA project team. WB informed the demands for installation of Rapid Pass card in the Chittagong City and expressed positive opinion for unifying transport E-money by Rapid Pass.

3.6.5 Toll Gate

Bangladesh has five toll bridges at three toll roads. Some of toll gate has already installed IC card.

(1) Meghna Gomti Bridge

Meghna Gomti Bridge is located on 30 kilometers southeast of Dhaka across the Meghna River.

Source: JICA Project Team

Source: Google Map

Photo 3.6-9 Meghna Bridge Toll Gate

Computer Network System Limited and NRB Bank Limited operate toll gate of this bridge. Average transaction per day is 18,000 and average sales per day is 15,800,000 BDT.

Touch and Go system using IC card (different from Rapid Pass card) has been already installed on this bridge, however actual operation has not commenced yet.

Source: JICA Project Team

Source: NRB Bank Limited

Photo 3.6-10 Touch and Go System on the Meghana Gomti Bridge

It is systematically possible to integrate the Rapid Pass System at the current Meghna Gomti Bridge system. In case Rapid Pass System is introduced on this toll gate, development and integration of the system will be required. Detailed feasible study for commercial operation of

Rapid Pass card on this Bridge may be needed to verify commercial viability of Rapid Pass System outside Dhaka.

(2) Jatrabari-Gulistan Flyover (Mayor Mohammad Hanif Flyover)

Jatrabari-Gulistan Flyover is located on southern part of Dhaka City near DTCA office. Orion Group constructed this flyover and operates fare collection.

Source: http://www.orion-group.net/concern/gallery/17/mayor-mohammad-hanif-flyover

Photo 3.6-11 Jatrabari-Gulistan Flyover Toll Gate

Touch and Go system and Electronic Toll Collection (ETC) system were installed on this flyover with technical cooperation of French company G.E.A. currently Touch and Go system for Jatrabari-Gulistan Flyover supports only Type A and Type B of Near Field Communication (NFC) and does not support FeliCa.

Source: JICA Project Team

Photo 3.6-12 Touch and Go System on the Jatrabari-Gulistan Flyover

Replacement of current IC card is required in order to install Rapid Pass card on Touch and Go system. And installation of car devices which can read and write Rapid Pass cards and emit necessary electromagnetic wave to the gate is required in order to make Rapid Pass card usable for ETC system. However, a considerable investment is required to change in IC card.

3.7 [A-6]: Additional Transport Service (monthly pass, discount ticket, online recharge) is Studied

Additional transport service was studied based on Hong Kong Octopus card model. The study result is discussed in the following sections.

3.7.1 Monthly Pass and Discount Ticket

Usually transport operators provide various types of fare services such as monthly and/or season pass, coupon/discount ticket etc. Some governments in the world provide subsidy to fare discount services because these fare discount services have close relation to modal shift from private transport means to public transport means. Since the mandate of CHU is mainly clearing and settlement of transport fares, cost of these discount services shall not be borne by CHU but should be borne by transport operators. JICA Project Team designed Rapid Pass card to secure memory field to accommodate such additional services in order to allow Rapid Pass card users to utilize transport E-money and other discount services through one card.

3.7.2 Online Recharge

Transaction data of Rapid Pass System is usually transmitted from handy R/W to data server through the internet. However, handy R/W has a function to store transaction data temporarily in its memory and can continue its operation without the internet connection. This data storage function is useful in Bangladesh where internet connection is not stable.

Auto recharge from credit card to add monetary value in IC card is technically possible, but system for instant credit authorizations must be established between credit card companies and CHU. Considering low rate of credit card use and absence of instant card authorization system in Bangladesh, auto recharge is too early to be introduced as of this time.

In the recent years smart phones are common in Bangladesh, some of which have no FeliCa chips, but have NFC functions. If a system that can handle NFC function in smart phone is developed, CHU will be able to provide Rapid Pass users with recharge function via these NFC smart phones and Rapid Pass users will be able to recharge each other through the smart phones.

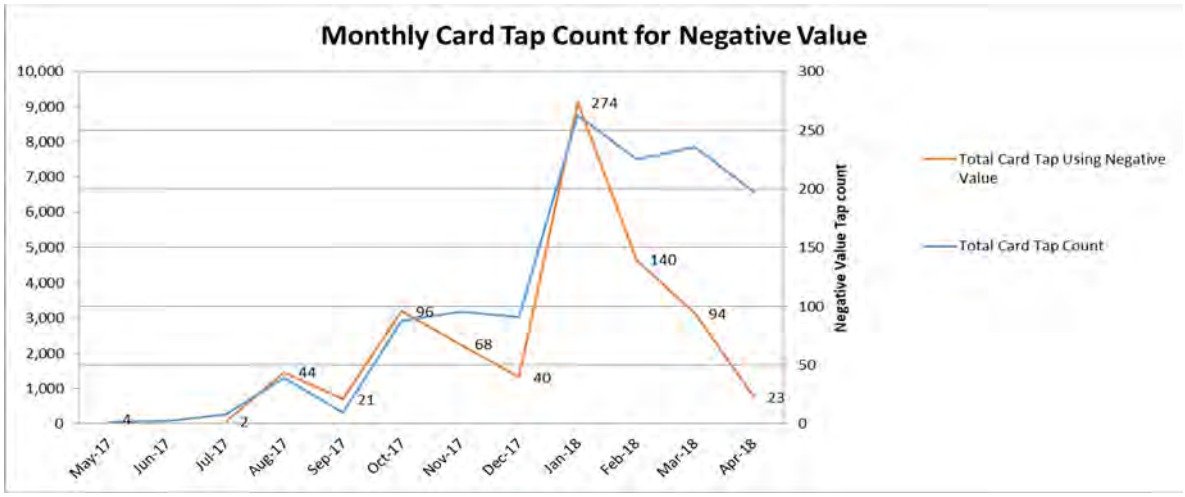
3.7.3 Negative Value Service

Negative Value function was developed and was installed on Rapid Pass System successfully. 100 BDT among 200 BDT of deposit amount can be used for negative value. Even if passengers with insufficient card balance ride on the bus or enter the station, they can settle using the negative value from the exit of the bus or the station and will be able to get on the train or bus beyond section entitled by the commuter pass or the day ticket. This enables stations to have no settlement machine if negative value amount is sufficient for settlement.

However, negative value service is one-time service, in case the passengers board buses or enter station premises with negative value they are required to recharge Rapid Pass first. After recharging Rapid Pass card, passengers can avail negative value service again.

JICA Project Team considered all feasibilities for installation of additional services in the world and concluded that negative value is the most effective function for Bangladesh. JICA Project Team proposed negative value as an additional transport service in ERQ. It was approved by DTCA on 11th November 2014 and JICA project team developed the negative value function.

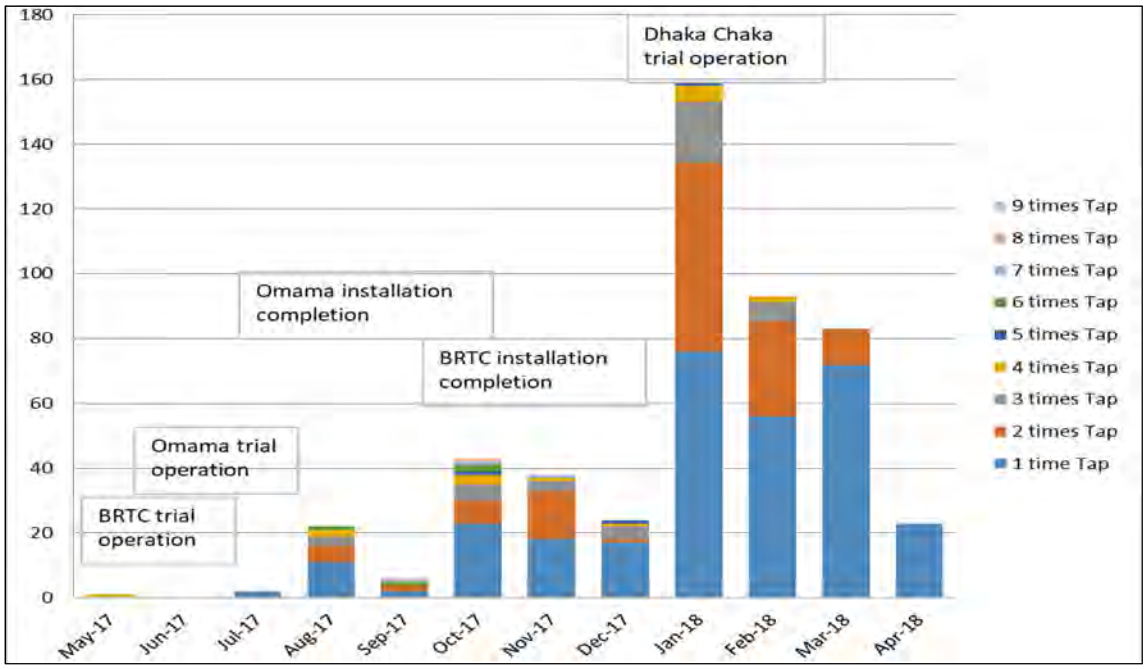
Through this Project it was found that at most 10% of tap count was negative value usage as shown in **Figure 3.7-1**.



Source: JICA Project Team

Figure 3.7-1 Monthly Card Tap Count for Negative Value

Figure 3.7-2 shows the number of people by frequency of negative value usage.



Source: JICA Project Team

Figure 3.7-2 Month Wise Negative Value User Chart

Negative value usage increased rapidly when new PTOs installed Rapid Pass System. BRTC completed installation of Rapid Pass system in October 2017 although Pilot Project officially started in May 2017. Omama completed installation of Rapid Pass system on August 2017 although trial operation officially started in June 2017. It can be observed that at the beginning, passengers recharged small amount and recharged again after using negative value. However, after using Rapid Pass several times, as passengers get used to using Rapid Pass card, they start recharging much higher amount per time and recharge again before availing negative value.

In order to expand the Rapid Pass card and its convenience, it can be concluded that it has some good effects on providing negative values as a remedy to beginners.

100 or 200 BDT of negative value may not be sufficient for the fare of MRT, BRT or other

PTOs if transport fare increases in the future. Auto recharge system should be considered for Rapid Pass users' convenience.

3.8 [A-7]: Data Analysis Strategy for Future Transportation Plan is Developed

Data Analysis strategy for Future Transportation Plan was developed after collection of information from other countries where integrated ticketing systems with IC cards is used and obtaining actual data from Rapid Pass System as shown in **Appendix A7-1**.

Rapid Pass system stored vital information regarding Origin - Destination (OD) data and trip pattern data of Rapid Pass card users. When ICT fare system adopts by numerous PTOs in the future, so called "big data" will be available, which can be utilized for formulation of variety types of marketing strategies such as analysis of profitability for opening new stores, opening new stations or new lines etc. In this Project, around 40,000 OD data was collected through Rapid Pass System. Although current OD data amount is small, some tendencies of passengers' behavior could be identified.

3.8.1 Privacy Protection Law in Bangladesh

Privacy Protection Law was enacted in many developed countries. However, Bangladesh has not enacted such regulation yet. Some of Bangladesh people recognize necessity for privacy protection. Therefore, some organizations in Bangladesh decide on their privacy protection policies such as banks, mobile phone operators and utility service-oriented companies and publish these policies on their web page.

JICA Project Team created draft of Rapid Pass privacy policy and submitted to DTCA. This will be uploaded on the Web page of Rapid Pass with condition of issuance after approval from ministry.

3.8.2 Extracted OD Data

JICA Project Team collected OD data and created OD matrix for BRTC and Omama. Only Originating data was collected from Dhaka Chaka because one tap operation is applied to Dhaka Chaka.

3.8.3 Data Analysis Seminar

Data analysis seminar was held on 9th October 2017 with attendance of Road Transport and Highway Division (RTHD), PTOs and CH Bank. The presentation in the seminar had case references from three countries which are Japan, United Kingdom and United States.

JICA Project Team concluded that OD data contribute to provision of new transport services and optimization of transport management if these data are open to public with consideration about privacy information protection.

Source: JICA Project Team

Photo 3.8-1 OD Data Seminar in DTCA

3.9 [A-8]: Future Expansion Plan (apply to other sectors such as e-money, mobile phone) is Studied

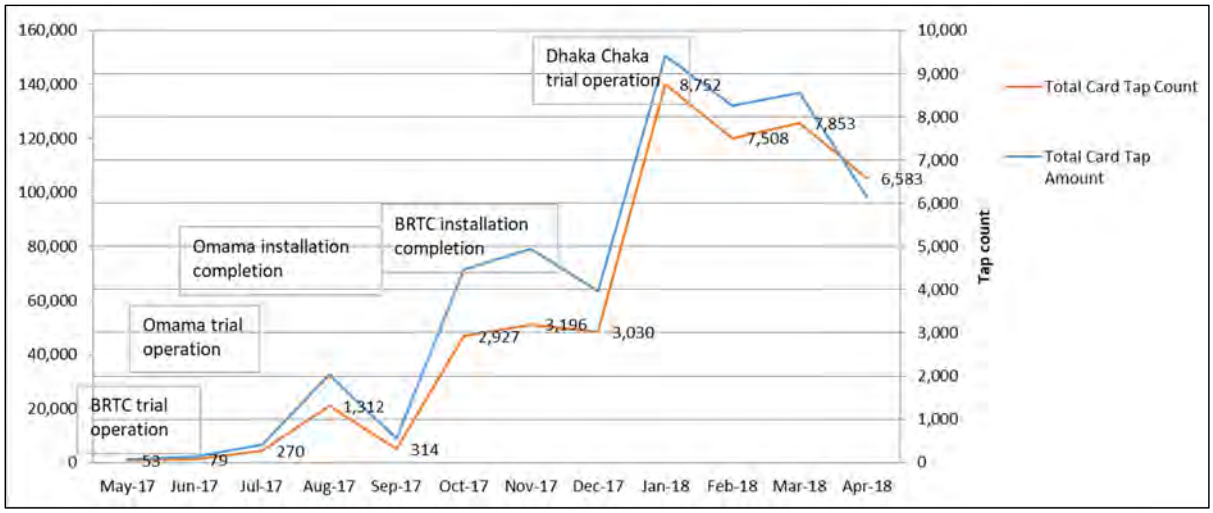
In this section, activities and corresponding achievements that have no direct relation to public transport is discussed. JICA Project Team surveyed Bangladesh social conditions and prepared future expansion plan as shown in **Appendix A8-1**. This information was continuously shared with DTCA. Main topics for future expansion plan is discussed in the following sections.

3.9.1 E-Money for Retail

In the future, SPC will be established under supervision of DTCA. The SPC shall have self-reliant operation without relying on any government subsidy and/or external assistance. To attain self-reliant operation, E-money may be one of the most profitable businesses in Dhaka. Since CHU is responsible for procurement of IC cards, recovery of such procurement cost can be partly covered by E-money business because this type of business can be started with relatively small amount of initial investment. Therefore, Rapid Pass card data format has designed in order to secure necessary fields for E-money business.

(1) The Benefit for Supporting Retailer Payment

Figure 3.9-1 shows monthly card tap count and amount obtained from Pilot Project. The amount of transaction and revenue increased rapidly when new PTOs installed Rapid Pass System. The same trend can be observed when mutual use of Suica card and Pasmo card (both are major transport E-money operators in Japan.) commenced in 2007. Suica card transaction increased sharply and steadily increased thereafter. One of the reasons is Suica card and Pasmo card had already commenced retailer use. Suica card commenced its service from 2001 and supported retailer payment from 2004. Pasmo card commenced its service with retailer payment service. Retailer use contributes continuous increase of IC cards area, while new PTO participation derives rapid increase of IC card users.



Source: JICA Project Team

Figure 3.9-1 Monthly Card Tap Count and Amount

It can be concluded that introduction of E-Money for retailers may be crucial for stable sustainability for Clearing House business.

(2) Road Map

Rapid Pass business designed based on the experiences of Octopus card which is one of the most

successful transport E-Money in the world. Octopus commenced its service from 1997 and also supported retailer payment from 2000.

Rapid Pass card commenced its trial operation from 2017 and it is better to support retailer payment until 2020 when MRT full operation commences. In addition, it will take at least six months for the development of E-Money function. However, the negotiation with retailers will require a business-oriented person different from that of PTOs. Therefore, establishment of business oriented public-private SPC is crucial to enter into E-money business.

3.9.2 Mobile Phone

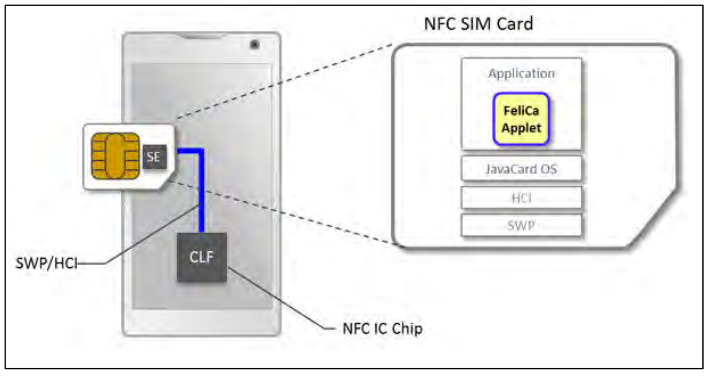
Only mobile Suica of Japan Railway (JR) East provides mobile phone services in Japan. Main three mobile phone companies in Japan, NTT Docomo, au and Soft Bank, are selling cell phones with FeliCa chip embedded. I-Phone of Apple also commenced supports for mobile phone service from 2016 only in Japan.

(1) Walton

At the initial period of this Project, JICA Project Team had meeting with Walton, one of the largest mobile phone vendors in Bangladesh. JICA Project Team submitted a proposal which contains basic information of mobile IC Chip applications in general on 3 July 2014. However, they did not express their interest in this proposal. At that time NFC was not so familiar in Bangladesh and Walton could not earn profit from NFC business. However, currently Walton commenced sales of mobile phone with NFC function (Not FeliCa chip) although available models are limited.

(2) FeliCa Chip / FeliCa SIM

In Japan, Suica provides mobile phone service on the platform of so called “Osaifu Ketiai” (means wallet phone) which SONY and DoCoMo developed. This platform requires FeliCa chip in the smart phone. However no smart phones in Bangladesh is equipped with FeliCa chip because installation of FeliCa chip on these smart phones will entail cost increase by 5 to 10 United States Dollar (USD).



Source: https://www.sony.net/SonyInfo/News/Press/201310/13-137E/

Figure 3.9-2 FeliCa-Compatible NFC SIM

SONY has also developed a SIM card with FeliCa chip which has been already installed on Octopus system in Hong Kong. And FeliCa-compatible SIMs will also cost 5 to 10 USD higher than other SIMs.

(3) Recharge through Smart Phone

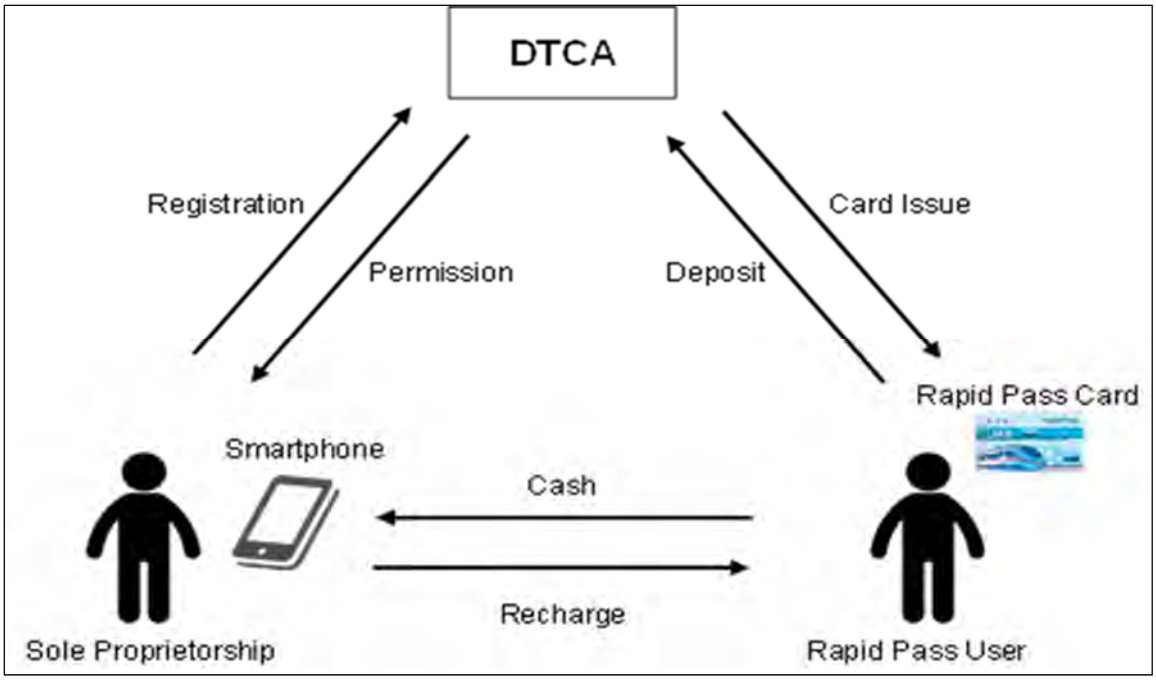
Payment by the smart phone with FeliCa chip/Subscriber Identity Module (SIM) is not much more attractive for Rapid Pass users than payment by Rapid Pass card because Rapid Pass card payment is sufficiently fast and easy. However, considering recharge through smart phones, the

convenience for Rapid Pass users will be largely increased. Through this Project, it was found that securing appropriate recharge shops is one of the most serious issues. Maintenance of the ticket shop costed around 70,000 BDT per month per one ticket shop for accommodation, human resource, equipment and other expenses if the ticket shops to be installed at convenient location for Rapid Pass users.

Therefore, ticket shop location is limited to some DBBL branches which are not convenient to Rapid Pass users or some bus stops which have many passengers. This problem may impede Rapid Pass card expansion.

In Japan, Hong Kong and other developed countries, auto recharge service provides the solution for this problem. However, credit card is not widely used in Bangladesh. Cash payment is still dominant while the trend for payment using mobile banking remittance has been emerged such as B-Kash and Rocket service since 2012.

Recently some collection agencies such as Square and Coiney provide retail shops with payment service by application software working on smart phones. This payment method is different from mobile banking remittance service mentioned in **Figure 3.9-3**. Basically, this payment method follows traditional payment on the Point of Sales (POS) terminals and they provide the service only through credit card reader. If Clearing House is able provide recharge service on smart phones, new business model by small retailers can be established with cooperation of mobile banking services. And it will promote installations of Rapid Pass system for E-money which will enable CHU/SPC to be sustainable.



Source: JICA Project Team

Figure 3.9-3 Recharge Service by Sole Proprietorship

3.9.3 Agent Bank

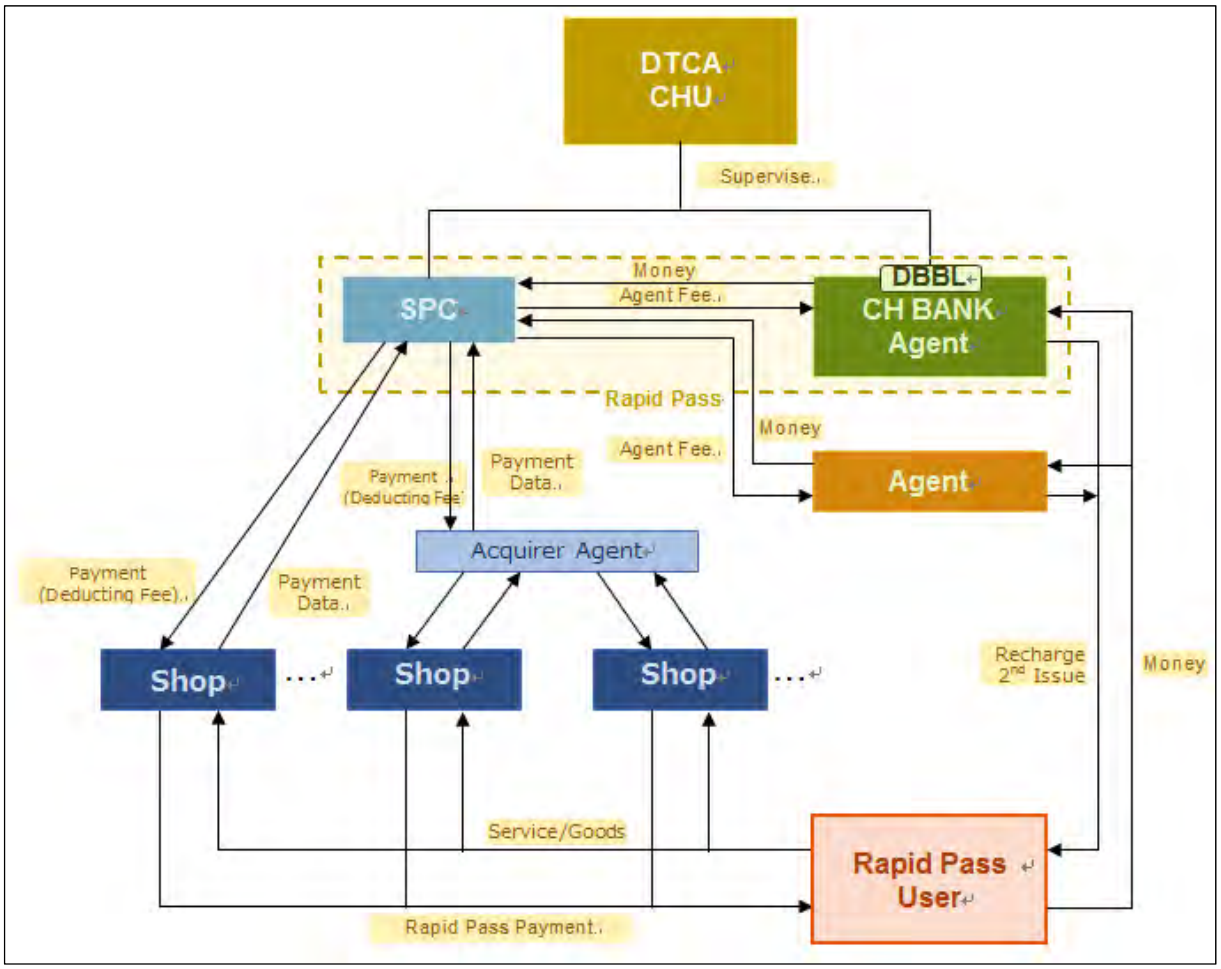
Agent bank means a bank has been authorized by an individual bank account holder to act as his/her agent. Illiterate bank account holders can still receive banking service with assistance from agent bank for clumsy paper works. An agent bank provides services such as back-office operations, processing of credit applications and verification services. In Bangladesh, most agent banks engage in microfinance in rural areas.

(1) Bangladesh Commerce Bank Limited

At the initial period of this Project, JICA Project Team contacted to Bangladesh Commerce Bank Limited (BCBL) which is not a major bank in Bangladesh. They expressed their keen interest in IC card to utilize as passbook of agent bank in rural areas. On 22nd July 2014, BCBL sent "Profile Agent Banking Services" in which BCBL detailed its idea for agent banking and preliminary discussion with BCBL was held on November 18, 2014. BCBL expressed their interest to join e-money and e-cash services but detailed entry strategy was not developed. Unfortunately, BCBL was not selected as CH Bank and was discouraged further cooperation.

(2) Alliance with Card Business Companies

From the example of BCBL, potential demands for cooperation with Rapid Pass System was observed. These were not only agent bank but also student ID and Automatic Teller Machine (ATM) card and so on. However, no alliance was established because the objective of this Project is to focus on transport services. These business companies have no knowledge and budget for development of Rapid Pass System. It is required that clear criteria and procedure for development and cooperation with Rapid Pass System by card business companies are established and business model for alliance with card business companies are to be considered such as license system.



Source: JICA Project Team

Figure 3.9-4 Alliance with Card Business Company

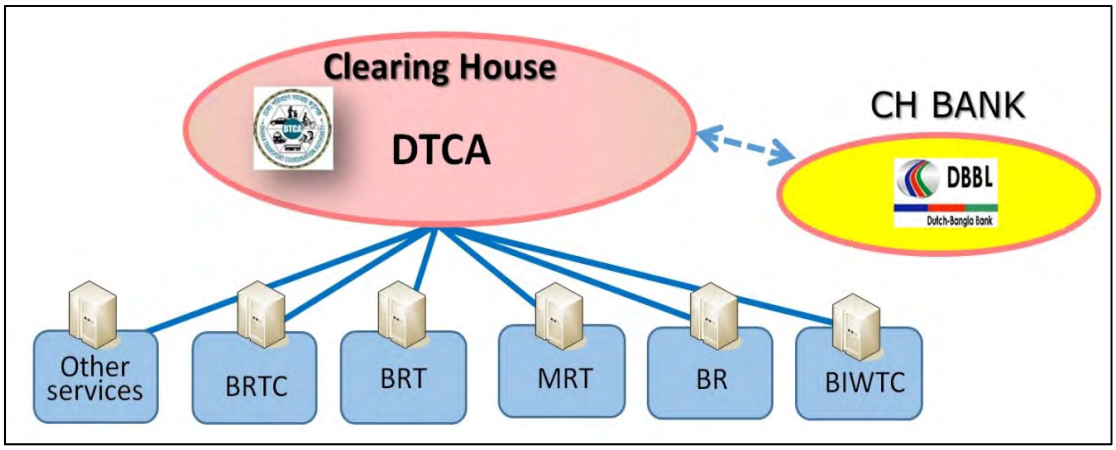
Chapter 4 Activities for Output-B

4.1 General

Main tasks of Output-B are development of Clearing House system including software for BRTC's fare collection system, and procurement / installation hardware for Clearing House and BRTC operation. Pilot Projects have been implemented to verify functions of the software and hardware developed and installed by the Project Team and shall be a basis for future uses to handle BRT and MRT operation.

First, SC Meeting was held on 17th August 2015 and Basic design concept of CHU and Rapid Pass System were discussed in the first SC. Basic design concept of CHU and Rapid Pass System were approved by the Committee on 25th January 2016 with approval of Work Plan and ERQ.

Rapid Pass System is ICT system which provides functions necessary for Clearing House operations. Rapid Pass users obtain Rapid Pass card and recharge money in Rapid Pass card by TOM at ticket office, pay fare by tapping Rapid Pass card on R/W installed in buses, gates or AFCs. These issue, recharge and payment data are collected to Rapid Pass servers and are checked their authenticity. After confirming authenticity Rapid Pass servers calculate amount of revenues from PTOs and settle the amount to each PTO. The PTO settlement is shown on **Figure 4.1-1**.



Source: JICA Project Team

Figure 4.1-1 Image of PTO Settlement

Rapid Pass System has the following three features.

1. High reliability using specification from MLIT which has over 15 years of experience by SuiCa.
2. High speed process by FeliCa which can handle nearly one million transactions per day which MRT and BRT will generate.
3. High Security using encryption for all communication using NFC by FeliCa between equipment and Rapid Pass card which is EAL 6+.

After approval of basic design concept for Rapid Pass System, JICA Project Team commenced the procurement of IT company for development of Rapid Pass System in March 2015 and E3JV (Joint Venture of Electro Craft Corporation Ltd. and Best Business Bond Ltd.) was awarded for Rapid Pass System development on 13th October 2014. E3JV commenced Rapid Pass System development on 27th October 2014 and completed its development on 28th February 2017. JICA commenced procurement of servers for Rapid Pass System with assistance of JICA Project Team on 29th March 2015 and the Hardwares were delivered by SMART Technologies (BD) Ltd. on

14th October 2015.

Rapid Pass System commenced its operation on 16th May 2017 under the trial operation for CHU. At the initial stage of trial operation, the servers of Rapid Pass System were maintained by NE3JV (Joint Venture of N-Wave BD Ltd., Electro Craft Corporation Ltd. and Best Business Bond Ltd.), a local service provider of JICA Project Team. DTCA recruited three operators in August 2017, another one operator in October and four engineers in December 2017. NE3JV commenced the training for Clearing and Settlement for Rapid Pass card transaction and monitoring and maintenance of Rapid Pass servers to newly recruited CHU staff.

Source: JICA Project Team

Photo 4.1-1 Training for CHU Staff recruited by DTCA

Verification of Rapid Pass System through trial operation has been completed. New DTCA organogram that includes CHU as a permanent section was eventually approved by Bangladesh Government in February 2018.

4.2 [B-1]: Rules and Regulations of Clearing House is Prepared.

This activity is initially planned to be focused on establishing the rules and regulations of CHU. However, in order to maintain flexibility of operation of CHU that changes as ICT evolves, JICA Project Team and DTCA considered it would be more valuable to prepare guideline and manuals as shown in **Appendix B1-2**.

Therefore CHU staff training for verifying the effectivity of guidelines and manuals was added to this activity after commencement of pilot project.

This activity was implemented in four phases. The first phase was a study on DTCA Act and other related regulations to determine basic requirements on CHU functions. Based on the result of first phase study, JICA Project Team hold coordination meetings, in the second phase, with major transport operators regarding demarcation between CHU and transport operators in integrated ticketing system. In the third phase, JICA Project Team trained CHU staff. In the fourth phase, study on SPC establishment was carried out in order to secure self-reliant Rapid Pass business.

4.2.1 Study on DTCA Act and Other Related Regulations

DTCA was proposed to be a Clearing House and Card Issuer (CHCI) and cash revenue from CHCI service shall be dispensed to related PTOs, agents and service provider on time. However, since DTCA is a government agency, it is compulsory that all cash revenue shall be remitted to national treasury first and all necessary payment shall have to secure prior approval from budgetary agency. This government regulation hampers flexible operation of CHCI by DTCA.

Therefore, JICA Project Team prepared the first draft of Clearing House Operation Rules as shown in **Appendix B1-1**. The draft is under review by DTCA for possible inclusion of future SPC activities.

4.2.2 Coordination with Major Transport Operators

JICA Project Team prepared a draft of demarcation between CHU and BRT/MRT as shown in **Table 4.2-1**.

Table 4.2-1 Draft of Demarcation between CHU, DBRT and DMTCL

ICT Fare System Functionality	CHU	DBRT/DMTCL
Rapid Pass Card Management		
Card purchase	○	JICA Project Team will support DBRT/DMTCL so that they will be able to share cost of card.
Card issue and recharge	Responsible for card issue and recharge for all PTOs except for DBRT/DMTCL which will handle by themselves.	Card issue and recharge in the station will be handled by them and handling charge is received.
Card management (lost, inquiry, balance confirmation, etc.)	○	-
The equipment such as gate, PTO server, etc.	-	○
Functionality for one-time ticket	-	○
Clearing House Function		
OD data management including one-time ticket.	Data from each PTO is integrated into synthesized data base.	Data will be submitted to CHU in electronic format.
Management of recharge amount etc.	○	-
Getting on and off data confirmation. Calculation of settlement.	○	-
Settlement amount confirmed by PTO	-	○
Settlement	○	○

Source: JICA Project Team

First coordination meeting with DBRT, DMTCL, BIWTC, BR and BRTC was held on 25th November 2014. It was agreed among participants that such coordination meeting will be held every month to refine proposed demarcation and to prepare detailed agreement among related agencies for future IC card services. Second coordination meeting with DMTCL was held on 23rd February 2015 and second coordination meeting with DBRT was held on 25th May 2015. Information for AFC specification was shared in these meetings.

After several meetings among DMTCL, NKDM and JICA Project Team, MOU among Road Transport and Highways Division (RTHD) of MRTB, DTCA, DMTCL and JICA was concluded on 31st March 2016 as shown in **Appendix A3-8**. In this MOU, it was stipulated that demarcation would be defined by PTO Agreement which would be concluded between DTCA and DMTCL.

4.2.3 Recruitment and Training for CHU Staff

Self-reliant and strategically stable operation of Rapid Pass System largely depends on the personal capability of CHU staff. Therefore, before recruiting the staff, JICA Project Team had shared information with DTCA regarding required experience and qualification of CHU staff. Revised TAPP was approved by Ministry on 16th April 2016, however fund for TAPP was released only in January 2017. After releases of TAPP fund, DTCA commenced recruitment process for technical engineers as described in **Figure 4.2-1**. However, first recruitment was failed due to lack of qualified applicants, all applicants were below required standards. Second recruitment was carried out in November 2018 and one programmer and three assistant programmers were recruited.

Due to delay of recruitment of CHU staff by DTCA, the Pilot Project was implemented only by JICA Project Team and NE3JV starting on 11th April 2017 focusing on monitoring and maintenance for Rapid Pass server and assistance on implementation of trial operation. JICA Project Team and NE3JV prepared manuals for CHU staff in order to train them appropriately. The manuals are classified into the following three categories.

1. Operation manuals which describe how to operate equipment of Rapid Pass System for CHU technical engineers or PTO operators.
2. Standard Operation Procedures which describe detailed procedures for all transactions undertaken by CHU technical and administrative staff.
3. Training manuals which describe how to train staff PTOs and agents.

Above manuals are listed in **Appendix B1-2**.

Government of the People's Republic of Bangladesh
Clearing House for Integrating Transport Ticketing System in Dhaka City Area
Dhaka Transport Coordination Authority
Dhaka South Nagar Bhaban, 13th Floor (East Block)
5, Phoenix, Fulbaria, Dhaka-1000
www.dtca.gov.bd

Memo No: 35.02.0000.008.37.021.16 Date: 26.01.2017

Re-advertisement for the Recruitment

Application is called for the Bangladeshi citizen for the following post of Dhaka Transport Coordination Authority under the Project for Establishment of Clearing House for Integrating Transport Ticketing System in Dhaka City Area as a temporary basis during the project period (June 2018).

Sl. No	Name of the post and consolidated salary	Number of Post	Maximum age	Qualification & Experience
1	Programmer (Clearing House) Grade-6	1	Not more than 35 years	BSc Engineering in IT/ICT/CSE & 2 years experience in related field
2	Programmer (Card Issuer) Grade-6	1	Not more than 35 years	BSc Engineering in IT/ICT/CSE & 2 years experience in related field
3	Programmer (Database admin & safety) Grade-6	1	Not more than 35 years	BSc Engineering in IT/ICT/CSE & 2 years experience in related field
4	Maintenance Engineer, Grade-6	1	Not more than 35 years	BSc Engineering in IT/ICT/CSE & 2 years experience in related field
5	Assistant Programmer, Grade-9	6	Not more than 32 years	BSc Engineering in IT/ICT/CSE & 1 years experience in related field

Conditions:

1. Above mentioned posts will be recruited temporarily during the project period (till June 2018)
2. Application can be downloaded from the DTCA website (www.dtca.gov.bd). Experience certificate should be attested by the 1st class officer and submitted along with the application.
3. Experience with related field will be considered.
4. Pay order/ Bank draft of 300 taka should be submitted to the Project Director as an examination fee.
5. Age will be considered according to the Birth certificate.
6. Application will be rejected if a person applies more than one post.
7. Quota system will be followed by the order of Government.
8. Name of the post, name of own district and name of the quota should be written on the left side above the envelope.
9. If there is found any wrong information, then application will be rejected.
10. All the original certificates should be shown during viva period
11. Candidates should apply to the appropriate authority.
12. Only eligible candidates will be called for the written exam/viva.
13. Necessary elements like pen pencil, Clip board should be brought during the examination.
14. Authority will preserve the rights to take all the decisions.
15. Government rules will be followed in selection above posts.
16. Deadline of the application is 14.02.2017 during the office period.
17. Incomplete application will not be accepted.
18. Postal ticket (size 9"X 4") should be attached with the envelope with candidate's present address.
19. Candidates who applied according to the previous advertisement on 25.10.2016, they don't need to apply again.

Md. Zakir Hossain Mazumder
Project Director
Project for Establishment of Clearing House for Integrating
Transport Ticketing System in Dhaka City Area

Source: DTCA

Figure 4.2-1 Advertisement for Recruitment of CHU Staff

CHU technical staff joined CHU operation in December 2017 which left only six months before completion of the Pilot Project. Their employment period was only up to June 2018. Although time was limited, JICA Project Team and NE3JV commenced training for CHU staff through On the Job Training using manuals prepared beforehand.


Source: JICA project team

Photo 4.2-1 CHU Staff Working in DTCA Office

DTCA decided to employ three consultants in order to maintain CHU operation after June 2018. Two of them will be recruited from NE3JV members and the other one will be recruited from current CHU staff.

In addition, DTCA will be able to recruit permanent CHU staff, once new DTCA's organogram including creation of CHU is approved and related fund is allocated based on the DTCA Act, 2012 to wit;

" which stipulates "Carry out any other duty assigned by the government" in the article of "Power and Functions of the Authority."

4.2.4 Studies for SPC Establishment

JICA Project Team proposed establishment of SPC in order to secure self-reliant CHU operation as described in Activity A-1. One of the most reliable plans for SPC establishment is that all the CHU operation except Rapid Pass card issuance will be implemented by a public-private company. This public-private company can be established following procedures for private company establishment prescribed in Company Act of Bangladesh. Audit will be also conducted by private accounting company. These public-private companies can be seen in Bangladesh such as Bangladesh Shipping Corporation and Dhaka Electric Supply Company Limited. The number of human resource of this public-private SPC is suggested by JICA Project Team shown in **Table 4.2-2**.

The expected number of staff from public and private sectors are the same. Staff from public will be responsible for coordination with public sector and maintenance of core technology of Rapid Pass System while staff from private will be responsible for expansion of Rapid Pass use and monitoring and maintenance of Rapid Pass System.

Table 4.2-2 Number of Human Resources of Public-Private SPC

Position	Public	Private
Board of Directors of SPC	3	2
Managing Director	1	0
Administrative division	2	0
Business division	3	4
Operation division	2	3
Planning division	0	2
Total	11	11

Source: JICA Project Team

4.3 [B-2]: Regulation of Technical Specification for AFC is Decided

This activity is for authorization of Technical Specification for FeliCa card and was implemented by following three phases.

1. First phase: Definition of Technical Specification in detail
2. Second phase: Authorization by DTCA
3. Third phase: Coordination and information sharing with stakeholders

4.3.1 Definition of Technical Specification

In June 2011, SONY launched new generation of FeliCa IC chip with enhanced the security by adopting the Advanced Encryption Standard (AES). This new generation of FeliCa IC chip has enhanced security and stability, multi-application platform with higher performance and reliability, Security-migration function and backward compatibility with the current FeliCa IC chips. SPASS used the old version of FeliCa with Data Encryption Standard (DES) which was decrypted by hacker in 1999.

Considering service life of FeliCa card of 10 years, JICA Project Team decided to use FeliCa with AES for Rapid Pass system. In addition, SPASS focused on usage for only one PTO and did not support multiple PTOs. **Table 4.3-1** shows comparison of FeliCa specification between AES and DES.

JICA Project Team had contacted with Ministry of Land Infrastructure Transport and Tourism (MLIT) in Japan and acquired license to use Common Implementation Specification and Common Technical Standard. Based on these specifications and standards, JICA Project Team prepared draft of Common Specification, Interface Specification for Rapid Pass card and ERQ as shown in **Appendix B2-1**.

Table 4.3-1 Comparison of FeliCa Specification

		New FeliCa IC Chip	Current FeliCa (Standard) IC Chip
Communication Standard		Supports ISO/IEC 18092 (212kbps passive communication mode)	
Operating frequency		13.56 MHz	
Modulation method		ASK modulation	
Bit coding		Manchester encoding system	
Communication speed		Supports automatic 212/242kbps switching	Supports automatic 212/242kbps switching (*1 *2)
Nonvolatile memory	Memory size	6KB	4KB (*2 *3)
	Error Checking and Correcting (ECC) function	Yes	none
	User memory	255 blocks (*4 *5)	154 blocks (*2 *3 *4 *6)
Memory separation		4 Partitions	4 Partitions (*1 *2)
Reader/Writer authentication		Mutual authentication via triple DES or AES (128k bit key length) encryption algorithm	Mutual authentication via triple DES encryption algorithm
Communication path encryption		DES or AES encryption algorithm	DES encryption algorithm
Supported commands		DES encrypted commands, AES encrypted commands and non-encrypted commands	DES encrypted commands and non-encrypted commands

Source: https://www.sony.net/SonyInfo/News/Press/201106/11-066E/index.html
*1 RC-S960 Series *2 RC-S962 Series *3 RC-S915 Series *4 1 block is equal to 16 bytes
*5 Includes 6 blocks as system management block. The area and service definition blocks will take up 2 blocks each.
*6 Includes 4 blocks as system management blocks

4.3.2 Authorization by DTCA

ERQ, Common Specification and Interface Specification should have been approved formally before commencement of development for Rapid Pass System. However, since first SC meeting was delayed, JICA Project Team held a presentation regarding ERQ including Common Specification and Interface Specification to DTCA on 8th September 2014. It was approved by Executive Director of DTCA on 11th November 2014, presented to Steering Committee together with Work Plan on 11th November 2014 and was formally approved on 17th August 2015.

4.3.3 Coordination and Information Sharing with Stakeholders

After approval of ERQ by Executive Director of DTCA, JICA Project Team commenced information sharing regarding AFC Technical Specification with DMTCL and DBRT.

(1) Coordination with DMTCL

Coordination meeting was held on 5th February 2015 with attendance of DMTCL, NKDM, DTCA and Katahira & Engineers International and NEC Corporation Joint Venture (KNJV) with JICA as observer. Extract version of Common Specification being accepted to use from MLIT was submitted to DMTCL through DTCA on 23rd February 2015. The Tender for Construction Package Seven (CP7) which covered procurement of facilities of machines and electricity including AFC for MRT-6 commenced on 26th May 2016. In this Tender, documents for the extract version of Common Specification were distributed. In addition, JICA Project Team prepared a room for access to Common Specifications in case Tenderers requested. However, no Tenderers requested access to Common Specifications.

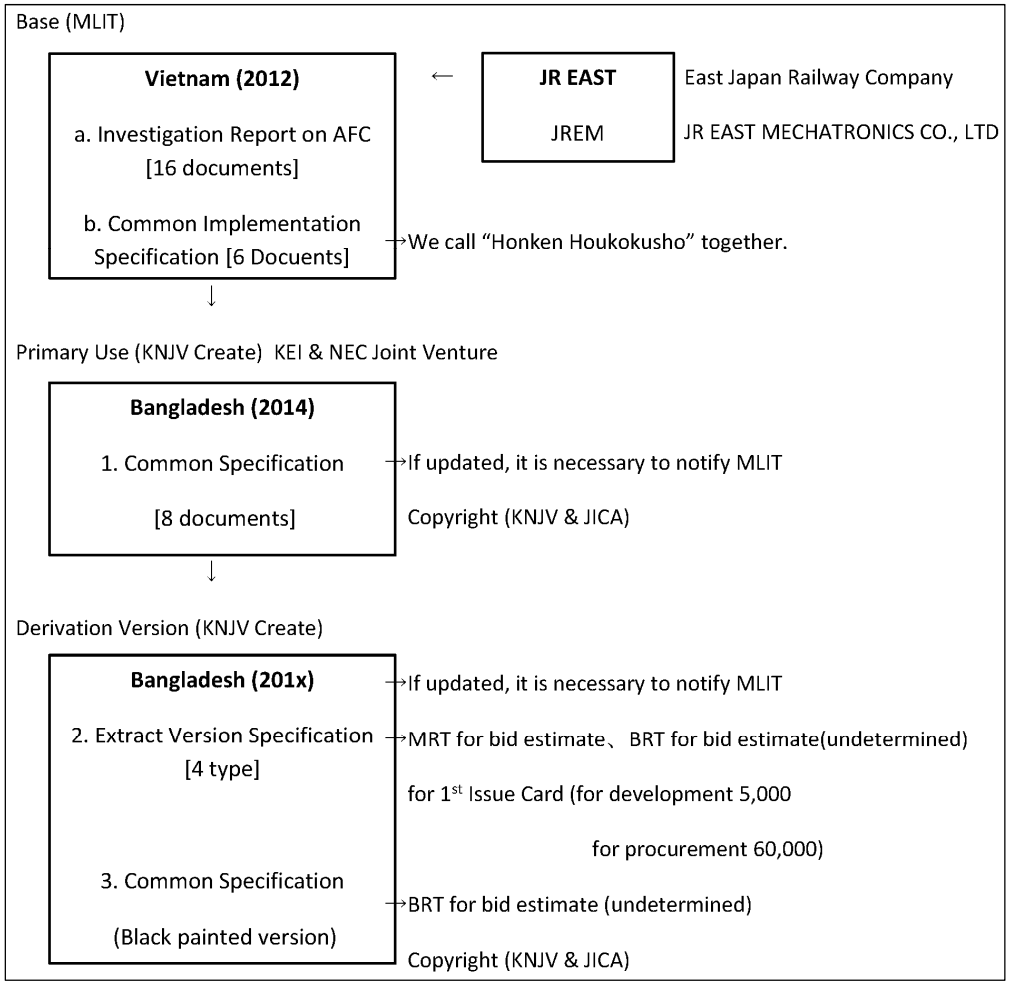
CP7 was awarded to Joint Venture of trading firms and agreement was concluded between DMTCL and wining tenderer on 3rd June 2018. AFC for MRT-6 will be designed in accordance with Common Specification for Rapid Pass System.

(2) Coordination with DBRT

Coordination meeting with DBRT was held on 25th May 2018. Due to delay of procurement of consultant for detailed design for AFC, the Tender for AFC procurement did not commence until the end of the Project.

4.3.4 Necessary Coordination with MLIT

Developed Common Specification of IC card has been modified by the Project Team. Originally, MLIT created a Common Technical Specification and a Common Implementation Specification for Vietnam based on the Technical Standard compliant with IC card service of JR East. KNJV developed the Common Specification based on their Specification. JICA Project Team got the permission to modify them and also made the terms of service of Common Specification disclosure to stakeholders in Bangladesh abiding by MLIT instructions. Disclosure and browsing of Common Specifications must be done under the constraints of terms of service when procurement of equipment and software development regarding IC card are carried out. The **Figure 4.3-1** illustrates creation process and all kinds of Common Specification.

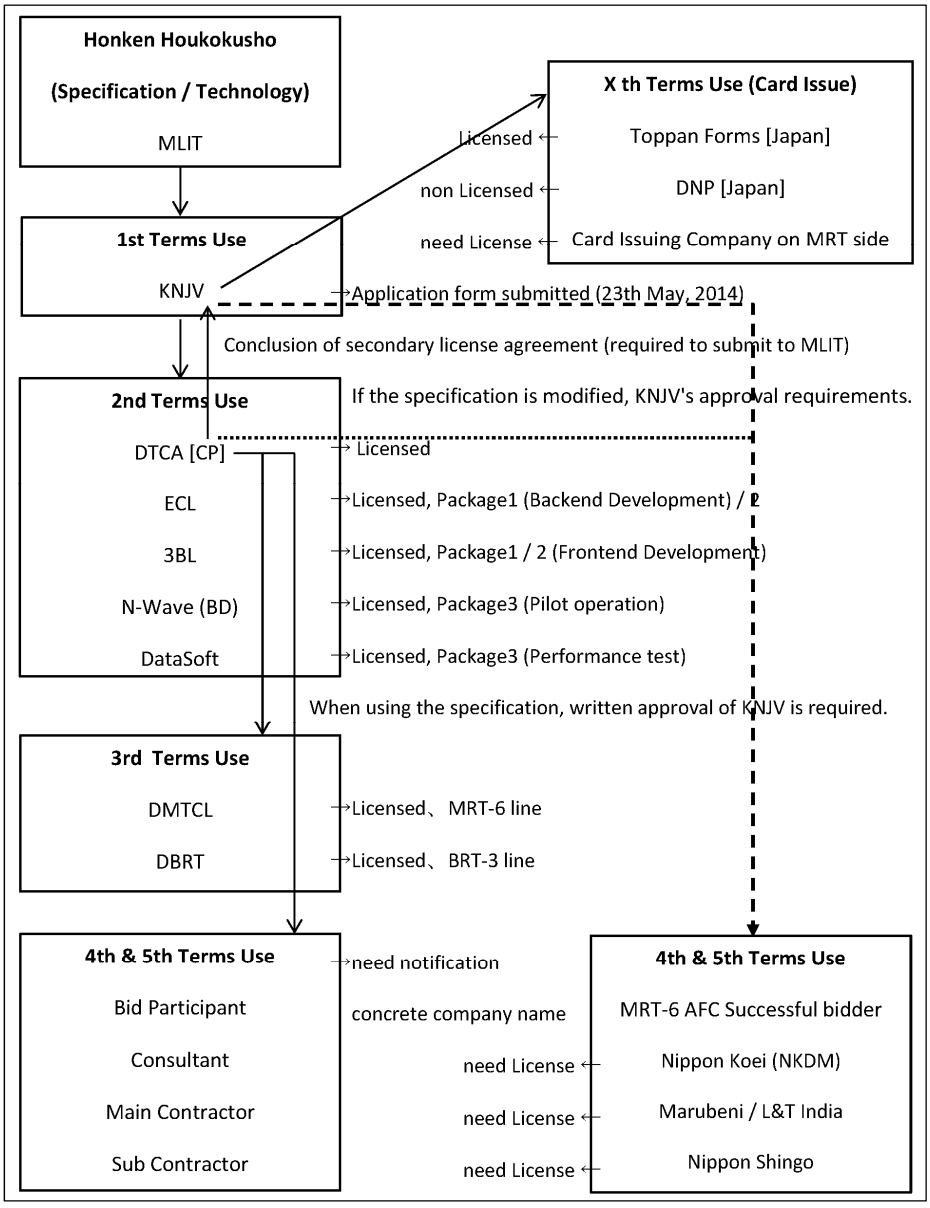


Source: JICA project team

Figure 4.3-1 Creation Process and All Kinds of Common Specification

Regarding MRT-6, the bidding of facilities of rail way and electrical construction works including AFC started in 26th May 2016. JICA Project Team created the extract version of Specifications for bidding under the discussion with MLIT. Moreover, JICA Project Team prepared disclosure of Common Specifications for bidders who wish to browse Common Specifications.

Common Specifications will be distributed to consultant or other stakeholders who are the successful bidder or contractor of MRT-6. AFC systems of MRT-6 will be developed based on Common Specifications. **Figure 4.3-2** illustrates the participants who used Common Specifications and those who will use in the future.



Source: JICA project team

Figure 4.3-2 Usage Status of Technical Specification

Common Specification consists of eight documents. **Table 4.3-2** shows list of Common Specification.

Table 4.3-2 List of Common Specification

Specification Name	Specification Number
Operation specification (ID management)	DCH01-SPEC-0001
Card Encode Format	DCH01-SPEC-0004
Ticket media validation	DCH01-SPEC-0005
Card Data encode	DCH01-SPEC-0006
Transaction data format	DCH01-SPEC-0007
Transaction data-value to set	DCH01-SPEC-0008
Trip pattern	DCH01-SPEC-0009
Common code	DCH01-SPEC-0010

Source: JICA project team

Considering that economic life of IC card is ten years, AES was adopted. The architecture of Common Specification has achieved successfully on fare collection in the pilot project of multiple bus companies. JICA Project Team could confirm that Common Specification is adaptable for AFC development in MRT and BRT. JICA Project Team needs to continue to support appropriate specifications by DTCA so that this Common Specification will be officially recognized as Technical Specifications.

4.4 [B-3]: Relations to Rules and Regulations of MRT are Clarified

This activity was implemented from the beginning of this Project. JICA Project Team regularly exchanged information with the team of "Preparation of Rules and Regulations for Dhaka MRT Project" which develops MRT rules and regulations since end of 2013.

4.4.1 Initial Coordination

JICA Project Team obtained draft copy of Chapter X for AFC system of MRT Technical Standard in June 2014. JICA Project Team reviewed the MRT Technical Standard and confirmed its consistency with ERQ of Clearing House Project. The result of review between MRT Technical Standard and ERQ is shown in **Table 4.4-1**.

Table 4.4-1 Result of Review and Confirmation between MRT Technical Standard and ERQ

Items	ERQ	Page/No.	MRT Technical Standard	Clause No.
Processing time between IC Card and AFC equipment	Not more than 0.1 sec (100 msec)	Page 2 No.2	Time required for transaction between cards and read / write unit of each AFC machine shall be equal or less than 100 ms.	10.15.6 10.16.6
Communication range	More than 100 mm	**Ditto**	No direct requirement exists.	N/A
Communication speed	Not less than 212 kbps	**Ditto**	Data transfer rate shall be at least 212 kbps.	10.14.5
Multiple File Handling	Minimum 8 data blocks	**Ditto**	To be enabled	10.15.16
Data Backup Capacity	CHS is to keep at least 3 days' backup data into R/W, Line Server or PTO Server	Page 2 No. 3	The AFC system shall retain backup data for 7 days or more. Targeted machine shall include, but not limited to: 1: Ticket vending machine; 2: Ticket office machine; 3: Passenger gate;	10.11.4
			The Central server shall retain backup data for 1 year or more.	10.11.5
Logs to be stored in IC Card	IC Card is to store certain amount of usage data.	**Ditto**	No direct requirement exists.	N/A

Source: JICA Project Team

JICA Project Team continued to have close coordination with “Preparation of Rules and Regulations for Dhaka MRT Project” Team. Whenever necessary system requirements related to MRT specifications were identified, these requirements were informed to JICA and "Preparation of Rules and Regulations for Dhaka MRT Project" Team. On the other hand, if requirements which may affect to ICT fare collection system were found by “Preparation of Rules and Regulations for Dhaka MRT Project”, JICA Project Team requested information and considered how to incorporate it into the fare collection system.

4.4.2 Completion of “Technical Standards for Metrorail in Bangladesh”

“Technical Standards for Metrorail in Bangladesh” had been formulated by the above JICA Project Team and approved by the Governing Council of DTCA on 28th May 2015. “Preparation of Rules and Regulations for Dhaka MRT Project" was completed in August 2015. The consistency between Rapid Pass System and “Technical Standards for Metrorail in Bangladesh” is confirmed as shown in **Table 4.4-2**.

Table 4.4-2 Results of Confirmation between Rapid Pass Specification and Technical Standard for Metrorail in Bangladesh (1/2)

Item	Rapid Pass	MRT Standard SPEC	MRT Standard SPEC Source
Card size	85.60mm × 53.98mm	85.60mm × 53.98mm Credit card size	10.14.1
Card material	not settled	Plastic	10.14.2
Card Type	FeliCa type SA-01	Contact-less IC shall be powered by a modulated radio frequency signal transmitted from read/write units of each AFC machine. Contact-less IC card shall not have battery inside	10.14.3
Data retention period	50 years (25°C) 10 years (85°C)	At least 10 years	10.14.4
Data transfer rate	212 kbps and 424 kbps automatically switchable	At least 212 kbps	10.14.5
Card apply	Stored fare card	Contact-less IC card shall be applied to; Day ticket Commuter Pass Stored fare card	10.15.1
Security Level	EAL5+ of ISO/IEC 15408	At least EAL4+ ISO/IEC 15408	10.15.2
Access area (file) protect	Protected by Key and access rights	Protected by encrypted authentication	10.15.3
Keys for file access	Requires authentication key for every files	More than 2 keys shall be able to set to each memory file	10.15.4
File block	1 file allocate to 1 block	Able to handle memory blocks as 1 file.	10.15.5

Source: Technical Standards for the Metrorail in Bangladesh (DTCA) 10.14, 10.15
DCHK01-MANOP-0014 SOP for Card/SAM Procurement (DTCA) 07.16

Table 4.4-2 Results of Confirmation between Rapid Pass Specification and Technical Standard for Metrorail in Bangladesh (2/2)

Item	Rapid Pass	MRT Standard SPEC	MRT Standard SPEC source
Data hierarchy	8 levels	4 levels	10.15.6
File access rights	Access rights shall be created by files flexibly	Access rights shall be created by file. Access rights shall be flexible enough to accommodate, considering the increase of other companies	10.15.7
File open	Open files through Mutual Authentication process	Able to open the specified file. Multiple file shall be opened by 1 authentication process.	10.15.8
File type	Random Cyclic Purse	Sequential access Random access Amount calculating	10.15.9
Command set	Follow the FeliCa card user's manual https://www.sony.net/Products/felica/business/tech-support/st_usmnl.html	Command set shall include: 1. Identifying file types 2. Issue (format, access control etc.) 3. Authenticate	10.15.10
Support encryption	AES encryption	Encrypted Data transfer required	10.15.11
Rewriting durability	500,000 times (25°C) 100,000 times (85°C)	At least 100,000 times	10.15.12
Minimum Data capacity	4 kbyte EEPROM (enable to set 160 blocks (1 block = 16 byte)	2560 bytes	10.15.13
Time require	The transaction process completed within 0.1 sec, including secure encryption.	Equal or less than 100 msec (0.1 sec) are required between card and read/write machine. Time require shall be calculated conditions: 1. Opening multiple files 2. Encrypting data transmission 3. Reading 240 bytes and writing 208 bytes	10.15.16

Source: Technical Standards for the Metrorail in Bangladesh (DTCA), Excerpted from Section 10.14 and 10.15 for AFC

Rapid Pass System will be installed on MRT as agreed in MOU among RTHD, MRTB, DMTCL and JICA as Development Partners on Introduction of Integrated Ticketing System of Rapid Pass including Clearing House.

4.5 [B-4]: IT System Structure (Server, Security, Back-up, etc.) is Designed and Specifications are Developed.

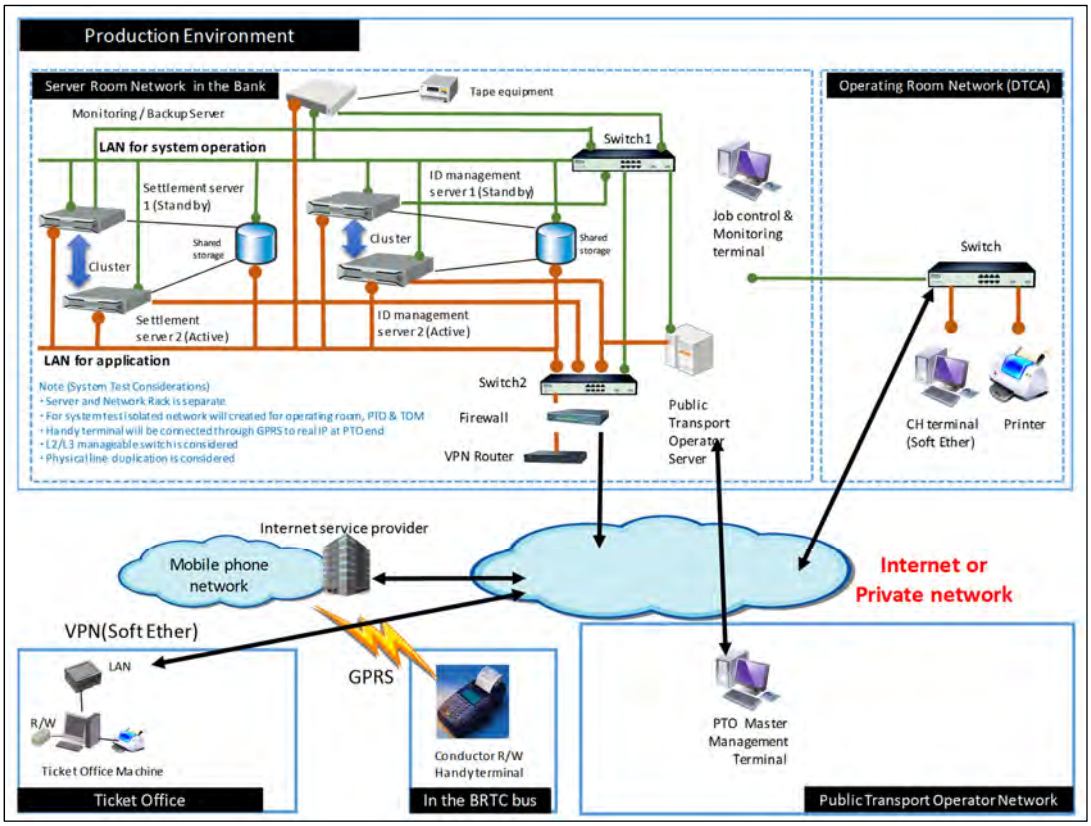
This activity was implemented by the following four phases.

1. First Phase: Design of IT system configuration and corresponding Technical Specifications based on ERQ.
2. Second Phase: Procurement of hardware and package software for Rapid Pass System.
3. Third Phase: Monitoring and maintenance of Rapid Pass System.
4. Fourth Phase: Finalization of IT system configuration and additional procurement for Rapid Pass System

4.5.1 Design for IT System Configuration and Corresponding Technical Specification based on ERQ

JICA Project Team prepared draft of IT system configuration and corresponding Common Specifications and requested related agencies such as DTCA, MLIT, Japan Railway East Mechatronics (JREM) and E3JV to review the draft because hardware component and network structure have close dependency on the specifications and software development.

After receiving feedbacks from above agencies, IT system configuration satisfying the ERQ and Common Specifications at minimum cost was finalized as shown in **Figure 4.5-1**.



Source: JICA Project Team

Figure 4.5-1 IT System Configuration for Rapid Pass System

Main components of Rapid Pass System are as follows.

1. ID Management Server (IDMS)
2. Settlement Server (SS)
3. Monitoring Backup Server (MBS)
4. PTO Server (PTOS)
5. Ticket Office Machine (TOM)
6. Handy R/W

(1) ID Management Server (IDMS)

IDMS is a server which manages information of IC card. IDMS collects, checks and keeps transaction data from PTOS, TOM and handy R/W. When a request for re-issue of IC Card is

made, IDMS provides card information to TOM. Also, IDMS provides card information and transaction data to SS.

(2) Settlement Server (SS)

SS manages stored value usage and IC card status. It outputs the report with the regular interval, such as daily, monthly, based on the agreement period with PTOs. It provides information necessary for Clearing and Settlement between CHCI and PTOs.

(3) Monitoring Backup Server (MBS)

MBS is a server which monitors the status of each server periodically and provide network connection to each server and equipment. It also backup IDMS and SS data regularly.

(4) PTO Server (PTOS)

PTOS is a server which stores and collects transaction data from handy R/W. Database of transaction data is installed in the PTOS. Collected transaction data is converted into Database format in the PTOS. It also provides function of browsing data through PTO terminal.

(5) Ticket Office Machine (TOM)

TOM is a device installed in ticket shops. It has functions regarding card issue and card re-charge necessary for ticket shop operation.

(6) Handy R/W

Handy R/W is a device used in the bus by a conductor or a driver-cum-conductor. It has functions of stored value deduction from IC card and print out the usage information. Handy R/W connects to PTOS and transmits sales data to the server and receives master data from the server.

A clustering system (redundant structure) was adopted in the Rapid Pass System. This is a duplication equipment to continue its operation even when some servers such as 1) an IDMS which processes the transaction data in real time, and 2) a SS which requires a high reliability of settlement for PTO, stop functioning. In addition to payment by FeliCa using AES with high security, the rapid-pass system builds an encrypted local network using Virtual Private Network (VPN) to prevent information leakage, and equipped high cyber security among TOP, PTOS and IDMS.

It is required to install package software such as backup software, anti-virus software, database software and clustering software in order to establish this IT System Configuration for Rapid Pass System.

4.5.2 Procurement of Hardware and Package Software for Rapid Pass System

Reference quotations for hardware component based on the IT system configuration for Rapid Pass System were obtained on 27 April 2015 from three venders. Hardware component and Package software for Rapid Pass system are shown in **Table 4.5-1**.

Table 4.5-1 Hardware and Package Software Installed in Rapid Pass System

Item	Required Specification	Quantity
Hardware		
1. IDMS	Dell PowerEdge R420 or equivalent	2
2. SS	Dell PowerEdge R420 or equivalent	2
3. MBS	Dell PowerEdge R420 or equivalent	1
4. LTO	HP LTO6 Ultrium 6250 SAS or equivalent	1
5. Shared Storage	Dell PowerEdge R330 or equivalent	2
6. Color Laser Printer	HP laserJet Pro 400 M451 nw or equivalent	1
7. Monitoring Terminal	Desktop PC	3
8. VPN Router	CISCO1921-SEC/K9 or equivalent	2
9. Firewall	CISCO ASA 5505 or equivalent	2
10. Hub	Allied Telesis GS908M or equivalent	2
11. UPS	APC Sysmmtra LX 4k VA or equivalent	1
12. KVM switch	D-Link 4-port USB KVM Switch	2
13. 42U rack		2
Software		
1. Clustering Software	NEC Express cluster	1
2. Database Software	Oracle MySQL Enterprise edition	5
3. System Backup Software	Acronis Backup Advance for Linux Server (v11.7)	6
4. Anti-virus Software	F-secure Linux security server edition	6

Source: JICA project team

JICA Bangladesh Office has procured hardware and JICA Project Team assisted JICA procurement.

JICA Project Team procured package software such as clustering software, Database software, system backup software and anti-virus software which have strong dependencies not only on IT system configuration of Rapid Pass System but also on volume of transaction data.

(1) Clustering Software

Clustering software makes multiple PCs or servers working as one PC or one server in order to have parallel calculation, load balancing and accident prevention. JICA Project Team found that "Xpress Cluster X 3.3 for Linux" ("Xpress Cluster"), product of NEC, is the most appropriate for Rapid Pass System. JICA Project Team concluded an agreement for procurement, installation and training for "Xpress Cluster" for two licenses with a distributer, International Office Machines Ltd. (IOM), for "Xpress Cluster" on 31st January 2016. Training was carried out on 2nd to 5th November 2015 as shown in **Appendix B4-1**.

Source: JICA Project Team

Photo 4.5-1 Xpress Cluster Training

Installation was implemented in February 2016. However, some function did not work properly. In May 2016 JICA Project Team found that the trouble was caused by relation with database software, "MySQL Enterprise Edition", and through discussion with MySQL advisory group, clue of solution for this trouble was identified. JICA Project Team and NEC worked together to solve this issue. In June 2016, installation of "Xpress Cluster" was successfully completed and NEC announced in the newspaper. In addition, IOM advertised "Xpress Cluster" installation on Rapid Pass System proudly as shown in **Figure 4.5-2**.

(2) Database Software

JICA Project Team found "MySQL Enterprise Edition", a product of Oracle, was the most appropriate Database software considering the volume of transaction data that MRT-6 may generate in the future and availability of back-up service after installation of the Database software. In addition, MySQL has Open Source version, which means operation cost of CHU can be minimized in case the volume of transaction data generated by MRT-6 is less than expected.

IOM

Officials of Katahira and Engineering International and International Office Machines Ltd (IOM) attend a programme in Dhaka, when IOM was selected as the official service provider for the delivery, installation, commissioning and provision of support services to establish a clearing house for integrating transport ticketing system in Dhaka.

Source: Courtesy of IOM

Figure 4.5-2 IOM Advertisement

Notice of tender for "MySQL Enterprise Edition" for five servers for two years was published on 14th October 2015, and software vender Computer Source was selected on 3rd December 2015. "MySQL Enterprise Edition" was installed successfully. However, conflicts among "Xpress Cluster", "MySQL Enterprise Edition" and "Ubuntu 14.04", an operation system for IDMS, SS and MBS have occurred. Although IOM, NEC and E3JV were not able to provide a solution, Oracle provided useful technical advisory to JICA Project Team.

(3) System Backup Software

System backup software creates backups for system which is used for recovery of system in case of system malfunction. JICA Project Team found "Acronis Backup Advance", a product of "Acronis", was the most appropriate software because only "Acronis Backup Advance" supported "Ubuntu 14.04", remote controlled backup and scheduled backup. JICA Project Team

issued purchase order for five "Acronis" for two IDMS, two SS and one MBS and installation was completed in June 2016.

Regarding PTOS, open source software of "Crone Zilla" was used for system backup because PTOS recovery did not require remote control.

(4) Anti-Virus Software

Anti-virus software provides protection against cyberattacks. JICA Project Team found F-Secure Linux Security server edition, the product of F-Secure Corporation, was the most appropriate software because only F-Secure provided standalone anti-virus software which supports "Ubuntu 14.04". Since Rapid Pass System shall be independent from other networks except VPN used for TOM, anti-virus software has to have standalone function. JICA Project Team issued purchase order for six "F-secure" for two IDMS, two SS, one MBS and one PTOS on 1st September 2016 and installation was completed on 30th September 2016.

(5) IC Card for Test Use for the Pilot Project

JICA Project Team procured 5,000 pieces of IC card RC-SA01 for test use and initial Pilot Project because of delay in G2 procurement.

4.5.3 Continuous Monitoring and Maintenance

Rapid Pass System servers shall be installed in secured place i.e. free from electricity blackout, air-conditioned and full access controlled. Two candidate locations were examined, one is DTCA server room where operational cost is free but no access control and the other one is commercial data center where operational cost will be incurred but full access control is secured with stable power supply. Commercial data center is more preferable than DTCA server room for reliable/stable server operation but cost for data center could not be shouldered with DTCA's limited budget.

Eventually, DBBL, a Clearing House Bank selected by DTCA, offered their data center at no cost to DTCA including electricity management, air conditioning and network connection. Server installation was completed in March 2017.

Source: JICA Project Team

Photo 4.5-2 Installation of Servers at DBBL Data Center

The servers of Rapid Pass System commenced its operation on 16th May 2017 when CHU commenced clearing and settlement service for BRTC. Monitoring of Rapid Pass System was undertaken for one year until the Pilot Project completion on 15th May 2018. JICA Project Team and NE3JV continuously monitored Central Processing Unit (CPU) usage rate and hard disk usage as shown in **Appendix B4-2**. No serious trouble was found during the monitoring period except minor two incidents as discussed below.

(1) PTO Server

Initial PTOS for Rapid Pass System was procured in 2011 and used as PTOS for SPASS operation. The PTOS became out of order beyond repair in August 2016 due to aged deterioration. JICA Project Team procured new PTOS and installed in DTCA server room on 30th March 2017.

(2) Linear Tape-Open

LTO is a data storage media which stores large amount of data not in disks but tapes. LTO cannot be monitored remotely under current condition of Rapid Pass System. JICA Project Team requested NE3JV to monitor the LTO in servers directly. In October 2017 and NE3JV found that the LTO was out of order but repaired immediately and reinstalled on Rapid Pass System in November 2017. This trouble indicates that current servers of Rapid Pass System requires the regular direct monitoring. Incidents encountered and actions taken are listed in **Table 4.5-2**.

Table 4.5-2 Incidents Encountered during Pilot Projects

Date	Item	Issue	Action Taken
August 2016	PTOS	PTOS in DTCA crashed	For immediate recovery, Laptop computer was configured temporarily as PTOS. Crashed server was not repaired as repair cost was higher than purchasing new one.
26th June 2017	LTO	LTO connection was loosened from mother board.	Vendor Smart BD fixed the connection
12th April 2018	PTOS	LAN cable was found to be completely pulled out from one switch during migration of PTOS from test to production. As a result, network was down. Actual, reason was unknown who, when and why pulled out the cable.	It took some time to find out the actual problem and eventually resolved by plugging the cable again.

Source: JICA Project Team

Through the Pilot Project, the maximum CPU usage rate per day and maximum data storage per day during Pilot Project implementation are summarized in **Table 4.5-3** and **Table 4.5-4** respectively.

Table 4.5-3 Maximum CPU Usage Rate per Day

Product	System Usage %	Users Usage %	Total %
IDMS-1	0.3	1.4	2.3
IDMS-2	0.3	0.7	1
SS-1	0.2	0.9	1.1
SS-2	0.2	0.9	1.3
MBS	1.0	4.8	5.5

Source: JICA Project Team

Table 4.5-4 Maximum Disk Space Usage per Day

Product	Total Space (GB)	Space Usage (GB)	Current Space Remaining (GB)	Data Storage Usage per day (GB)
IDMS-1	391.6	104.61	294.28	1.2
IDMS-2	391.6	247.11	144.96	1.29
SS-1	391.6	214.69	184.82	0.5
SS-2	391.6	237.69	259.87	0.48
MBS	483.3	473.79	9.82	10.61

Source: JICA Project Team

The CPU usage rate of MBS was high compared to other servers. In any case, the usage rate that may abnormally affect the operation of the system was not detected.

Remaining disk space of MBS is tight, and it is necessary to monitor the disk usage situation and review data contents in the disk. There is sufficient remaining disk space for other servers, IDMS-1, 2, SS-1 and 2.

4.5.4 Finalization of IT System Configuration and Additional Procurement

JICA project team implemented test server procurement as additional procurement of Rapid Pass system.

(1) Test Server Procurement

If system update is needed in the future, the system shall be updated using test servers that have same operational features and environment as original Rapid Pass System servers before updated system is installed in the original servers to avoid system errors and disruption of system operation. JICA Project Team procured test servers that have same specification and operational environment of original servers. **Table 4.5-5** shows list of equipment of test servers.

Table 4.5-5 Procured Equipment of Test Servers

Equipment	Quantity	Required Product
IDMS	1	Dell PowerEdge R420 or equivalent
SS	1	Dell PowerEdge R420 or equivalent
MBS	1	Dell PowerEdge R420 or equivalent
Shared Storage	2	Dell Power Edge R330 or equivalent
VPN Router	1	Cisco1921-Sec/K9 or equivalent
Switch	1	Cisco catalyst or equivalent
KVM switch	1	Cresum KVM 1708
42U Rack	1	equivalent with Current server

Source: JICA Project Team

Procurement was made by nominated competitive bidding. **Table 4.5-6** shows essential process of the bidding.

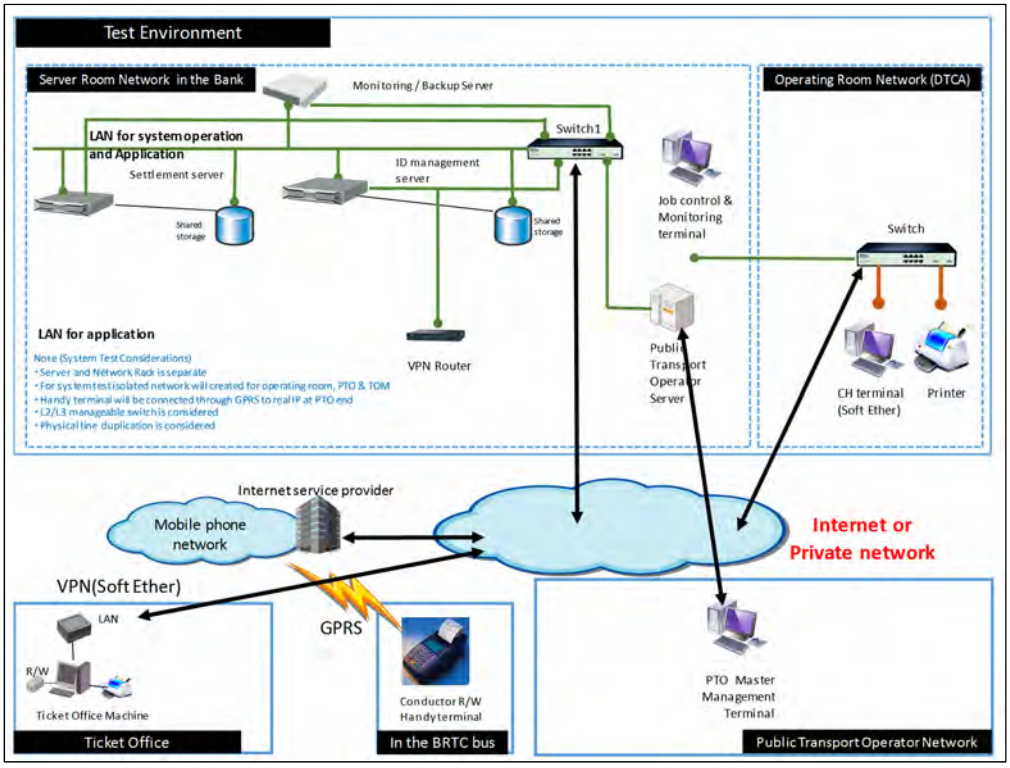
Table 4.5-6 Process of Test Server Procurement

Date	Activity	Status
21st August 2017	Sending invitation and bid documents	Send invitation and bid document to four companies.
30th August 2017	Bid opening	Finally, two companies responded to bidding. JICA project team bid price. Bid price of Tech valley Solution was lowest and got right of priority bidder.
31st August 2017	Contract negotiation and agreement	After negotiation of contract, Tech Valley solution agreed the contract.

Source: JICA Project Team

As a result of nominated competitive bidding, Test server equipment has been procured from Tech Valley Solution and the server equipment was installed in the data center of DBBL.

Configuration of the test servers is illustrated **Figure 4.5-3**. Considering saving the cost for equipment, it is not the duplex structure. This test servers were used for system test including stress test carried out by DataSoft. JICA Project Team anticipates that it will be used for troubleshooting and reproduction and verification of the system by DTCA in the future.



Source: JICA Project Team

Figure 4.5-3 Test Server Configuration

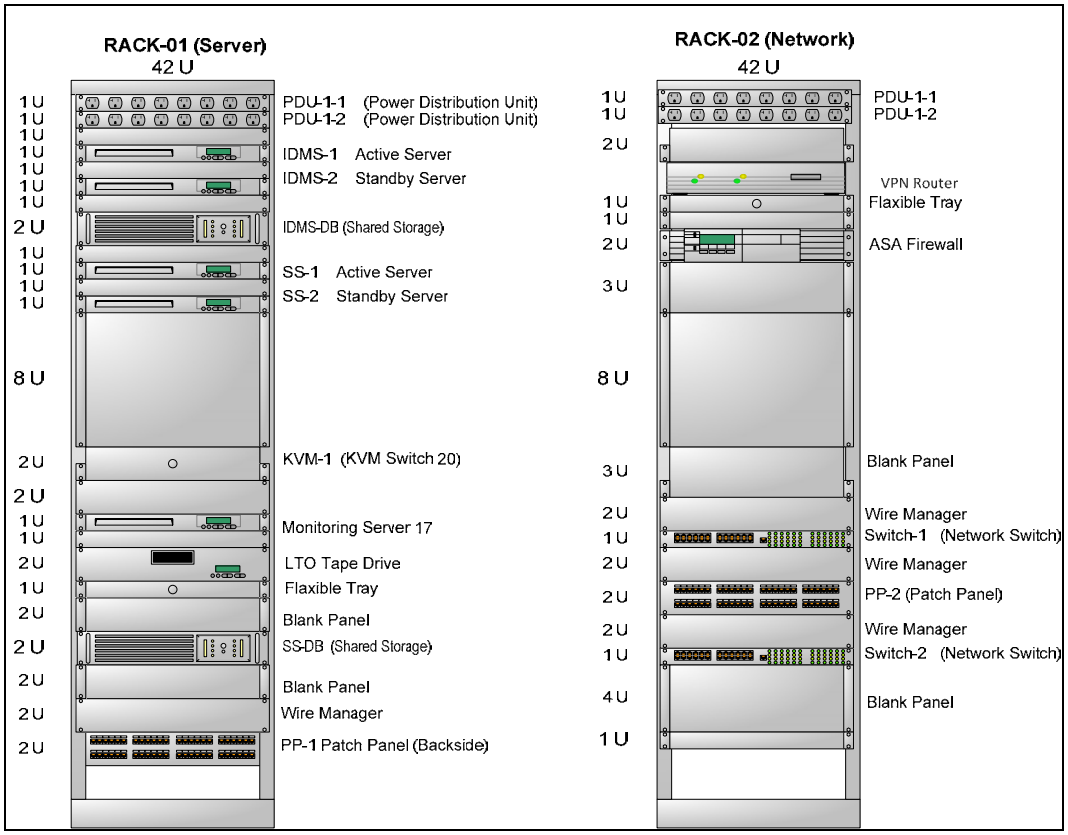
In addition, JICA Project Team procured PTOS for the test environment. Based on the result of the system test including stress test, JICA Project Team determined that environment for the test must include the PTOS. Procurement of test PTOS was made in April 2018.

4.6 [B-4-1]: IT System Hardware is Procured.

JICA Project Team assisted JICA and DTCA to procure IT System Hardware for Rapid Pass System. JICA procured servers' network equipment for Rapid Pass System and DTCA procured handy R/Ws, TOMs, IC cards and Secure Application Modules (SAM) Card.

4.6.1 Assistance for JICA Procurement

Reference quotations based on IT system configuration for Rapid Pass System were obtained on 27th April 2015 from three venders. Tender was held on 29th July and SMART Ltd., the lowest bidder, was selected as a hardware supplier. Contract was signed on 9th August 2015 and hardware was delivered to development room of E3JV on 14th October 2015. Servers were installed in the ruck as shown in **Figure 4.6-1** and used for integration test system test by E3JV.



Source: JICA Project Team

Figure 4.6-1 Server Installation Diagram in the Rack of Rapid Pass System

4.6.2 Assistance for DTCA Procurement

Procurement by DTCA was implemented by three packages.

1. Package G2: CHU hardware including IC card
2. Package G3: Office Equipment
3. Package G4: Furniture

(1) Package G2

In Package G2, DTCA decided to procure CHU hardware including IC card shown in **Table 4.6-1**.

Table 4.6-1 List of System Equipment under Package G2

Item	Unit	Quantity
1. Ticket Office Machine (TOM)	set	50
2. SAM reader	set	50
3. IC Card reader/writer	set	50
4. Handy R/W	set	150
5. GPRS SIM	set	150
6. IC card (Rapid Pass Card)	pcs	60,000
7. SAM Card	pcs	200

Source: JICA Project Team

JICA Project Team prepared a tender document and DTCA commenced the tender process on 12th March 2016 and agreement was concluded between DTCA and NetWorld Ltd. Originally procurement of "MPOS 3000" was proposed as handy R/W but the production of "MPOS 3000" was ceased when the agreement between DTCA and NetWorld Ltd. was concluded. Net World had to seek alternatives and delivered "VEGA 3000" to DTCA. As a result, delivery of the equipment was made three times, the first delivery was Point of Sales (POS) related to equipment (No.1 to 3), second delivery was handy R/W related to equipment (No.4) and final delivery was IC card (No.5 to 7). Each time acceptance test was made as described in **Appendix B4-3**. **Photo 4.6-1** and **4.6-2** show delivery and inspection in DTCA. Deliveries of all equipment were completed on 14th June 2017.


Source: JICA Project Team

Photo 4.6-1 Delivery of POS Related Equipment


Source: JICA Project Team

Photo 4.6-2 Delivery of handy R/W Related Equipment

(2) Package G3

DTCA decided to procure the office equipment under Package G3 as shown in **Table 4.6-2**.

Table 4.6-2 List of Office Equipment under Package G3

Equipment	Quantity
1. Desktop Computer	5
2. Uninterruptible Power Supply (UPS)	5
3. Scanner	1
4. Laser printer (black and white) with tonner	5
5. Laptop	5
6. Digital Photocopier	5
7. Fax machine	1
8. Mobile phone	5
9. External Internet Modem	10
10. Air condition	1
11. CISCO Managed switch	2
12. Digital Video recorder (DVR)	1
13. Bullet Camera	2
14. Monitor	1
15. UPS	1
16. Power Cable	100 meter
17. Coaxial cable	150 meter
18. Camera Power Adapter	2
19. Accessories	Full installation
20. Installation service fee	Full installation

Source: JICA Project Team

DTCA procured above equipment at its own fund and procurement process.

(3) Package G4

DTCA decided to procure office furniture shown in **Table 4.6-3** under Package G4. Installation was completed on 28th February 2018.

Table 4.6-3 List of Office Furniture under Package G4

Office Furniture	Quantity
1. Sofa 3 person capacity	1
2. Vacuum Cleaner	01
3. Sofa 2 person capacity	01
4. File rack, melamine board and hardware	02
5. Chair	21
6. Low height partition	17
7. Ceiling fan	04
8. Water filter machine	02
9. Light shade set	10
10. Carpet	496 sqt
11. Door lock	04

Source: JICA Project Team

4.7 [B-5]: Clearing House IT System (Software, Hardware) is Developed.

This activity was implemented by four phases as follows.

1. First Phase: Procurement of IT development company.
2. Second Phase: IT system development by a local IT development company.
3. Third Phase: Acceptance test and removal of inconsistencies
4. Fourth Phase: Trial operation for Clearing House IT system (Rapid Pass System)

This Clearing House IT system was designed as a common IC card system for all transport in Dhaka City based on Common Specifications provided by MLIT of Japan which can handle multiple transport operators while existing SPASS card could handle a single transport operator only. Development had two main packages as follows.

Package-1: Clearing House IT System for Settlement (back end)

Package-2: Fare Collection System for Small PTOs (front end)

The package 1 was developed which consists of three elements such as 1) an IDMS for management function for the owner of the IC card and processing transaction data for checking unauthorized use, 2) a SS for processing calculation of clearing and settlement, and 3) a MBS for monitoring and managing the server status.

Package 2 was IT system development for the software handy R/W and TOMs by which Rapid Pass users pay fare through Rapid Pass card and recharge into Rapid Pass card. These two packages were combined in the system of test phase and checked the inconsistencies against requirements.

4.7.1 Procurement of IT Development Company

(1) Package 1

JICA Project Team commenced procurement process for Package-1 on 10th August 2014 with advertising Request for Expression of Interest (REOI) in a newspaper. Seven companies submitted EOI documents and 4 companies were short listed among these companies.

Although ERQ was not approved formally by SC, its draft was presented on 8th September 2014. JICA Project Team distributed Request for Proposal (RFP) to these four companies in the Pre-Proposal Meeting conveyed on 22nd September 2014 with notifications of required design. It was amended and these amendments were arranged by addendum. Three companies submitted their Proposals and Electro Craft Corporation Limited and Best Business Bond Ltd. Joint Venture (E3JV) were awarded after the evaluation. Detailed Tender processes are shown in **Table 4.7-1**.

Table 4.7-1 Activities for Package 1

Date	Activity
10th August 2014	Request for EOI was advertised on Daily Star in Bangladesh.
24th August 2014	EOI submission date. 7 companies submitted.
01st September 2014	After evaluation of EOI submitted, 4 companies were shortlisted and notified.
02nd September 2014	RFP was distributed.
11th September 2014	Request for Clarification submission date. 3 Tenderers, 17 items were submitted.
15th September 2014	Clarification-1 and Addendum-1 were issued.
22nd September 2014	Pre-Proposal Meeting and Issue of Addendum-2
25th September 2014	Request for Clarification submission date. No request was received.
28th September 2014	Clarification-2: Explanation of Calculation of Financial Proposal Score and Addendum-3: Assistance by the Client were issued.
02nd October 2014	Proposal Submission date
09th October 2014	Notification Technical Evaluation result---ECL-3BL JV and DataSoft passed
13th October 2014	Financial opening with attendance of JICA---ECL-3BL JV was selected as preferred Tenderer.
19th October 2014	Negotiation was made
23rd October 2014	Development Agreement signed between ECL-3BL JV and KNJV

Source: JICA Project Team

The agreement for development of Rapid Pass system was signed on 23rd November 2014.

(2) Package 2

Request for EOI was advertised in Daily Star on 11th March 2015. Five companies submitted EOI documents. As a result of evaluation, two respondents, ECL-3BL JV (E3JV) and Spectrum Engineering Consortium Ltd. were shortlisted. RFP was issued on 29 March 2015 and two shortlisted tenderers submitted their tenders on 23rd April and only the proposal of E3JV passed the technical evaluation. Development agreement was concluded and signed on 11th May 2015.

Detailed tender processes are shown in **Table 4.7-2**.

Table 4.7-2 Record of Tender Activities for Package 2

Date	Event	Contents
11th March 2015	Request for EOI	An advertisement of Request for EOI was made in Daily Star, local English newspaper. It was also posted in the Katahira & Engineers International HP.
Till 18th March 2015	Distribution of EOI Documents	EOI documents were distributed to 8 respondents.
Till 19th March 2015	Receipt of EOI Documents	5 Respondents were submitted EOI Documents.
29th March 2015	Evaluation of EOI Documents, Shortlist and distribution of RFP	After evaluation of EOI documents submitted, following two bidders were shortlisted. Request for Proposal were sent to them. - Spectrum Engineering Consortium Ltd. (SECL) - ECL-3BL Joint Venture (E3JV): Electro CRAFT Corporation Ltd. (ECL) and Best business Bond Ltd. (3BL)
15th April 2015	Pre-Proposal Meeting	Above two Bidders were invited and explanation of answers to Questions, calculation of Financial Score, interrelation of documents was made. On the same day, Answers were distributed to two Bidders.
23rd April 2015	Receipt of Proposals	Two Bidders were submitted their Bid.
24th to 28th April 2015	Technical Evaluation	Only E3JV's proposal got the score higher than minimum score of 400. Score of SECL was lower than 400 points, financial offer of SECL was returned with unopened.
30th April 2015	Opening of Financial offer and evaluation	Financial offer of ECL-3BL JV was made at the presence of representative of JICA Bangladesh office. Offered price of ECL- exceeded referenced price. As per Sub-Clause 13.7a included in Addendum No.1 of Instruction to Tenderers, E3JV was selected as preferred bidder and negotiation will be held on 5 May 2015.
5th May 2015	Negotiation Meeting	A preferred bidder, E3JV accepted KNJV's proposed price and through negotiation, Development Agreement was concluded.
11th May 2015	Signing Development Agreement	Development Agreement was signed by representative of E3JV and KNJV.

Source: JICA Project Team

4.7.2 IT System Development by Local IT Development Company

(1) Package 1

After agreement was concluded, E3JV commenced internal design for Rapid Pass System and completed it on 10th February 2015.

Development of the system delayed due to rampant Hartal, delay in hardware preparation and delay in security key installation of FeliCa. By the end of July 2015, more than 56 days Hartal occurred and hardware procurement was further delayed. Therefore, completion of service was extended to 25th April 2016 and added activity of Integration Test in simulation environment because E3JV could not implement the Integration Test in actual environment.

As soon as the Integration Test commenced, JICA Project Team found out that the Unit test, a software test module by module, was not properly carried out. Therefore, JICA Project Team

decided to commence test named "Acceptance Test" under Package 3 to remove inconsistencies among program modules against system requirements.

(2) Package 2

After agreement was concluded, E3JV commenced the development from first July 2015. Due to delay of Package 1, completion of Package 2 was also extended to 25th April 2016. After the integration test commenced, Package 1 and package 2 were united and completion of development of Package 2 was extended again in the accordance with extension of Package 1 due to low quality.

4.7.3 System Test, Acceptance Test and Removal of Inconsistencies

(1) Package 3 Procurement

Part of "acceptance test" was carried out as a part of maintenance and monitoring of Rapid Pass System. The objectives of Package 3 were mainly maintenance and monitoring of Rapid Pass System, bug fixing and updating of Rapid Pass System and implementation of Pilot Project for PTOs.

Procurement of Package 3 commenced from 21st November 2015 by advertising EOI. EOI submission for Package 3 was made on 6th December 2015 and two companies had been short-listed. RFP document was issued on 12th January 2016. Pre-bid meeting was held on 21st January 2016. Technical evaluation was carried out and only NE3JV (Joint Venture of N-wave BD, Electro Craft Corporation Limited and Best Business Bond Ltd.) passed required minimum score for proceeding next step. Opening of the financial proposal was made on 9th February and contract was signed on 16th March 2016. Detailed procurement processes are shown in **Table 4.7-3**.

Table 4.7-3 Procurement Process for Package 3

Date	Procurement Activity
21st November 2015	Advertisement of EOI
24th November 2015	Distribution of EOI Format
6th December 2015	Submission of EOI
10th December. 2015	Short Listing
12th January 2016	Distribution of RFP
20th January. 2016	Acceptance of Question
21st January. 2016	Pre-bid Conference
1st February. 2016	Submission of Tender
By 8th February. 2016	Evaluation of Tender
9th February 2016	Financial Proposal Opening
Within February 2016	Negotiation
1st March 2016	Contract Signing

Source: JICA Project Team

(2) Acceptance Test and System Test

After contract was signed with NE3JV, JICA Project Team established new local staff team and commenced the acceptance test that confirmed inconsistencies of Rapid Pass System developed by E3JV. Acceptance test was planned to simulate actual operation model of BRTC in the DTCA server room as shown in **Appendix B5-1**.

Completion of development of Package 1 and 2 was extended up to 30th August 2016 for fixing bugs and removal of inconsistencies found out during the test and second acceptance test was

carried out but failed again. While the Project Team was struggling for completion Package 1 and 2, terrorists attack occurred on 1st July 2016 and operation in Bangladesh was temporarily suspended. Therefore, completion of development for Package 1 and Package 2 was extended up to 28th February 2017.

(3) Delivery

E3JV delivered internal design, source code and system test result on 28th February 2017 as shown in **Appendix B5-2**. The reasons why it took two years and four months were as follows.

1. NFC technology was unfamiliar to Bangladesh and took time for developers to acquire NFC knowledge.
2. Quality assurance system of Bangladesh developers was still immature and difficult to meet stringent quality requirement of the AFC technology.
3. Remote supervision of IT development from Japan was required during temporal suspension of expert dispatch to Bangladesh.

4.7.4 Trial Operation for Clearing House IT System (Rapid Pass System)

JICA Project Team and NE3JV continuously monitored Rapid Pass System for both hardware and software functions. Transaction process, batch job and unauthorized access were monitored. **Table 4.7-4** shows incidents found during Package 3 monitoring.

A reporting system between the JICA Project Team and the NE3JV has been established and quick action has been taken whenever incidents happened. In addition, the content of the incidents was recorded as document, and the lessons from those incidents were reflected in the technical and service operation manuals.

JICA Project Team carried out system test including stress test on the assumption that the Rapid Pass System will be used by MRT and BRT that may require huge amount of data transaction. The System test was contracted out to DataSoft Systems Bangladesh Limited (DataSoft) with the consideration that technical know-how of Rapid Pass System shall be maintained by several local IT developers other than NE3JV. **Table 4.7-5** shows process of subcontract to DataSoft.

Table 4.7-4 Incidents Encountered during Monitoring

Date	Item	Issue	Action Taken
5th November 2017	Database	During taking database backup from production sever to test server, SS database in production was deleted.	Acronix backup of SS was not useful as it does not take share storage backup. We reran SS batch process to recover database.
December, 2017	TOM	TOM 2nd issue process was faulty because of failure of network connection. Data was written in the card but not updated in the database.	Card was sent back to CH, data was erased, sent back to TOM and card was issued again.
10th January, 2018	PTO	PTO batch job name TXCP failed during stress test due to limit to handy devices set in batch job	Device limit was increased.
18th January, 2018	CH Terminal	1st issue data upload failed from CH terminal during stress test because max file size limit in PHP settings.	File size limit increased in PHP configuration
6th May 2018	PTO	PTO server disk was full because backup data were too big. It happened because migration backup data was not deleted from the server and it was regularly taking 20 GB for backup. It caused some data loss from handy R/W but recovered later from backup data in handy R/W	When disk is full server does not work properly and cause data loss. It is now fixed to prevent data loss when disk is full.

Source: JICA Project Team

Table 4.7-5 Process Re-entrusted Contract with DataSoft

Date	Procurement Activity	Status
9th June 2017	Advertisement of RFP	Send three local companies include DataSoft
4th July 2017	Receive Proposal	Received proposal from three companies include DataSoft
5th July 2017	Evaluation of Proposal	JICA project team evaluated proposal, DataSoft evaluated as Primary negotiation right holder.
31st July 2017	Contract agreement of NDA	Contract agreement with DataSoft.
7th August 2017	Pre-Contract negotiation	DataSoft agree with contract negotiation
10th August 2017	Contract signing	DataSoft signed contract

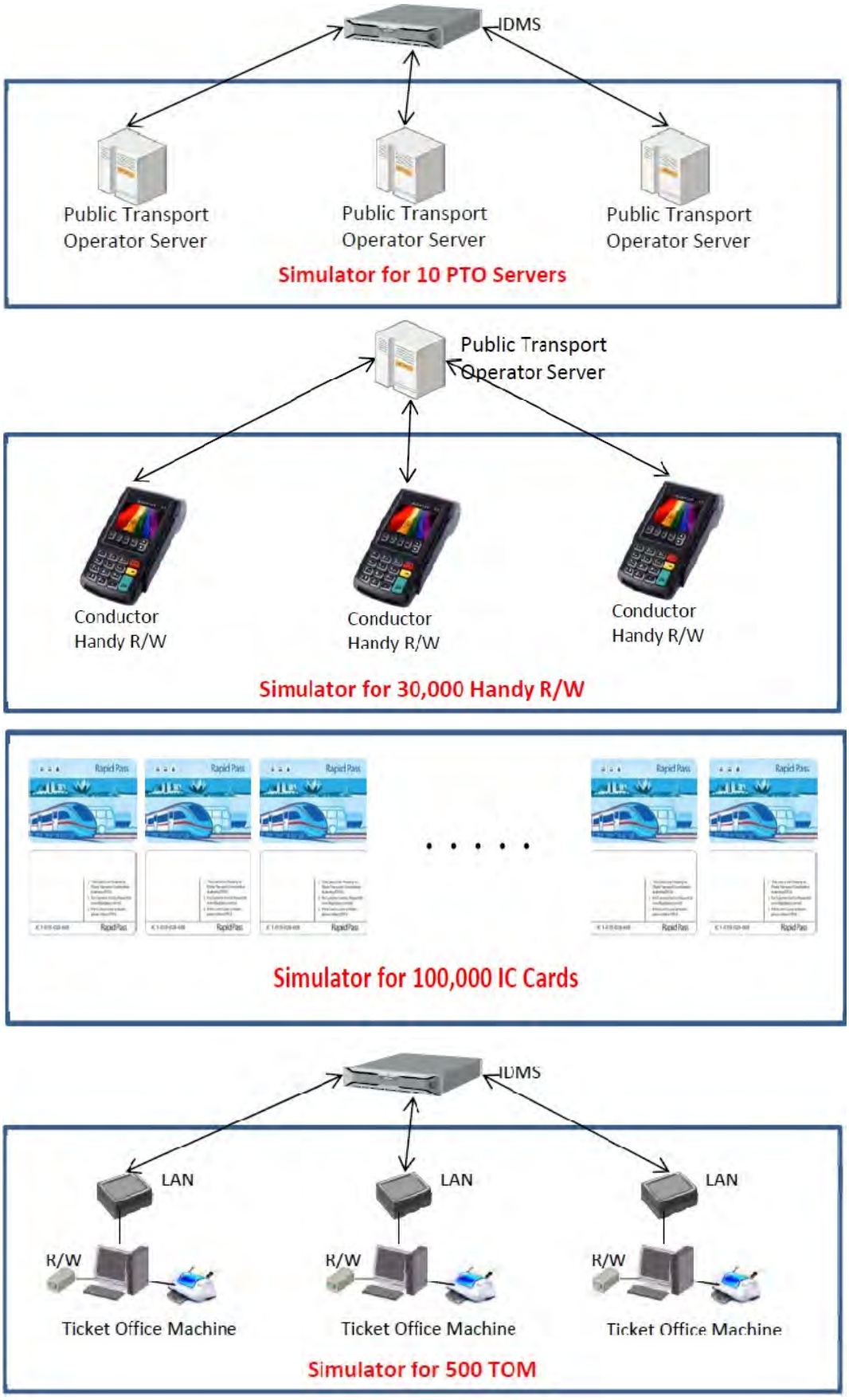
Source: JICA Project Team

DataSoft first developed the software for simulation. It can simulate 100,000 IC card usage, 500 TOM simulation, 10 PTOS and 30,000 handy R/W transaction access to IDMS. **Figure 4.7-1** shows image of simulation.

Before staring the stress test, DataSoft carried out system test to understand the whole system. Contents of the System test were simulation of transaction of handy R/W to PTOS and TOM to IDMS.

As the Pilot Project launched, DataSoft made migration of actual transaction to test servers procured in advance so that actual Rapid Pass operation can be continued without disruption while system test being undertaken using original servers. And then stress test carried out in real infrastructure of Rapid Pass System. Stress test was carried out continuously for fourteen days. Lessons learned as a result of examination are summarized in **Table 4.7-6**. For items that can be rectified within the scope of the Pilot Project operation, JICA Project Team and NE3JV revised the program code and modified the related manuals.

Through this activity, JICA Project Team developed Clearing House IT system and demonstrated that the system will operate stably during the Pilot Project of three bus service in Dhaka City. However, if the number of devices connected to the system increases for accommodation of MRT and BRT operation in the future, there would be a possibility that problems such as bottle-neck of network communication may occur with the current system structure. JICA Project Team and DTCA should consider these potential problems for the future operation.



Source: JICA Project Team

Figure 4.7-1 Image of Simulation

Table 4.7-6 Lessons Learned from System Test

Category	Lessons and learned
Data Communication	The FFM connection server at IDMS cannot handle more than 10 parallel connections at the same time.
	In case of TOM FTP connection, TOM has to send 3 files at the same time. In 30% to 34% of cases IDMS drop the 3rd file.
	Server drops VPN connections when the load is high. If the server drops, VPN connections during simulations run all the rest of the connections fails automatically
	Server cannot properly handle both parallel FFM connections and parallel FTP connections at the same time. If both the FFM and FTP simulations run at the same time, server error rate drastically increases.
Data Preparation	Document mismatch found with source code.
	Initially first issue registration is hampered for new 40,000 cards, because of CH terminal couldn't communicate with IDMS. It was found that CH terminal was configured with hard coded IP address instead of database.
Common Findings	In current architecture, IDMS cannot identify more than one PTO request. PTOS is configured in IDMS database for 1. So DataSoft can only simulate 1 PTO machine requesting to IDMS.
	DataSoft has found several processes at both of the IDMS and PTOS which was puzzled situation.
	Sometime situation that the data DataSoft found was not in process or file was not in process.
	DataSoft found that PTOS, IDMS and SS processes continue to operate until it is manually stopped. Sometime DataSoft found that freeze occurred if more than 8 processes run at a time.

Source: JICA Project Team

4.8 [B-6]: Relationship with Agent Bank (Money Transaction, Interest Rate, etc.) is Considered

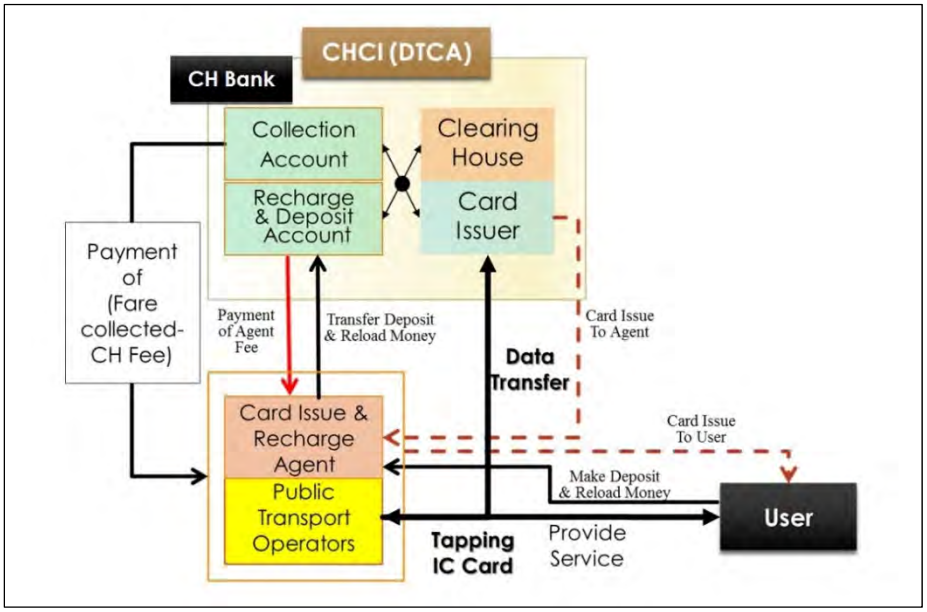
Draft contract for CH Bank including tender document for procuring CH Bank was prepared under this activity.

4.8.1 Review of Terms and Conditions for CH Banks

During SPASS card operation for BR and BRTC under "Consultancy Service on Support for Introduction of ICT Fare System in Dhaka, JICA Expert", Mercantile Bank (MB) selected by N-Wave BD was responsible for banking service of Clearing House. MB had permission from Bangladesh Central Bank as an agent bank of N-Wave BD for fare collection in BRTC and BR using IC cards. But MB account that did not generate interest was used for recharge collection. Cost for procurement and issuance of IC card could not be covered by the interest at all.

Based on the lessons learned from the preceding project, JICA Project Team reviewed the terms and conditions of the current contract with MB on the condition that DTCA will be the card issuer. JICA Project Team had several meetings and coordination with banks and DTCA, and prepared draft of REOI and Terms of Reference (TOR) for bidding of new Clearing House Bank.

JICA Project Team and DTCA reviewed the money flow as DTCA will be the card issuer. **Figure 4.8-1 s**hows revised money flow among card users, CHCI (DTCA) and CH Bank. Details of the preparatory work for Rapid Pass service, bank account service, card issue and recharge agent, Rapid Pass promotion activity, colocation service as roles of CH Bank were decided.



Source: JICA Project Team

Figure 4.8-1 Revised Money Flow of CH Bank

Compared with CH Bank contract with preceding project of SPASS, new roles such as card issue promotion or colocation service for server systems were included in the TOR in addition to previous roles keeping bank account and money transaction of Clearing House.

4.8.2 Review and Update Contract for New CH Bank

JICA Project Team and DTCA decided to select new Clearing House Bank because MB was not selected following government procurement rules. From July 2014 to June 2015, JICA Project Team engaged in preparing REOI and TOR for selection of CH Bank with DTCA.

DTCA posted REOI for selection of CH Bank in Daily Star newspaper. Six banks submitted EOI and evaluated by JICA Project Team and DTCA. As a result of evaluation, all of six banks were qualified and DTCA requested for proposal from six banks. Four banks submitted proposal and JICA Project Team and DTCA evaluated the proposals. **Table 4.8-1** shows Procurement schedule of CH Bank.

Table 4.8-1 Procurement Schedule of CH Bank

Procurement Activity	Date
Distribution of RFP	2nd December 2015
Pre-bid Conference	20th December 2015
Submission of Proposal	4th Jan 2016
Proposal Evaluation	From 5th January to 29th February 2016
Approval of Evaluation by EC	16th February 2016
Opening of Financial Proposal	22nd February 2016
Negotiation	March to April 2016
Signing of Draft Contract	11th May 2016
Approval of MRTB	29th December 2016
Contract Signing	25th January 2017

Source: JICA Project Team

CH Bank was selected through Quality and Cost Based Selection (QCBS) method, which consists of two parts, technical evaluation and financial evaluation. Technical evaluation is made first and only financial proposal of those banks that have passed technical evaluation will be opened and evaluated. **Table 4.8-2** shows evaluation criteria of technical evaluation and financial evaluation.

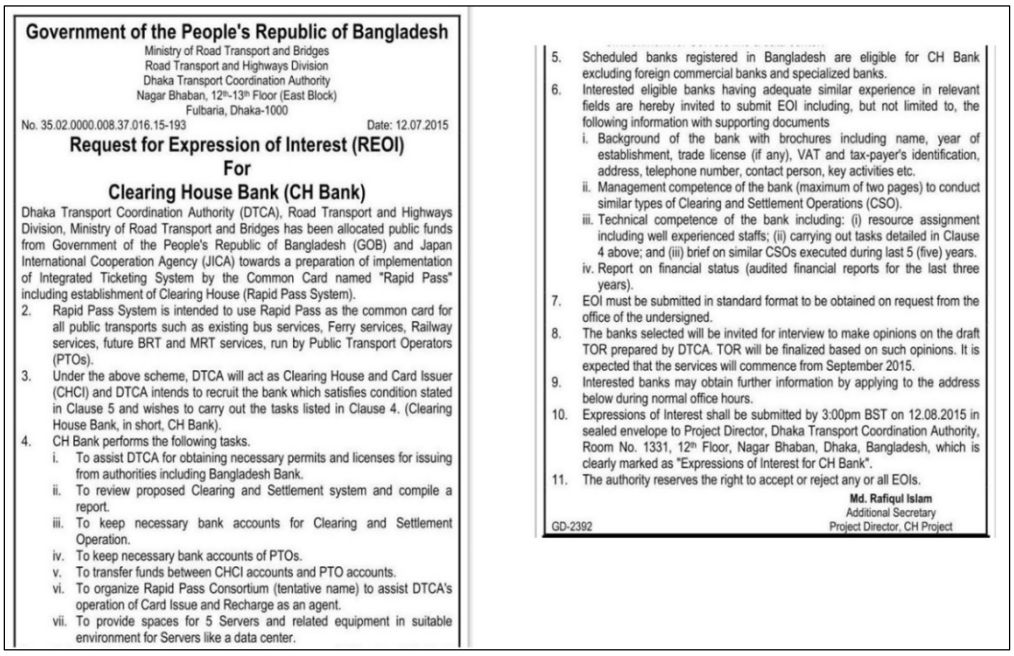
Table 4.8-2 Evaluation Criteria of Technical Evaluation and Financial Evaluation

Sl	Sheet Name		Weight/ Score
Technical Evaluation			**70**
1	Approach and Methodology		25
2	Resource Capacity		50
	(a)	Organization Chart	(15)
	(b)	CV for Key Personnel	(15)
	(c)	Support Facilities & Equipment	(20)
3		Credit Rating	25
	Total for Technical		**100**
Financial Evaluation			**30**
1	Financial Offer		
	a	Agent Fee for Card Issue + Initial Recharge	8
	b	Agent Fee for Recharge	72
	c	Number of Agent Service Counters	20
	Total for Financial		**100**
Grand Total			-

( ) shows breakdown of resource capacity
Source: JICA Project Team

As a result of evaluation, DBBL was identified as first ranked bank for contract negotiation. The result was noted to DBBL on 22nd February 2016 and negotiation for contract agreement started.

After the negotiation and approval of MRTB, DTCA decided to make contract agreement with DBBL as CH Bank. The contract signing ceremony was held on 25th January 2017. DBBL started its activities as CH Bank from the BRTC Pilot Project started in May 2017. DBBL not only fulfilled its roles as CH Bank, but also installed TOM shops at bank counters for the card issue and recharge.



Government of the People's Republic of Bangladesh
Ministry of Road Transport and Bridges
Road Transport and Highways Division
Dhaka Transport Coordination Authority
Nagar Bhaban, 12th-13th Floor (East Block)
Fulbaria, Dhaka-1000

No. 35.02.0000.008.37.016.15-193 Date: 12.07.2015

Request for Expression of Interest (REOI)
For
Clearing House Bank (CH Bank)

Dhaka Transport Coordination Authority (DTCA), Road Transport and Highways Division, Ministry of Road Transport and Bridges has been allocated public funds from Government of the People's Republic of Bangladesh (GOB) and Japan International Cooperation Agency (JICA) towards a preparation of implementation of Integrated Ticketing System by the Common Card named "Rapid Pass" including establishment of Clearing House (Rapid Pass System).

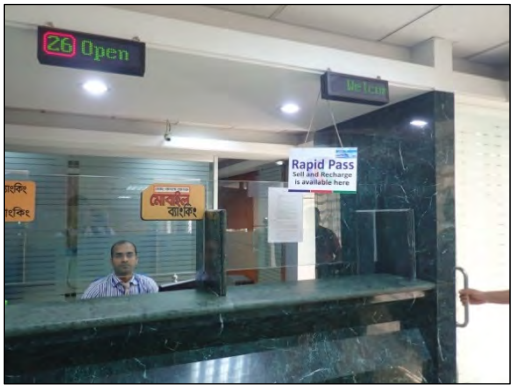
2. Rapid Pass System is intended to use Rapid Pass as the common card for all public transports such as existing bus services, Ferry services, Railway services, future BRT and MRT services, run by Public Transport Operators (PTOs).
3. Under the above scheme, DTCA will act as Clearing House and Card Issuer (CHCI) and DTCA intends to recruit the bank which satisfies condition stated in Clause 5 and wishes to carry out the tasks listed in Clause 4. (Clearing House Bank, in short, CH Bank).
4. CH Bank performs the following tasks.
   i. To assist DTCA for obtaining necessary permits and licenses for issuing from authorities including Bangladesh Bank.
   ii. To review proposed Clearing and Settlement system and compile a report.
   iii. To keep necessary bank accounts for Clearing and Settlement Operation.
   iv. To keep necessary bank accounts of PTOs.
   v. To transfer funds between CHCI accounts and PTO accounts.
   vi. To organize Rapid Pass Consortium (tentative name) to assist DTCA's operation of Card Issue and Recharge as an agent.
   vii. To provide spaces for 5 Servers and related equipment in suitable environment for Servers like a data center.
5. Scheduled banks registered in Bangladesh are eligible for CH Bank excluding foreign commercial banks and specialized banks.
6. Interested eligible banks having adequate similar experience in relevant fields are hereby invited to submit EOI including, but not limited to, the following information with supporting documents
   i. Background of the bank with brochures including name, year of establishment, trade license (if any), VAT and tax-payer's identification, address, telephone number, contact person, key activities etc.
   ii. Management competence of the bank (maximum of two pages) to conduct similar types of Clearing and Settlement Operations (CSO).
   iii. Technical competence of the bank including: (i) resource assignment including well experienced staffs; (ii) carrying out tasks detailed in Clause 4 above; and (iii) brief on similar CSOs executed during last 5 (five) years.
   iv. Report on financial status (audited financial reports for the last three years).
7. EOI must be submitted in standard format to be obtained on request from the office of the undersigned.
8. The banks selected will be invited for interview to make opinions on the draft TOR prepared by DTCA. TOR will be finalized based on such opinions. It is expected that the services will commence from September 2015.
9. Interested banks may obtain further information by applying to the address below during normal office hours.
10. Expressions of Interest shall be submitted by 3:00pm BST on 12.08.2015 in sealed envelope to Project Director, Dhaka Transport Coordination Authority, Room No. 1331, 12th Floor, Nagar Bhaban, Dhaka, Bangladesh, which is clearly marked as "Expressions of Interest for CH Bank".
11. The authority reserves the right to accept or reject any or all EOIs.

Md. Rafiqul Islam
Additional Secretary
Project Director, CH Project

GD-2392

Source: JICA project team

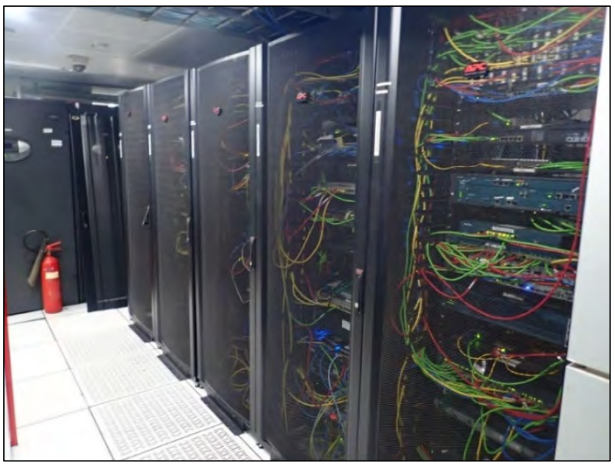
Figure 4.8-2 Advertisement on Daily Star Newspaper



Source: JICA Project Team

Photo 4.8-1 TOM Shops at DBBL Bank Counter

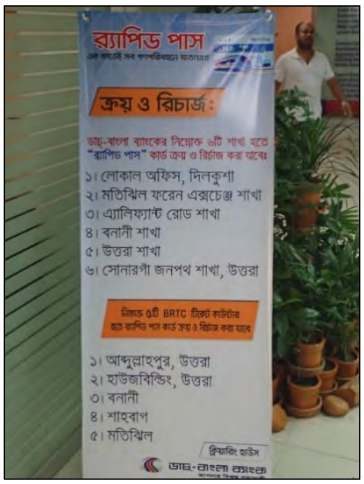
The agreement of CH Bank also includes installation of Clearing House system in DBBL's data center, and servers of Clearing House system were installed in DBBL's data centers.



Source: JICA Project Team

Photo 4.8-2 Data Center of DBBL

DBBL also conducted activities related to promoting for Rapid Pass use. At the branches dealing with Rapid Pass services, banners for promoting Rapid Pass use are set up prepared by DBBL voluntarily. In February 2018, DBBL staff carried out promotion activities on Dhaka Chaka's route.



Source: JICA Project Team

Photo 4.8-3 Promotion Banner of DBBL

Source: JICA Project Team

Photo 4.8-4 Shirt for Promotion


Source: JICA Project Team

Photo 4.8-5 Promotion Activity by DBBL

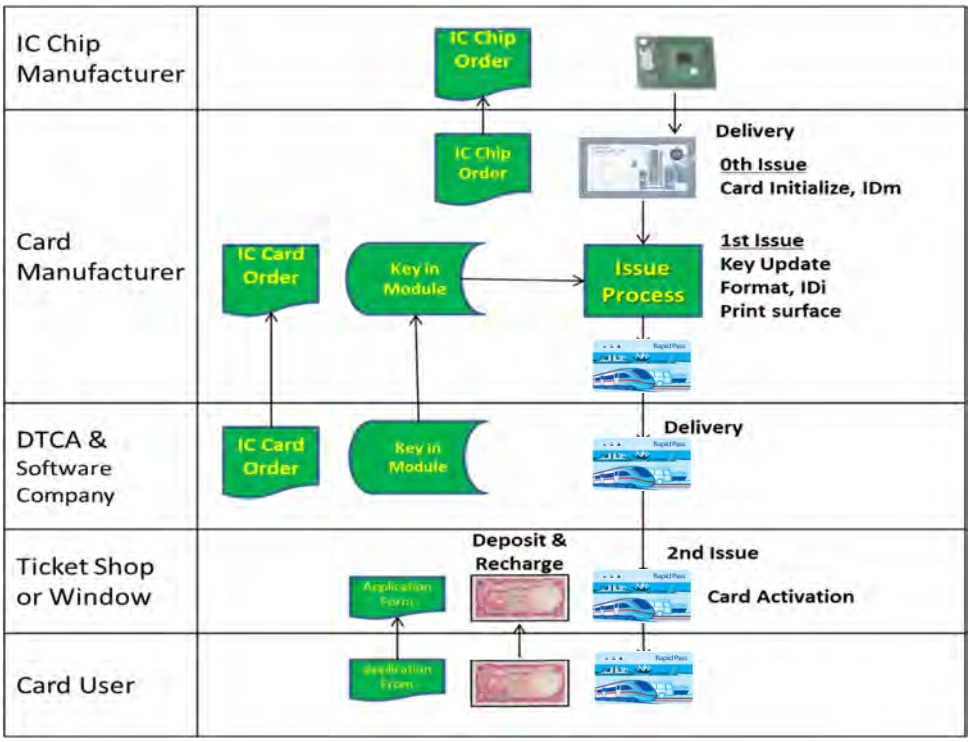
4.9 [B-7]: Card Issuance Management (security key installation etc.) is Considered

This activity includes preparation of card issue flow, IC card procurement procedure and study on security management of Rapid Pass card.

4.9.1 Card Issue Flow Design

Card issue flow was prepared based on the lessons of the preceding projects by using SPASS for BR and BRTC. N-Wave BD was managing IC card issuance and key management of BRTC and BR based on MOU between DTCA and N-Wave BD. Card key and card issue were managed by N-Wave BD without proper security measures that may lead to leakage of card key to fraudulent parties. With the result of preceding projects and experiences in Japan, JICA Project Team and DTCA decided that DTCA will be the card issuer and will be the responsible agency for security key management since DTCA is the most appropriate and reliable agency regarding card issue and security key management.

Flow of card issuance with DTCA as the card issuer was then prepared by joint study of JICA Project Team and DTCA as shown in **Figure 4.9-1**.



Source: JICA Project Team

Figure 4.9-1 Flow of Card Issuance (New Card Issuance)

Recycle card issuance was also proposed to DTCA in order to reduce the IC card procurement cost. It means DTCA collects refunded cards and black listed cards, deletes data in these cards and issue again as another Rapid Pass cards. This proposal was approved formally on 25th January 2016.

After discussion with DMTCL, DBRT and other PTOs, DTCA and JICA Project Team decided banks, PTOs and other organization may issue Rapid Pass cards with conclusion of Agent Agreement with DTCA and DTCA reserves the ownership of Rapid Pass cards as sole card issuer. DTCA was approved as the sole card issuer of Rapid Pass by Honorable Prime Minister Sheikh Hasina at the inauguration held on 4th January 2018.

4.9.2 IC Card Procurement Method

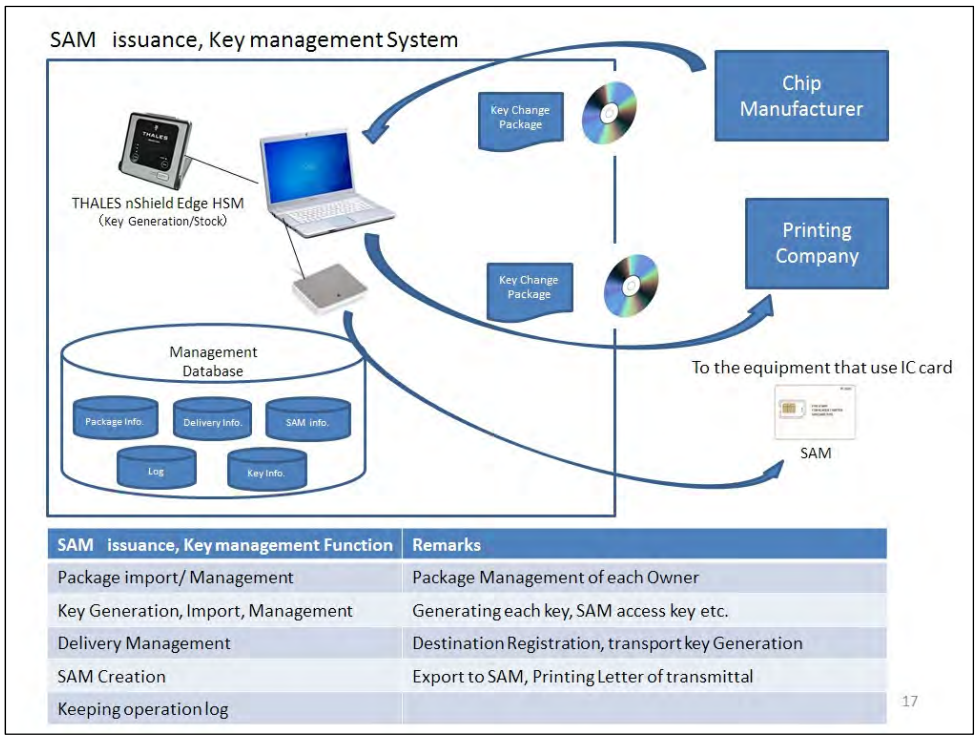
As a part of the trial procurement, DTCA procured 5,000 IC cards. The tax imposed on the imported IC card was 70% of the purchased price. This high tax rate might have great impact on CH business plan, and IC card procurement method was formulated based on this trial procurement and described in detail in the Service Operation Manual for Card/SAM Procurement.

Using this IC card procurement method, DTCA procured 60,000 IC cards in April 2017. Out of 60,000 cards, Rapid Pass Card has issued 2,247 during the trial operation. Since establishment of SPC is proposed, card procurement task will be in charge of SPC in the future.

4.9.3 Study on Security Management Related to SAM Issue and Key Management

Discussions about key management are still underway between JICA Project Team and DTCA. As one of the ideal method of SAM issue and key management for future expansion plan of Rapid Pass, JICA project team suggests the key management method using Hardware Security

Module (HSM) box that can store critical key information using encryption and electronic signature. Moreover, multiple authentications will be required for opening HSM box. Secured SAM issue and key management like HSM box would be essential for future expansion of Rapid Pass.



SAM issuance, Key management Function	Remarks
Package import/ Management	Package Management of each Owner
Key Generation, Import, Management	Generating each key, SAM access key etc.
Delivery Management	Destination Registration, transport key Generation
SAM Creation	Export to SAM, Printing Letter of transmittal
Keeping operation log	

Source: JICA Project Team

Figure 4.9-2 Image of SAM Issuance and Key Management System

JICA Project Team tentatively proposed that DTCA to be a responsible agency for card procurement and card issue. However, for the further expansion of the Rapid Pass card, more economical card procurement and card issue methods have to be explored including more reliable and secured key management to provide against external threats of key leakage[1].

4.10 [B-8]: IC Card Design Strategy is Prepared

Rapid Pass card design was finalized through card design competition by Dhaka University students. JICA Project Team also studied a possible use of card surface as advertising media.

4.10.1 Card Design Competition and Finalization of Card Design

The name of "Rapid Pass" with the approval by honorable Prime Minister. JICA Project team proposed to have a card design competition for finalization of the card design. DTCA agreed with this proposal and JICA Project Team and DTCA requested Dhaka University faculty of Graphic Design to hold an IC card design competition.

The reason why it was held at Dhaka University is because students understood the card concept and possessed excellent design talents. The card design competition was held after sufficient explanation about naming background, concept of multiple use of card and another detailed dimension of card design. Five outstanding card designs were selected as a result of card design

[1] Key leakage happen to T-money in Korea in 2009

competition and submitted to DTCA on 28th May 2015 for review.

Source: JICA Project Team

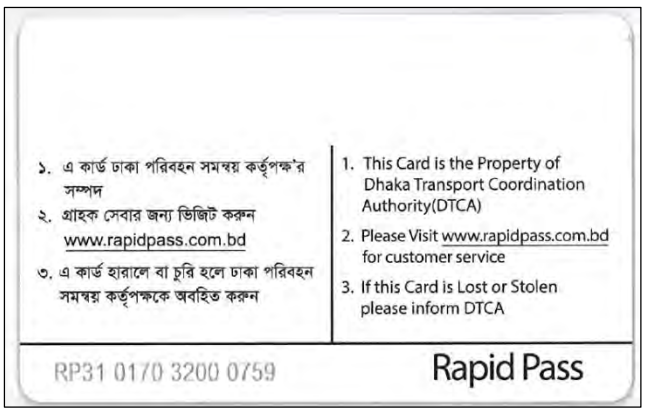
Figure 4.10-1 One of the Candidate Card Design

Final design was selected after several adjustments with the card designer and MRTB.

Source: JICA Project Team

Figure 4.10-2 Final Card Design

The card design shows multiple transport means of train, bus and ferry together with symbols of Bangladesh. This card design was printed on IC cards that were procured by DTCA in April 2017. On the back side of Rapid Pass, Explanation of Rapid Pass card use is printed. JICA Project Team and DTCA examined the detail of contents of explanation. The explanation was mentioned in two languages i.e English and Bengali.



Source: JICA Project Team

Figure 4.10-3 Back Side of the Card

4.10.2 Future Card Design Plan and Multiple Use Strategy

IC card may be used not only for transportation card but also for other profitable sources of revenue, such as advertisement media for the future expansion of Rapid Pass. The plan for utilization of card design as an advertisement media is shown in **Table 4.10-1**.

Table 4.10-1 The Plan for Utilization of Card Surface as an Advertisement Media

Plan	Description
Commercial advertisement	The effect of advertisement can be expected by the number of issues
Logo of school, company or agencies print on card	Cooperation with applications such as entrance and exit, attendance management can be expected.
Special print design for event, gift or anniversary	Attract the customer's willingness to buy a card due to rarity and limitedness of card design

Source: JICA Project Team

As actual case study was made for Military Institute of Science and Technology (MIST) as student ID. The card has combined functions of MIST student ID, Rapid Pass for transportation and DBBL for bank ATM. JICA Project Team shared information about Rapid Pass or function of FeliCa with MIST. This case was not realized because of budget and human resource constraints for development of student ID card systems with Rapid Pass. But, this case study was useful case for multiple use strategy of Rapid Pass for future expansion.

Source: Courtesy of DBBL

Figure 4.10-4 Image of Student ID on Rapid Pass Card with Bank ATM

Chapter 5 Activities for Output-C

5.1 [C-1]: Services of Current Public Transport Operator is Analyzed:

5.1.1 Services of Current Public Transport Operator

At the beginning of the Project in May, 2014, there was only one PTO, namely BRTC, adopted IC card for the fare collection. BRTC started the fare collection using IC card based on the support extended under "Project for Improving Fare System of Mass Transportation in Dhaka City Area through ICT as the Pilot Project" implemented in 2011 to 2012. In addition to BRTC, BR implemented a Pilot Project under "Consultancy Service on Support for the introduction of ICT Fare System in Dhaka JICA Expert (Project implementation and IC card operation)" for 4 months from October 21, 2013 to February 20, 2014, as part of the preparation of the second phase of the Pilot Project.

JICA Project Team studied and analyzed the examples of use of IC card in those agencies in order to find out the merit and problems of IC card application.

5.1.2 Fare Collection Using IC card in BRTC

(1) Background

In order to establish efficient and effective ICT fare collection system in Dhaka public urban transportation system, "Project for Improving Fare System of Mass Transportation in Dhaka City Area through ICT" was implemented by DTCA and supported by JICA. The project started in October 2011 and completed in December 2012. Later on BRTC was included in this Pilot Project from April 2012 to October 2012.

After the completion of the Pilot Project, BRTC decided to continue to use ICT fare collection system, using IC card named SPASS card. On February 28, 2013, BRTC issued the order for management of ICT Fare System to N-Wave Co. (BD) Ltd., who supported BRTC during the implementation of the Pilot Project. N-Wave (BD) was ordered to collect Fare of AC/Non AC, single/double-decker bus through ICT Fare System using handy R/W, card case, SPASS card, etc. charging 10% commission from each day's revenue.

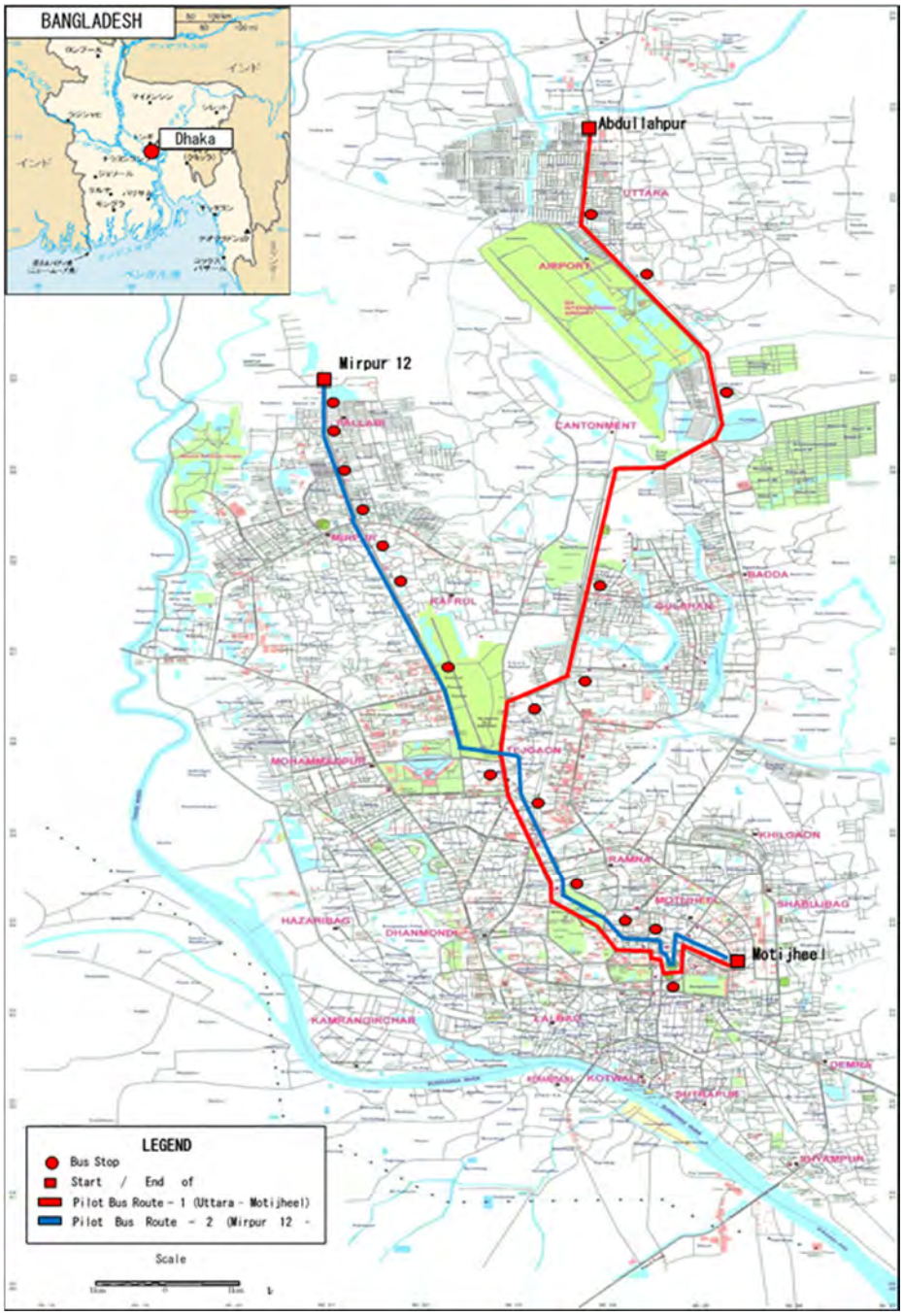
(2) Main Feature of the ICT Fare Collection Service Contract

The main features of the ICT fare collection service contract were as follows:

Duration: March 1, 2013 to the end of February 2016 for 3 years

Service Route: Abdullahpur to Motijheel Route (around 35 AC buses) and Mirpur to Motijheel Route (around 20 Double-Decker buses)

Location of above service routes is shown in **Figure 5.1-1**.



Source: JICA Project Team

Figure 5.1-1 Location of ICT Fare Collection Service Routes

Operation Scheme: N-Wave (BD) was instructed by BRTC to collect Fare of AC/Non-AC, single/double-decker bus through ICT Fare System using handy R/W, card case, smart card etc. Also N-Wave (BD) was instructed to bear the expense of building ticket shops, buying and installation charge of computers and accessories, handy R/W, salary of system operators and security guards to maintain ICT fare collection system. N-Wave (BD) was to receive 10% commission out of each day's revenue.

Issue, recharge, re-issue of SPASS card was carried out at BRTC ticket shops operated by N-Wave (BD). Passengers without SPASS card were to use e-ticket at any BRTC ticket shops by paying cash. When the passenger with SPASS card rides the bus, they touch SPASS card in handy R/W operated by staff of N-Wave (BD). After reaching destination, the passengers have

to touch the device for second time and the device calculated the distance and deducted normal fare from the stored value of the SPASS card.

(3) Chronological Events

At the beginning of the Work Order, the management of BRTC showed very positive attitude toward SPASS card, and intended to introduce it to all their bus routes. However, due to frequent change in management and the field staff of BRTC including Depo managers, N-Wave faced difficulties coping up and number of bus operated under SPASS card was limited to around 20 buses, although in the Work Order, BRTC assured over 100 buses.

Particularly, during December 2014 to March 2015, there were very frequent Hartal, which made the bus operation difficult. Because of such low level of bus operation, the commission dropped to financially unsustainable level for N-Wave (BD). Although the complaints made by N-Wave (BD) in their several letters and even a letter from JICA Bangladesh Office asking the improvement to BRTC, the deteriorated situation continued and did not improved. **Table 5.1-1** shows monthly use by passengers and corresponding sales between January 2013 and January 2014.

Table 5.1-1 Monthly Summery Report of BRTC, January 2013 to January 2014

Month	Abdullahpur - Motijeel (AC Service)		Gazipur/Shibbri - Motijheel		Mirpur 12 - Motijeel		Nobinogor - Motijheel		Total	
	Total Passengers	Total Sale (BDT)	Total Passengers	Total Sale (BDT)	Total Passengers	Total Sale (BDT)	Total Passengers	Total Sale (BDT)	Total Passengers	Total Sale (BDT)
13-Jan	77,471	3,144,209	255,827	5,985,459	160,859	2,306,149	-	-	**494,157**	**11,435,817**
13-Feb	64,072	2,587,465	167,312	3,971,168	111,379	1,596,699	-	-	**342,763**	**8,155,332**
13-Mar	70,073	2,871,375	126,634	2,997,138	93,632	1,278,031	-	-	**290,339**	**7,146,544**
13-Apr	102,391	4,185,351	115,035	2,683,917	96,888	1,364,717	-	-	**314,314**	**8,233,985**
13-May	99,917	4,063,770	113,055	2,719,082	64,073	930,139	45,371	1,169,724	**322,416**	**8,882,715**
13-Jun	204,318	8,240,428	156,115	3,840,257	119,782	1,765,090	75,879	1,882,984	**556,094**	**15,728,759**
13-Jul	159,944	6,446,194	115,976	2,945,683	100,325	1,464,972	88,613	2,011,770	**464,858**	**12,868,619**
13-Aug	116,241	4,513,897	63,964	1,681,742	60,136	883,902	69,983	1,476,470	**310,324**	**8,556,011**
13-Sep	170,596	6,936,030	7,226	185,555	13,880	209,595	4,820	126,430	**196,522**	**7,457,610**
13-Oct	31,834	1,316,225	31,526	1,542,200	38,149	676,900	-	-	**101,509**	**3,535,325**
13-Nov	66,534	2,749,790	29,804	1,490,200	50,161	863,750	-	-	**146,499**	**5,103,740**
13-Dec	17,100	684,920	18,657	932,850	910	9,800	-	-	**36,667**	**1,627,570**
14-Jan	13,955	590,080	3,196	159,800	-	-	-	-	**17,151**	**749,880**

Note: Duet to political unrest in the country from October 2013 to 5th January 2014, Card sale and total revenue has decreased.
Source: N-Wave Co. Ltd. (BD)

As BRTC decided to increase the bus fare from October 2015, it was required to modify the system for SPASS card. However, BRTC had no intention to bear the necessary cost for the modification, and it was difficult for N-Wave (BD) to continue the operation of SPASS card. N-Wave (BD) with the consent of BRTC decided to terminate the operation of SPASS card on October 1, 2015.

Up to October, 2015, the number of SPASS cards delivered to passengers was 31,945. At the beginning, the cards were delivered to passengers without deposit assuming that the use of the cards would be accelerated in BRTC, BR, BIWTC, etc. With the termination of SPASS operation, the recovery of SPASS cards was undertaken up to December 2015, and 1,608 SPASS cards were recovered, among which 946 cards with deposit of 100 BDT. However, only for 40 cards refund of 4,233 BDT were made, among which 39 cards with no deposit.

(4) Lessons Learned

Introduction of SPASS card and e-ticket was enable BRTC to grasp accurate number of passengers and secure the collection of appropriate fare from passengers, eliminating pilferage through cash collection. However, there were very strong resistance from the field staff and Depo management of BRTC, and this type of fare collection will not be sustainable. Therefore, in the Project, it was decided to concentrate on introduction of Rapid Pass card, excluding issuance of e-ticket, operated by staff of each PTO.

There were lack of understandings in BRTC of the meaning of introduction of ICT fare collection system, rather they understood it as an alternative type of the ordinary fare collection contract. Because of this lack of understanding, BRTC refused to bear the cost of program development necessary for modification of the bus fare. Therefore, in the Project, it was decided to avoid the fare collection contract and only extend technical support to staff of PTO of the Pilot Project, who do the actual operation of equipment of Rapid Pass System.

5.1.3 Bangladesh Railways (BR)

(1) Background

Under “consultancy service on support for the introduction of ICT Fare System in Dhaka JICA Expert”, BR implemented a Pilot Project for the introduction of ICT Fare System. The MOU amongst JICA, DTCA and BR on Fare Collection System Using Common IC Card was concluded on September 29, 2013 and considering abnormal congestion of Eid-ul-Azha (from October 14 to October 17, 2013) and preparation period, commencement date of Pilot Project was decided to be on 21 October 2013.

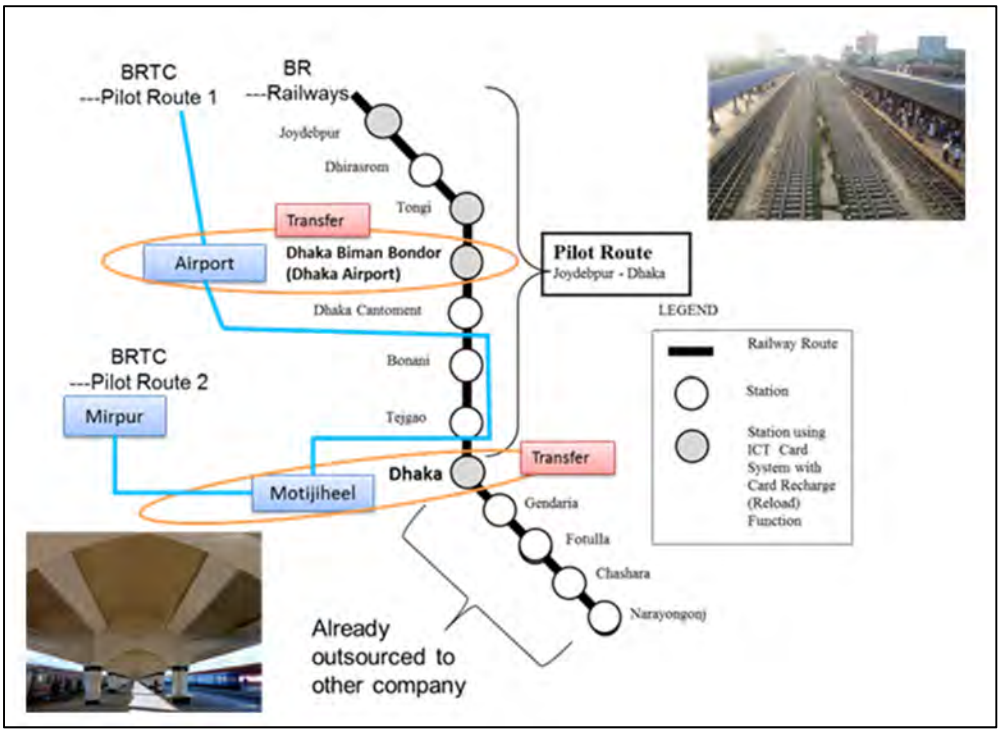
(2) Main Feature of the Pilot Project

The main features of the Pilot Project were as follows:

Project Duration: October 21, 2013 to 20 February 2014

Project Site: The route for Pilot Project is shown in **Figure-5.1-2**.

Fare collection task for Southern line from Dhaka to Narayangonj was outsourced to other company. Trains designated were 4 Turags, which were Commuter trains, named after Turag River.



Source: Expert Activity completion Report, March 2014, JICA

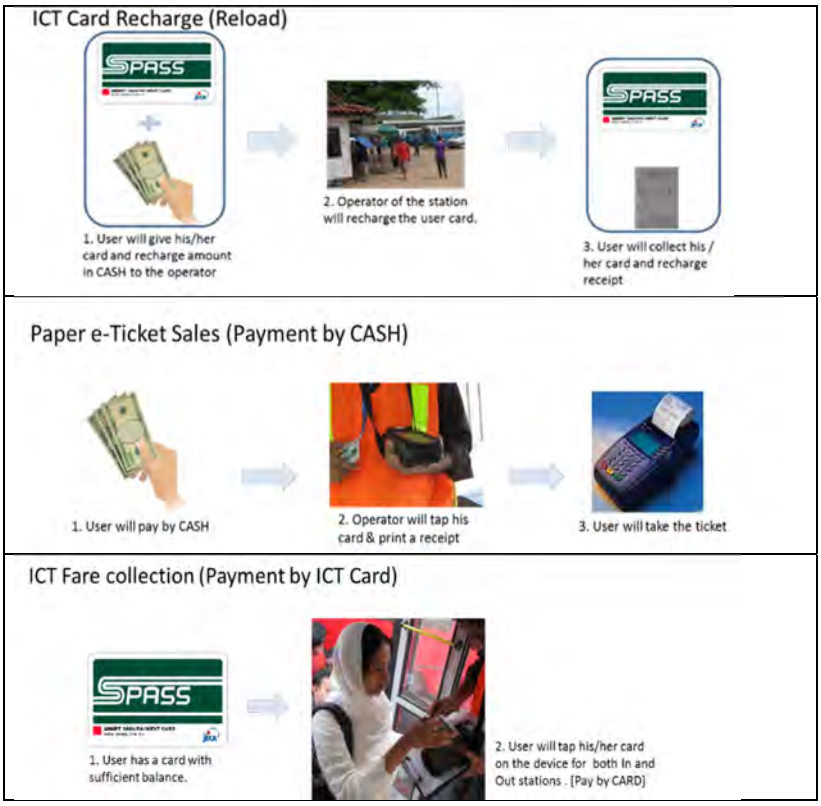
Figure 5.1-2 Location of Pilot Project Route

Operation Scheme: Operational flow of SPASS transaction is shown in **Figure 5.1-3** while number of staff deployed by JICA Project is presented in **Table 5.1-2**. Ten handy R/W operators were assigned at eight railway stations while another 10 handy R/W operators were deployed inside trains. The following two types of fare collection service were experimentally implemented;

1. ICT fare collection: Payment by IC card (SPASS card), IC card recharge at stations
2. Paper e-ticket sales: Payment by cash

Through above two types of fare collection services, effects and impact of the following three major trial items were tested and verified.

1. Clearing House function for BR and BRTC,
2. Transfer passengers from bus to train and vice versa
3. Ticket for non-frequent users



Source: Expert Activity Completion Report, March 2014, JICA

Figure 5.1-3 Operational Flow of SPASS Transaction

Table 5.1-2 Number of Staff of JICA Local Consultant

Name of Stations	Monitoring Staff from JICA	R/W Operators from JICA Local Consultant		
	Monitoring Engineer of JICA Local Consultant	Recharge for SPASS Card Paper e-ticket Sales SPASS Tap		Total JICA Staff
		At the station	Inside Train	
1. Joydebpur	3	1(2)	10*	11 (12**)
2. Dhirasrom		1		1
3. Tongi		1		1
4. Dhaka Airport		2(1)		2 (1)
5. Dhaka Cantonment		1		1
6. Bonani		1		1
7. Tejgaon		1		1
8. Dhaka (Kamalapur)		2		2
Total	**3**	**20**		**20**

* R/W in the train will be 10 Nos. (2 doors x 5 trains). 10 Nos. of R/W operators move on train.
** It includes 10 R/W operators in the trains.
Figure in brackets shows final arrangement of staffs. Because row in Joydebpur station was longer than that in Airport station. One staff in Airport station was moved to Joydebpur station.

Source: Expert Activity Completion Report, JICA, March 2014

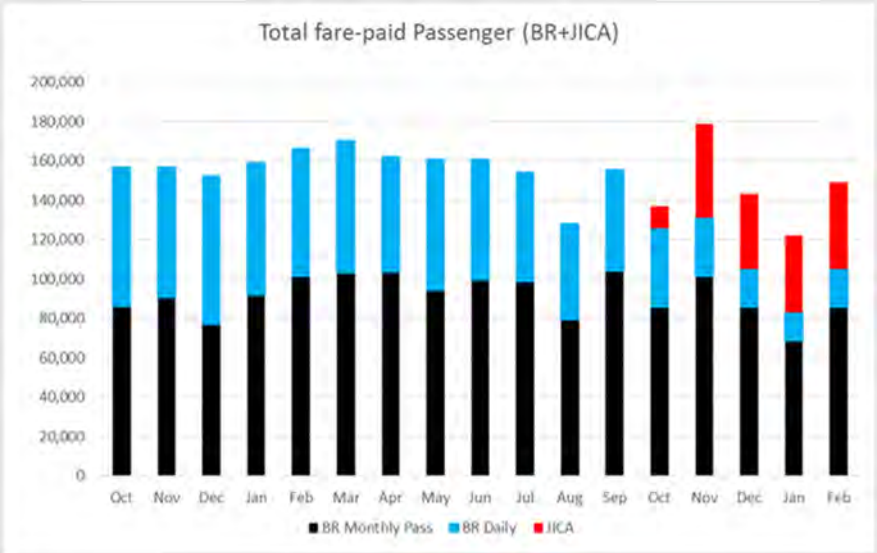
(3) Result of the Pilot Project

The fare collection result of the Pilot Project is as shown in **Table 5.1-3**, and the trend of fare paid by passengers during project period is shown in **Figure 5.1-4**.

Table 5.1-3 Results of Fare Collected by ICT Fare System

Year Month	Passenger/Month	Fare Collected (BDT)	Working Days	Average Passengers/ Day	Average Passengers/ Train
2013/Oct	11,253	121,805	9	1,250	417
2013/Nov	47,290	549,460	25	1,892	631
2013/Dec	38,534	447,480	24	1,606	535
2014/Jan	39,119	475,820	27	1,449	483
2014/Feb	30,500	386,250	18	1,694	564

Source: Expert Activity Completion Report, JICA, March 2014



Source: Expert Activity Completion Report, JICA, March 2014

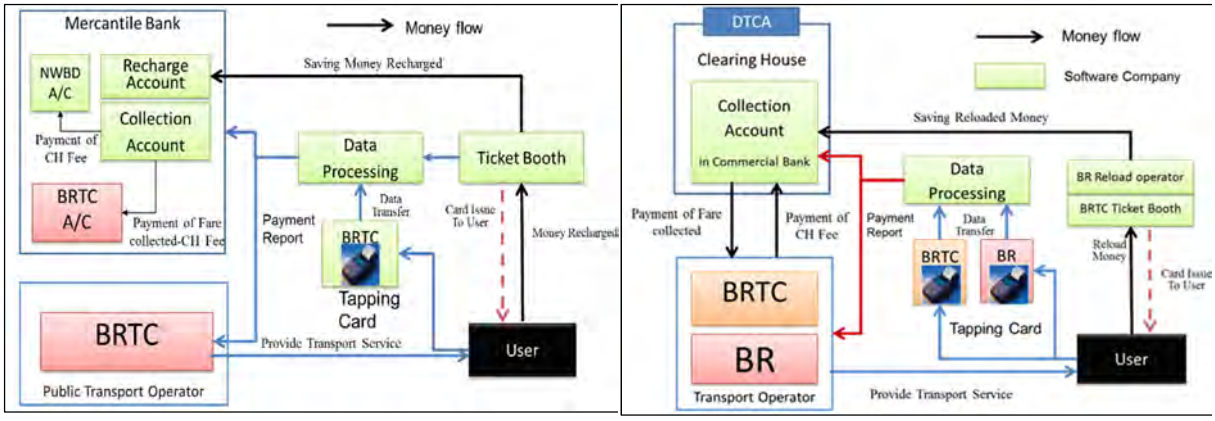
Figure 5.1-4 Trend of Fare Paid by Passengers

1) Clearing House Function for BR and BRTC

The following two systems needed to be developed and managed for gathering and analyzing data using SPASS and handy R/W.

1. Device System
   The system that can process BR fare collection in addition to BRTC operation.
2. Service Center (Server) System
   The system that can register, process and analyze the information of BR passengers in addition to BRTC passengers.

Figure 5.1-5 illustrates system before and during BR Pilot Project.



ICT Fare System before BR Project　　ICT Fare System during BR Project

Source: Expert Activity Completion Report, JICA, March 2014

Figure 5.1-5　Revised ICT Fare Collection System for BR Pilot Project

2)　Transfer Passengers from Bus to Train and Vice Versa

As shown in **Figure 5.1-2**, passenger transfer is expected at following two stations. During the site investigation of all stations including other candidate stations revealed that passenger transfer between bus and train and vice versa was not observed at all although information campaigns were carried out at the BRTC Ticket Shops (Gazipur Uttara, Airport, Bonani, Motijheel) and inside bus for encouraging passengers to catch the train.

Table 5.1-4　Transfer Station and Stoppage

BRTC Stoppage	BR Station
Airport	Dhaka Biman Bondor (Dhaka Airport)
Motijiheel	Dhaka

Source: Expert Activity Completion Report, JICA, March 2014

3)　Ticket for Non-Frequent Users

For introduction of ICT fare collection system, handling of non-frequent or non- IC card holder passengers is important. In BRTC operation, paper e-ticket system has adopted. For BR Pilot Project, the same method as applied in BRTC, ie paper e-ticket system plus manual checking by BR staffs are used in combination with SPASS.

(4)　Lessons Learned

Upon completion of the Pilot Project, the JICA expert made the following recommendations.

1)　Fare Structure

Turag-2,7 and 8 had more than 2,000 fare-paid passengers in average. (Monthly Pass Users 1,100+Daily Ticket Users 900). On top of 2,000 there were fare-free riders, numbers of which were estimated to be approx. 400. Because seat capacity is 68, Load Factor may be not less than 250%. Rate of fare-paid passengers were estimated to be not less than 80% (=2,000/2,400).

An estimate for Maximum collectable fare from fare-free passengers is BDT 4,720/train (=11.8×400). Monthly collectable fare is calculated in the same manner and it is BDT 368,000 (=3 trains/day×26 days/month×4,720/train).

BR kept considerably high rate of fare-paid passengers by the followings.

1. Ticket sales at ticket window of stations
2. Sales of Monthly Pass
3. Ticket checking at Dhaka Station[1] and fine to be imposed to passengers who has no ticket as per "Proof of Payment" method.

Commuter Pass is valid with a duration of one month and passengers can get on and get off Turag train at all stations in Dhaka to Joydebpur freely if Monthly Pass is valid. Price is BDT 450, a discount rate of which is 58% {=450/780 =450/(2 trips×15/trip×26 days/month)}

Averages from October 2012 to February 2014 are given in **Table 5.1-5**.

Table 5.1-5 Monthly Pass Holders and Fare Collected

Item	Monthly Average	Calculation
Pass Holders (person)	1,908	= (1,392,352+286,864)persons/20 months/(2 trips/day)/22 days/month
Fare collected (BDT)	817,000	=BDT (13,406,800+2,926,760)/20 months

Source: Expert Activity Completion Report, March 2014, JICA

With above observations, it is recognized that BR has been made enough management effort within existing fare structure.

Although fare was raised in October 2012 first time in 20 years, it was recommended to raise fare step by step for opening of BRT and MRT. There were rumors among people who do not use BR that most passengers have got on the train without fare payment for riding commuter trains. BR is to disclose the current situation of fare collection of commuter trains.

2) Necessity of an Introduction of Ticket Gate System

An introduction of Ticket Gate System is essential to operate urban rail system which conveys mass passengers. In the current situation of BR, passengers accepted the environment corresponding to low fare, in which not less than 2,000 passengers/train were jam packed into passenger cars with seat capacity of 68 and a load factor of which was not less than 250%. Bangladesh is expected to become a middle-income country in the near future with economic growth. In such process, system of BR is to be modified.

In order to introduce Ticket Gate System, it is necessary to limit accesses to station platform and to trains. In this connection, renovation of stations is necessary. Necessary fund may be requested by GOB to international donor(s). However, in order to do so, financial commitment for sustainable operation after renovation of stations is essential for funding by donor(s). It is recommended to study together with a review of fare structure.

[1] In Dhaka Station, there are Inter City Train and Turag. It is unable to identify the train in which a passenger takes to Dhaka Station. BDT 700 was imposed in Dhaka Station if a passenger has no ticket. If a passengers with no ticket is found inside Turag train, BDT 20 is imposed as penalty.

5.2 [C-2]: Assistance to Public Transport Operators (PTOs) for Introduction of ICT System is Provided

5.2.1 Assistance to PTOs for Introduction of ICT System

In order to introduce ICT System to PTOs, the following Pilot Projects were undertaken,

- Bangladesh Railways (BR),
- Bangladesh Inland Water Transport Corporation (BIWTC),
- Bangladesh Road Transport Corporation (BRTC),
- Omama International (PVT). Ltd. (Omama) and
- Dhaka Chaka Co. Ltd. (Dhaka Chaka).

The result of the Pilot Project of each PTO is discussed in the succeeding sections.

5.2.2 Assistance to Bangladesh Railways (BR)

(1) Preparation for the Pilot Project

BR implemented a Pilot Project for IC card operation under "Consultancy Service on Support for the introduction of ICT Fare System in Dhaka JICA Expert" for four months from October 21, 2013 to February 20, 2014. The Pilot Project was completed successfully with significant improvement in the fare collection system, as well as in terms of customer satisfaction.

However, due to some unexpected political unrest during the project period, a concrete impact of introducing ICT Fare System in BR could not be assessed. Thus, BR requested JICA to extend the Pilot Project in all the Turag Trains (total 8 trains) for another six months starting from July 1, 2014 to December 31, 2014 through an official meeting held at the BR Headquarter, chaired by the honorable Secretary of Ministry of Railways on March 25, 2014. The MOU amongst JICA, DTCA and BR on Fare Collection System Using Common IC Card Including Clearing House (Extension of Pilot Project with Bangladesh Railway) was concluded on November 17, 2015.

(2) Main Feature of the Pilot Project

The main feature of the Pilot Project compared with the Phase I is shown in **Table 5.2-1** while location of project route Joydebpur to Dhaka is shown in **Figure 5.2-1**.

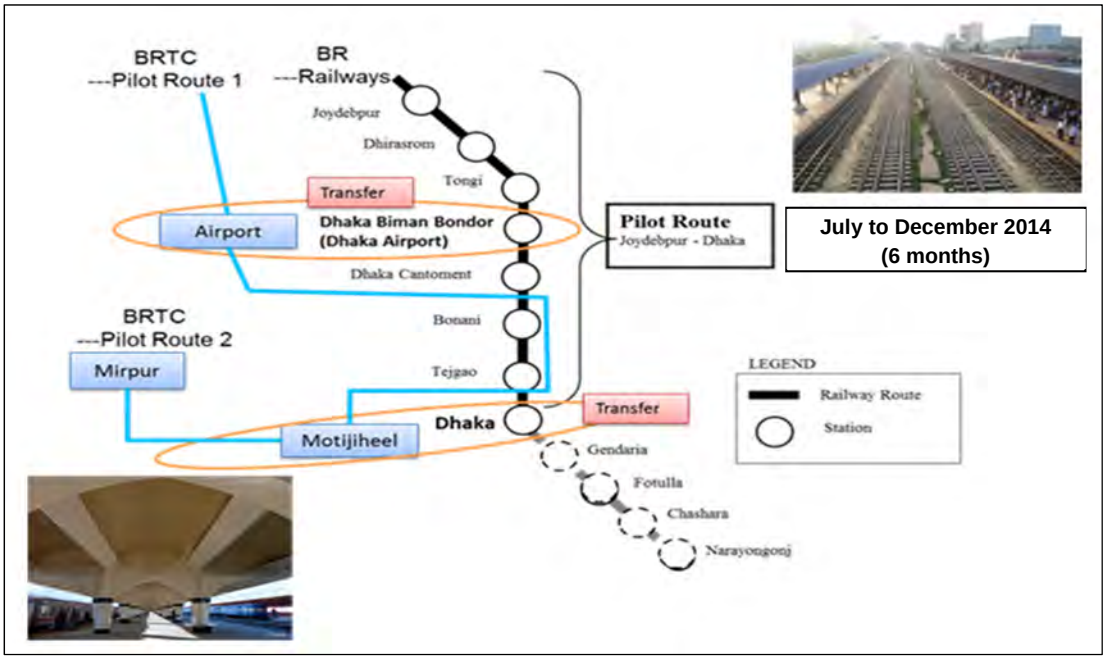
As mentioned in the table, paper e-tickets were sold to passengers using SPASS card. Operational activities of the BR Pilot Project Phase II are as follows.

1. SPASS tapping and paper e-ticket sales by cash have carried out by BR staff at the ticket windows designated by BR. e-ticket sales were not allowed inside trains.
2. Service operator (NWBD) sold e-tickets for eight train stations (all Turag and DEMU) exclusively.

Table 5.2-1 Comparison of Operation Activities

Item	Phase II (2014 to 2015)	Phase I (2013 to 2014)
Service Provider	Joint Venture of N-Wave Co., (BD) Ltd and N-Wave Co., Ltd (NWJV)	N-Wave Co., (BD) Ltd
Commencement	Plan; July 2014⇒Actual: **Jan 2015** 5.5 months delayed from date agreed in MOU.	Plan: May 2013⇒Actual: Oct 2013 5 months delayed by completing established procedures by BR and JICA
Original Period	6 months	6 months
Actual Period	5.5 months, from 1 Jan 2015 and till 15 Jun 2015	4 months from end of October 2013 to middle of February 2014
Trains designated	All 8 trains (4 Turag* and 4 DEMU**)	4 Turag (4 DEMU were not included)
Operation Area	Ticket windows and portable counters	Platforms and inside trains
R/W operator	Inside Ticket Windows: e-ticket sales: BR 8 staffs in two shifts. Card Issue and Recharge: NWJV staff Only three major stations, Dhaka, Airport and Joydebpur. 3 staffs in two shifts.	All R/W operators were provided by NWBD.
Operation Requirement	Paper e-ticket is to have serial No. for each R/W to record sales of ticket into Register book of BR. Regular Reporting of Ticket sales is mandatory.	Regular Reporting of Fare collection (Ticket sales and IC Card tapping) is mandatory.

Source: JICA Project Team
Note: *Turag: Name of Commuter train, it may come from Turag River.
**DEMU: Diesel-Electric Multiple Unit purchased from China in 2013
http://en.wikipedia.org/wiki/Diesel_multiple_unit



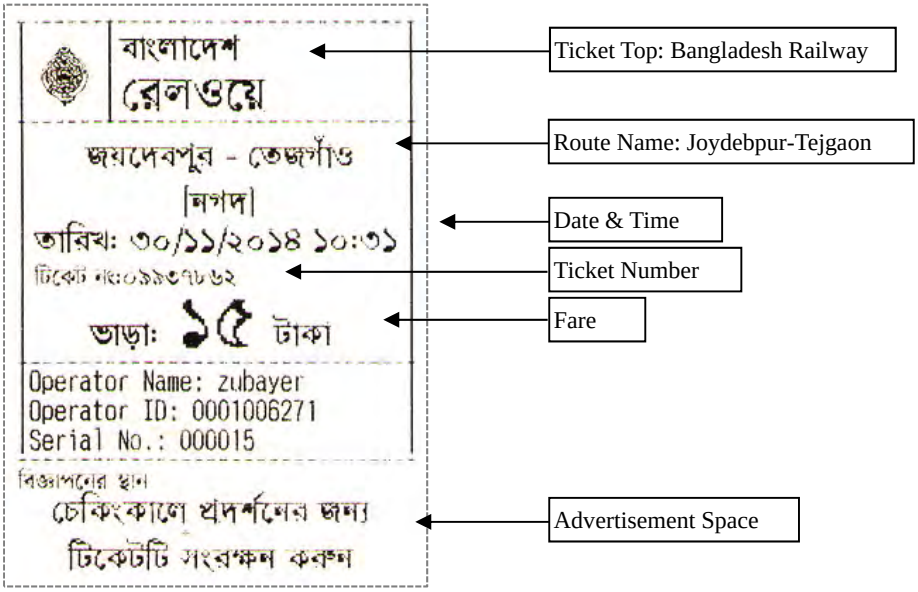
Source: JICA Project Team

Figure 5.2-1 Location of Project Route

3. Eight stations, such as Dhaka (Kamlapur), Tejgaon, Banani, Cantonment, Airport, Tongi, Dhirasrom and Joydebpur; BR assigned their staff for selling e-ticket using R/W and receive tapping of SPASS.
4. E-ticket sales, Tapping SPASS and Recharge SPASS facility was made at the three stations written above, namely Dhaka, Airport and Joydebpur, where NWJV and BR's staffs were deployed.
5. NWBD has assigned four Engineers for two shifts on duty for technical support at Dhaka - Airport and Airport - Joydebpur stations; and they were ready to move to other stations as

per urgency.

6. NWJV has provided one roll supplier to deliver paper rolls to eight stations.



Source: JICA Project Team

Figure 5.2-2 Paper e-ticket used for BR Phase II Pilot Project

7. NWJV has provided training for seven days to BR staff on issuing e-tickets for passengers and receive tapping of SPASS.
8. Fare collection using SPASS has been transferred by NWJV to the bank account nominated by BR according to MOU with BR.
9. NWJV has modified existing software to suit the following requirements of BR to sell tickets as per provision of present practice of Railway; i.e. Ticket Serial number and others.

Every e-ticket has serial numbers by specific R/W and by month. First day of the month starts with "1" and continued till the end of the same month. In the first day of the next month, serial number resets as "1". Daily Sales report includes serial number of e-tickets sold.

Ticket Counter at Airport Station

Ticket Counter at Dhaka (Kamlapur) Station

Source: JICA Project Team

Photo 5.2-1 Ticket Counter at Airport and Dhaka Station

(3) Number IC Card (SPASS card) Used and E-Ticket Issued

Table 5.2-2 shows the summary of Pilot Project while **Figure 5.2-3** illustrates amount of ticket sales by the station and month.

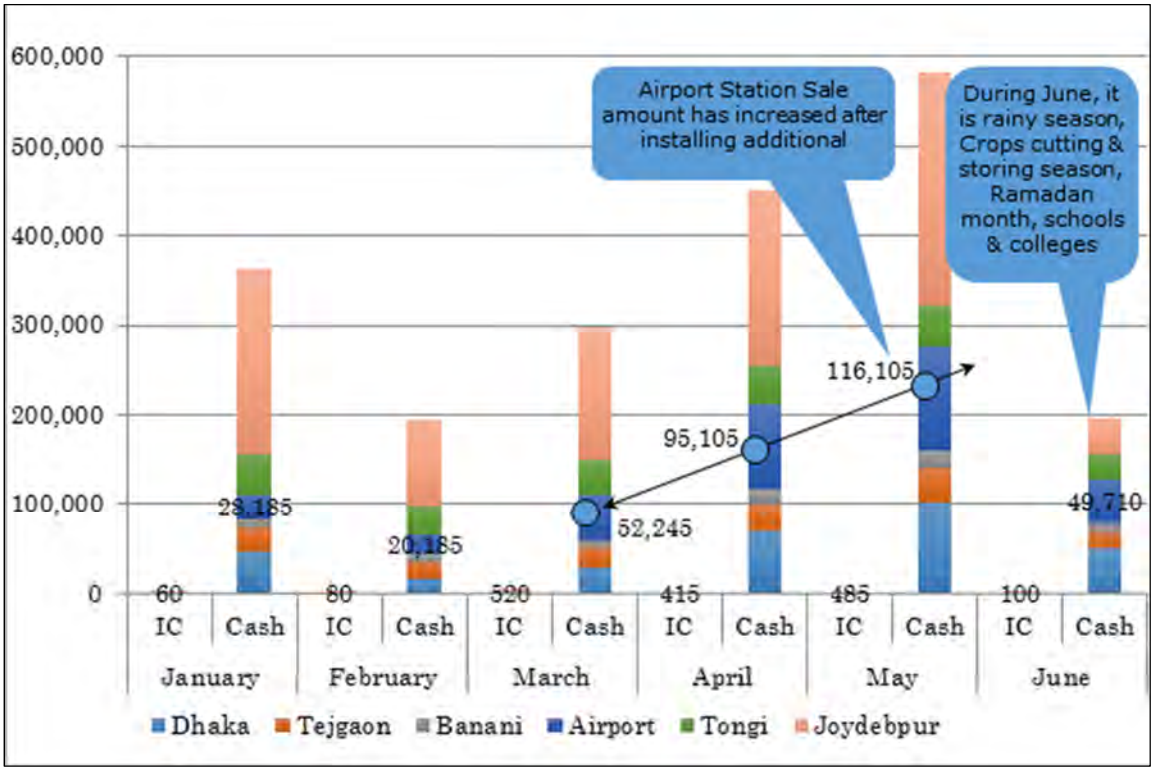
(4) Result of the Pilot Project and Lessons Learned

Comparison of average number of passengers per day and train is shown in **Table 5.2-3**. In Phase I, as BR refused to allocate any staffs for handling handy R/W and e-ticket sales was handled by the handy R/W operators of the Service Provider, and handy R/W operators traveled on the train and issued tickets to passengers without tickets. However, in Phase II, BR decided to allocate their own staff for e-ticket sales, and the e-ticket sales were handled at the ticket window of each station following the rules of BR. Because of this change, number of passengers with ticket was drastically reduced.

Table 5.2-2 Summary of BR Phase II Pilot Project

Month	Days of Operation	Category	By Cash		IC Card		Total	
			No. of Transaction	Amount (BDT)	No. of Transaction	Amount (BDT)	No. of Transaction	Amount (BDT)
January	26	Total	26,034	362,505	41	565	26,075	363,070
		Per Day	1,001.3	13,943	1.6	22	1,002.9	13,964
February	24	Total	14,423	176,550	99	1,195	14,522	177,745
		Per Day	601.0	7,356	4.1	50	605.1	7,406
March	27	Total	23,625	450,655	345	4,220	23,970	454,875
		Per Day	875.0	16,691	12.8	156	888	16,847
April	26	Total	32,690	450,655	344	4,020	33,034	454,675
		Per Day	1,257.3	17,333	13.2	155	1,270.5	17,488
May	26	Total	40,308	581,435	319	3,710	40,627	585,145
		Per Day	1,550.3	22,363	12.3	143	1,562.6	22,506
June	13	Total	14,060	196,590	70	850	14,130	197,440
		Per Day	1,081.5	15,122	5.4	65	1,086.9	15,188

Source: JICA Project Team



Source: JICA Project Team
Note: Values in the graph is amount of ticket sales at Airport Station.

Figure 5.2-3 Amount of Ticket Sales (IC Card and E-Ticket)

Table 5.2-3 Comparison of Average Passengers between Phase I and II

Phase I	Oct.-2013	Nov. 2013	Dec. 2013	Jan. 2014	Feb. 2014	-
Pax/day	1,250	1,892	1,606	1,449	1,694	-
Pax/train	417	631	535	483	564	-
Phase II	**Jan. 2015**	**Feb. 2015**	**Mar. 2015**	**Apr. 2015**	**May 2015**	**Jun. 2015**
Pax/day	1,003	605	888	1,003	1,563	1,087
Pax/train	184	165	175	190	228	155

Source: JICA Project Team

Another element for reduction of number of passengers with ticket was that platforms of all stations were not enclosed properly, and passengers without ticket could not be controlled. In order to eliminate passengers without ticket, it is necessary for BR to enclose the platform with fence and ticket gates. This was the reason why during Phase I, handy R/W operators traveled on a train and issued ticket to those who are without the ticket. Introduction of ticket gate system is essential to employ ICT Fare System or Rapid Pass System.

It was not feasible to issue SPASS cards to many passengers because deposit of BDT 100 was considerably high compared with maximum fare, from Dhaka to Joydebpur, which is BDT 15. Purchase of e-ticket using SPASS card was not attractive for passengers.

5.2.3 Assistance to Bangladesh Inland Water Transport Corporation (BIWTC)

(1) Preparation for the Pilot Project

BIWTC with approval of Ministry of Shipping had series of discussions on various occasions with JICA and DTCA for the purpose of an introduction of e-ticketing (Phase I) and subsequent implementation of common card named Rapid Pass with Clearing House (Phase II). BIWTC, DTCA and JICA agreed the fundamental terms and conditions for carrying out the pilot project (Phase I) and concluded MOU amongst JICA, DTCA and BIWTC on September 1, 2015.

(2) Main Feature of the Pilot Project

The main feature of the Pilot Project was as follows:

Project Duration: the Pilot Project was planned to be consisting the following three (3) phases;

Phase I: e-ticket Operation Phase (Oct. 2015 to Mar. 2016 for 6 months)

Phase II: e-ticket & IC Card Operation Phase (Apr. to Sept. 2016 for 6 months)

Phase III: Commercial Operation Phase (After Oct. 2016)

Project Site: The Project would cover the three BIWTC ferry terminal at Paturia, Daulatdia and Kajirhaat as shown in **Figure 5.2-4**.

Source: JICA Project Team

Figure 5.2-4 Location of Three Ferry Terminals

Operation Scheme: The Project would deal with vehicles taking ferry only. Passengers handled by Bangladesh Inland Water Transport Authority (BIWTA) are not included in the Project.

Table 5.2-4 Number of Counters

Name of Terminal		No. of Counters		Total Counters
		BIWTC	BIWTA	
1	Paturia	3	0	3
2	Daulatdia	3	0	3
3	Kajirhaat	1	0	1

Source: JICA Project Team

E-ticket sales record registered in the handy R/W was to be transferred to the laptop computer at each terminal and would be encrypted and transmitted through internet to the workstation of Software Company, which JICA Project Team compiles the data and produce sales reports to be posted on the web site, from which BIWTC would download the report for their use. By introducing e-ticketing system (Phase I), data is to be accumulated in a manner with easy-to-retrieve for various purpose use.

It was also agreed that BIWTC shall pay one percent (1%) commission to DTCA and the commission amount is to be used for preparation of Phase II.

(3) Activities of the Pilot Project

1) Establishment of E-Ticketing System for BIWTC

BIWTC provided a fare chart and conditions and JICA Project Team developed the software according to those conditions and the fare chart. The following software development activities were carried out.

1. Operators login section development
2. Route creation section development

3. Vehicle name & type classification section development
4. Mapping vehicle type-wise fare table
5. Redesigned truck ticket mentioning extra weight and additional length
6. Redesigned bust ticket mentioning separate body fare and passenger number
7. Comma- Separated Values (CSV) data download option from PC
8. Data encryption for data security during transferring through email
9. Printing e-ticket with Bengali character in image
10. Building number characters Bengali font (০-৯) for MPOS
11. Sales log printing from POS
12. Internal design
13. System test

2) System Setup and Training

After development of handy R/W software, JICA Project Team has conducted system setup at the pilot project location; that system has following features:

1. E-ticket terminal will be capable of issuing, recording, and outputting the sale of e-ticket for BIWTC ferry services based on the fare table, other terms and conditions of BIWTC.
2. Supporting functions such as start-up and shut down procedures and log on/off procedure shall also be provided.
3. All functions will operate on the handy R/W in isolated mode and no Internet will be required.
4. The structure and format of record shall be compatible with the Rapid Pass System and conform to Common Specifications of Rapid Pass System.
5. The e-ticket issuing procedure shall be the same as the manual procedure and print tickets in quadruplicate.

Trainings shown in **Table 5.2-5** were offered to BIWTC staff prior to commencement of the Pilot Project.

Table 5.2-5 Summary of Trainings Offered to BIWTC Staff

Training Days	Date	Modules
Day 1	October 18, 2015 (40 Trainees)	Training Opening and project briefing 1. Definition and Responsibility of Operators 2. What is Fare Machine or R/W? 3. Necessary Preparation before START the Operation
Day 2	October 19, 2015 (40 Trainees)	4. Introduction with the Fare Machine 5. Sound Notifications of Fare Machine 6. Message (Text) Notifications and Error Handling
Day 3	October 20, 2015 (40 Trainees)	Continued… 4. Introduction with the Fare Machine 5. Sound Notifications of Fare Machine 6. Message (Text) Notifications and Error Handling
Day 4	October 21, 2015 (40 Trainees)	7. Device Handling and Maintenance
Day 5	October 22, 2015 (40 Trainees)	Hands on Experience with Fare Machine

Source: JICA Project Team

(4) Result of the Pilot Project and Lessons Learned

The Pilot Project was prepared by coordinating mainly with Project Development Department of BIWTC. However, Department responsible for actual fare collection services was Commercial Department, and Project Development had limited knowledge about actual fare collection procedures currently practiced in the field. In addition, preparatory works and preparation of project work plan for Pilot Project were mainly undertaken by communicating with staff of head office of BIWTC, not with field staff of BIWTC, who are familiar with daily operation.

Lesson learned is that detailed project implementation plan should be prepared through intensive discussion with the field staff who actually engaged in fare collection operation. BIWTC staff had little knowledge on e-ticketing System; they blindly accepted new system without acknowledging that introduction of e-ticketing system would entail drastic change in business process. They expected that e-ticketing system would simply replace paper based manual fare collection without changing current business procedures, but later they realized that drastic change in business process would be involved if e-ticketing system is introduced.

The revised management plan of BIWTC should be prepared by BIWTC, in order to smoothen transition from traditional manual operation to digital ticketing system or AFC system, because Rapid Pass System would not require to handle cash by BIWTC field staff, as the fare would be collected using Rapid Pass. Such revised management plan for introduction of e-ticketing system should be discussed among BIWTC staff, including field staff, thoroughly prior to implementation of the project. It seems to be difficult for field staff of BIWTC to accept paperless fare collection system without extensive awareness education and proper guidance.

5.2.4 Assistance to Bangladesh Road Transport Corporation (BRTC)

(1) Preparation for the Pilot Project

As mentioned in **Section 5.1.2**, although the commercial operation of fare collection using SPASS card system was terminated in October 2015, BRTC was willing to participate in Rapid Pass System. BRTC had series of discussions through various occasions with JICA and DTCA for the purpose of participating Rapid Pass System and BRTC, DTCA and JICA agreed the fundamental terms and conditions for carrying out the Pilot Project and concluded the MOU amongst JICA, DTCA and BRTC on April 11, 2017.

(2) Main Feature of the Pilot Project

The main feature of the Pilot Project was as follows:

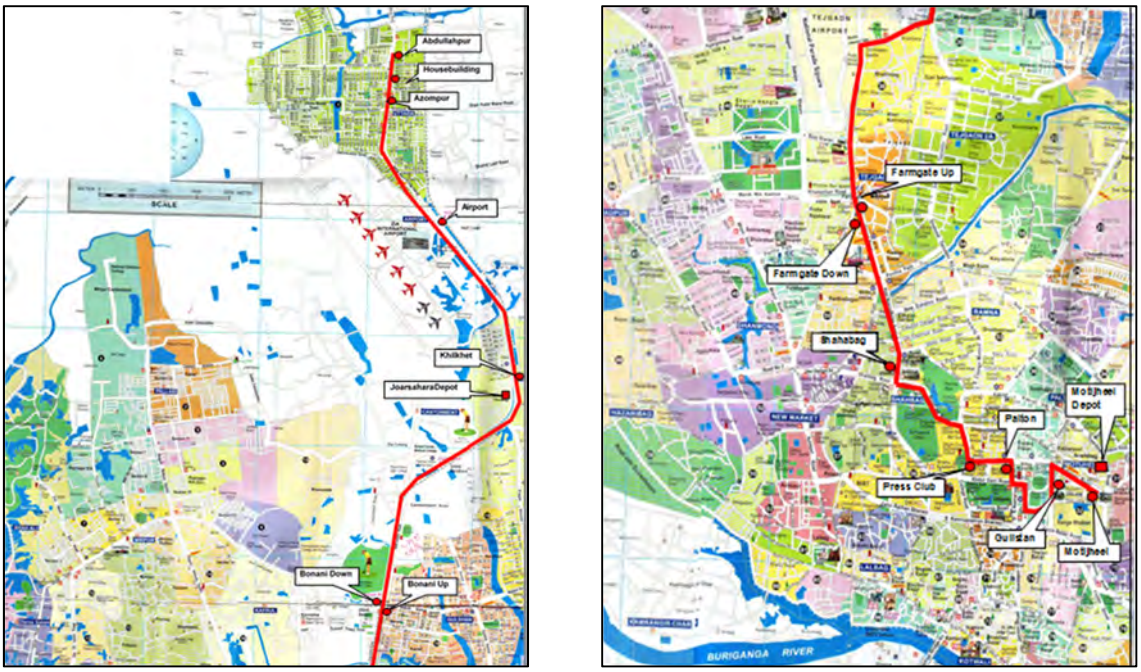
Overall Project Period: March 2017 to April 2018 (14 months including preparatory work)

Pilot Project Operation Period: May 2017 to April 2018(12 months)

Project Route: Abdullahpur to Motijheel Route (about 25AC Buses/day) as shown in **Figure 5.2-5**.

Operation Scheme: The Pilot Project only dealt with Rapid Pass card, not issuing e-ticket.

Bus users should apply for second issue and recharge of Rapid Pass at the sale counter of CH Bank, the office of CHU and BRTC's five ticket shops (namely, Abdullahpur/up, Uttara/Housebuilding/up, Bonani/up, and Motijiheel/down, and Shahabag/down) operated by local service provider hired by JICA. Handy R/W shall be operated by the conductor on each AC bus. Resources deployed for the Pilot Project is shown in **Table 5.2-6.**



Source: JICA Project Team

Figure 5.2-5 Location of Bus Stops and Depots along Abdullahpur to Motijheel Route

Table 5.2-6 Resource Deployed for the Pilot Project

Name of Place	Type	Staff	
		BRTC	JICA Project Team
1. CHU (DTCA)		-	1: Project Manager
			1: Deputy Project Manager
			4: System Engineers
2. Uttara/Housebuilding/up	Ticket shop	-	2:TOM Operators in two shift
3. Bonani/up	Ticket shop	-	2:TOM Operators in two shift
4. Motijiheel/down	Ticket shop	-	2:TOM Operators in two shift
5. Shahabag/down	Ticket shop	-	2:TOM Operators in two shift
6. Inside Bus	25 Veh./day	25x2shift. Later replaced by the bus drivers who operate handy R/W.	-
7. Joarsahara Depot		1: Depot Manger	2. Hardware Engineers. After November, 2017 handed over to BRTC staff
8. TOM shop preparation		-	2. Operators
9. Training in Depot		-	2. Trainers
10. Clearing House in DTCA		-	2. System Engineers
PTO Assistance		-	2. Staff
TOM Assistance		-	2. Staff

Source: JICA Project Team

(3) Number Rapid Pass Card Issued and Used

The number of Rapid Pass issued and usage of cards is shown in **Table 5.2-7**. As mentioned above, usage of Rapid Pass has drastically improved from October 2017.

Table 5.2-7 Rapid Pass Card Issued and Used

Year 2017, 2018	Card Issue Qty	Deposit (BDT)	Total Recharge (BDT)	Running Recharge (BDT)	BRTC Card Tap Count	Card Tap Amount (BDT)
May	148	29,600	36,700	7,100	53	1,340
June	71	14,200	16,000	1,800	63	1,675
July	90	18,000	20,000	2,000	72	1,560
August	113	22,600	48,600	26,000	259	5,355
September	60	12,000	24,800	12,800	75	2,070
October	147	29,400	93,000	63,600	2,927	71,510
November	99	19,800	95,800	76,000	3,196	79,175
December	271	54,200	111,700	57,500	1,916	47,005
January	334	67,000	190,800	123,800	1,879	47,560
February	161	32,200	154,900	122,700	1,926	48,485
March	193	38,600	148,300	109,700	1,697	44,795
April	225	45,200	117,000	71,800	687	18,340
Total	**1,912**	**382,800**	**1,057,600**	**674,800**	**14,750**	**368,870**

Source: JICA Project Team

(4) Lessons Learned

The most important lesson was the initiative of top management of BRTC. The introduction of the fixed type of handy R/W was only possible with the decision of chairman, and this is a clear change and improvement of the fare collection operation.

Similar to BIWTC, there were strong opposition for introducing a new system from the field staff of BRTC. Particularly, Rapid Pass System is a cashless system, which changes the existing manual procedure with cash payments drastically. Although in this Pilot Project, issuance of e-ticket was excluded, those field staff were not cooperative to the Pilot Project. It indicates that in order to obtain the understanding and support from the field staff, incentive system must be considered and introduced when the bus operation was outsourced to a private company. It is not possible in BRTC because BRTC is a government enterprise.

5.2.5 Assistance to Omama International (PVT). Ltd. (Omama)

(1) Preparation for the Pilot Project

Omama International (Pvt.). Ltd. (Omama) with approval of Bangladesh Road Transport Authority had a series of discussions through various occasions with JICA and DTCA for the purpose of agreement for implementing an integrated ticketing system using common card named Rapid Pass including Clearing House. JICA, DTCA and Omama agreed the fundamental terms and conditions for carrying out the Pilot Project and concluded the MOU Amongst JICA, DTCA and Omama on May 16, 2017.

(2) Main Feature of the Pilot Project

The main feature of the Pilot Project was as follows:

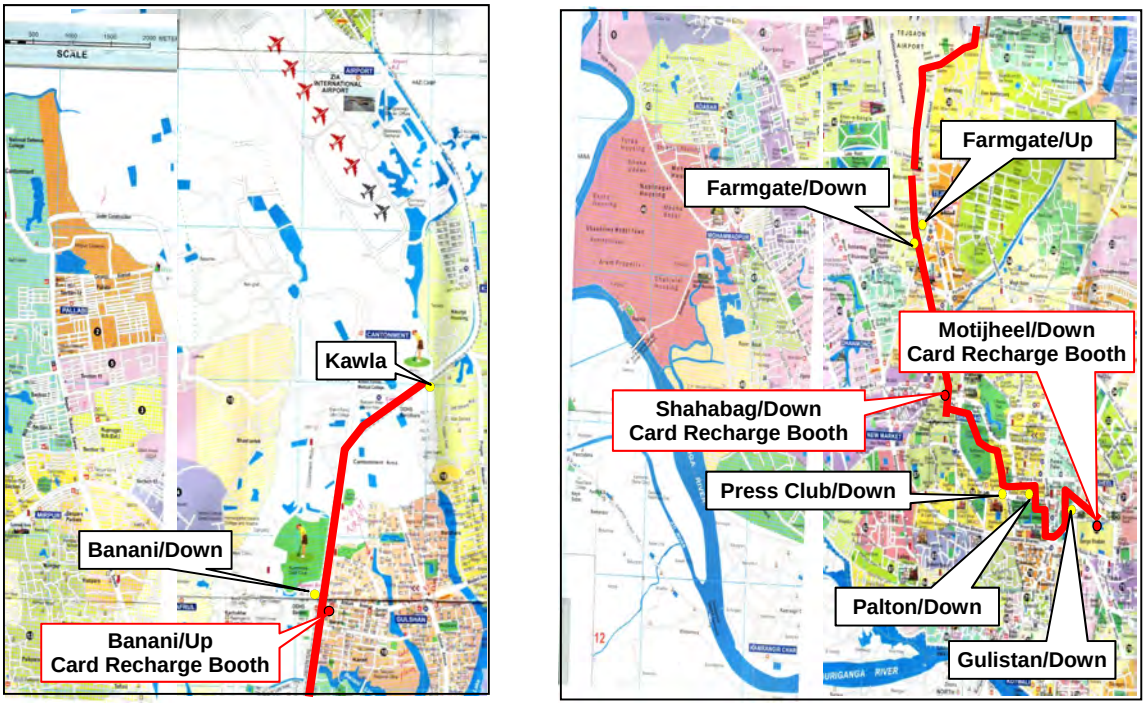
Overall Project Duration: March 2017 to April 2018 (14 months including preparatory work)

Pilot Project Operation Period: June 2017 to April 2018 (11 months)

Project Route: Kawla to Motijheel (about 30 AC Buses/day) which is almost same with BRTC as shown in **Figure 5.2-6**.

Operation Scheme: The Pilot Project only dealt with Rapid Pass card.

Bus users shall apply for second issue and recharge of Rapid Pass at the sale counter of CH Bank, the office of CHU and BRTC's four ticket shops (namely, Uttara/Housebuilding/up, Bonani/up, and Motijiheel/down, and Shahabag/down) operated by local service provider hired by JICA. Handy R/W shall be operated by the operator on each AC bus. The resources deployed for the Pilot Project are shown in **Table 5.2-8**.



Source: JICA Project Team

Figure 5.2-6 Location of Bus Stops and Card Recharge Booth along Route

Table 5.2-8 Resources Deployed for the Pilot Project

Name of Place	Type	Staff	
		Omama	Local Service Provider
1. CHU (DTCA)		-	1 Project Manager 1 Deputy Project Manager 1 System Engineer 1 Hardware Engineer
2. Depot		1: Depot Manager	1 Sysytem Engineer 2 Monitoring Engineers
3. Bonani/up	Ticket shop	-	2 TOM Operators
4. Motijiheel	Ticket shop	-	2 TOM Operators
5. Shahabag	Ticket shop	-	2 TOM Operators
6. Inside Bus	30Veh./day	30 x 2shift + 7 Operators. Later replaced by the bus drivers who operate handy R/W	-
7. Kawla Depot		1: Depot Manger	2 Hardware Engineer
8. TOM shop preparation		-	2 Staff
9. Training in Depot		-	2 Staff
10. Clearing House in DTCA		-	2 Staff

Source: JICA Project Team

(3) Number of Rapid Pass Card Used

The number of Rapid Pass usage of cards in Omama buses is shown in **Table 5.2-9**.

Table 5.2-9 Monthly Card Tap Amount

Year 2017, 2018	Card Tap Count	Card Tap Amount (BDT)
May	-	-
June	16	370
July	198	5,050
August	1,053	27,245
September	239	6,875
October	-	-
November	-	-
December	26	490
January	45	1,230
February	48	1,510
March	44	1,140
April	4	95
Total	**1,673**	**44,005**

Source: JICA Project Team

(4) Lessons Learned

The number of bus companies was very much limited for Abdullahpur to Motijheel Route, as congestion was beyond control, and Omama had route permission only for the section of Kawla to Motijheel. In order to extend the route permission to Abdullahpur from Kawla, it seemed that Omama participated in the Pilot Project, the government project, and to obtain the support from DTCA, which was successful.

The shift from handy R/W to the one with fixed type and the introduction of discount fare for Rapid Pass passengers were good examples of flexibilities of a private company.

However, as similar to other medium to small bus companies, Omama consists of many owners from one to several buses. When among those small bus owners had some internal conflict, it is very difficult for them to settle among themselves, and for the outsiders, it was much more difficult to intervene.

5.2.6 Assistance to Dhaka Chaka Co. Ltd. (Dhaka Chaka)

(1) Preparation for the Pilot Project

Dhaka Chaka Co. Ltd. (Dhaka Chaka) with approval of Bangladesh Road Transport Authority had a series of discussions through various occasions with JICA and DTCA for the purpose of implementing an integrated ticketing system using common card named Rapid Pass including Clearing House. JICA, DTCA and Dhaka Chaka agreed the fundamental terms and conditions for carrying out the Pilot Project and concluded the MOU amongst JICA, DTCA and Dhaka Chaka on December 18, 2017. At the same time with MOU, Agent Agreement was concluded between DTCA and Dhaka Chaka.

(2) Main Feature of the Pilot Project

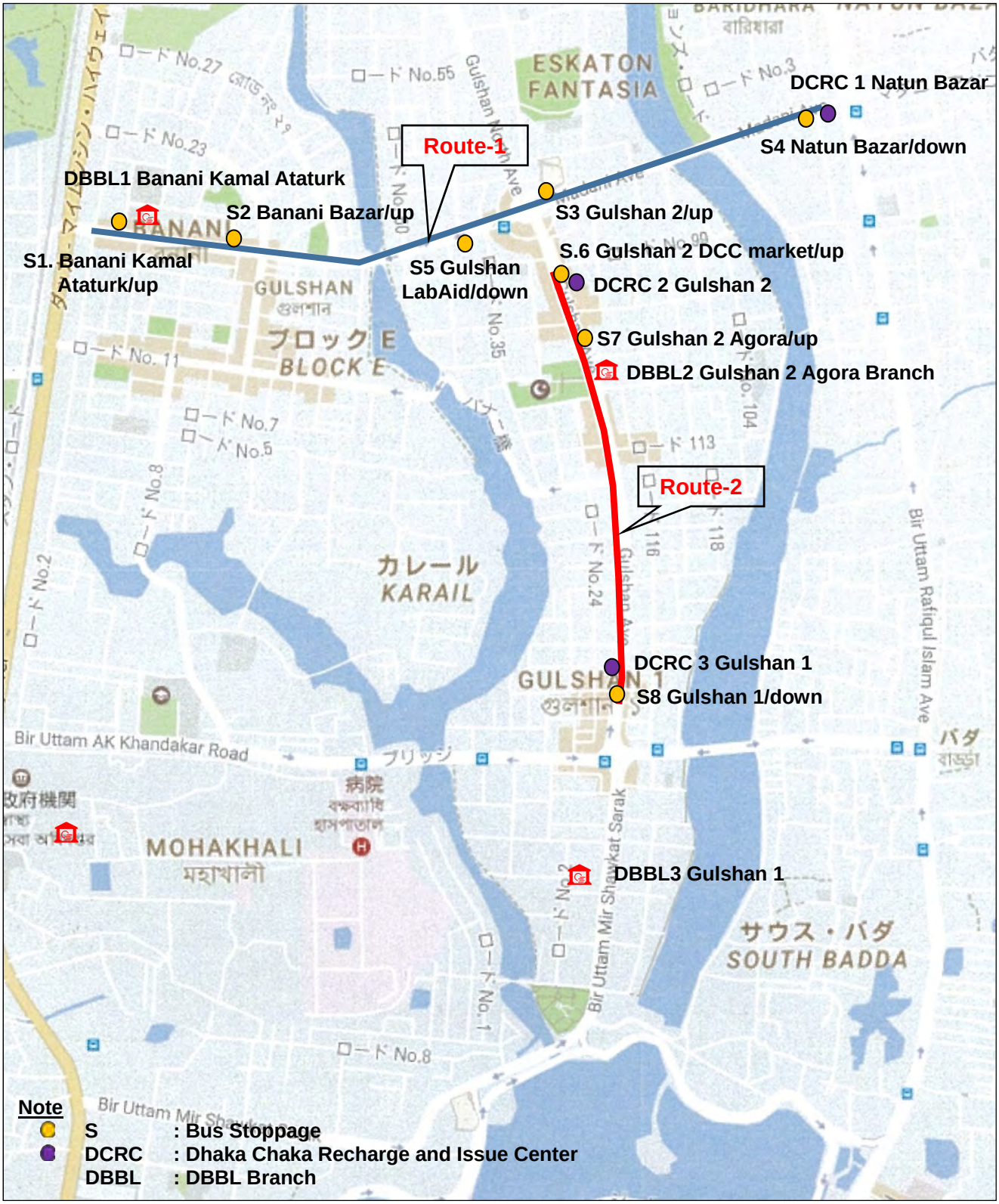
The main feature of the Pilot Project is as follows:

Overall Project Duration: December 2017 to April 2018 (5 months including preparatory work)

Pilot Project Operation Period: December 2017 to April 2018 (5 months)

Project Route: Route 1: American Embassy to Kakoli (about 20 AC Buses/day)
Route 2: Navana Mor to Gulshan- 2 (about 20 AC Buses/day)

Location of the project route is shown in **Figure 5.2-7** together with bus stops, recharge booths of Dhaka Chaka and DBBL.



Source: JICA Project Team

Figure 5.2-7 Location Map of Dhaka Chaka Pilot Operation

Operation Scheme: The Pilot Project only dealt with Rapid Pass card.

Bus users shall apply for second issue and recharge of Rapid Pass at Ticket Shops operated by Dhaka Chaka at Natun Bazar, Gulshan 2 and Gulshan 1 (later two Ticket Shops at Natun Bazar

and Banani Kamal Ataturk). **Table 5.2-10** shows resources deployed for the Pilot Project.

Table 5.2-10 Resource Deployed for the Pilot Project

Name of Place	Type	Staff		Equipment	
		Daka Chaka	JICA Poject Team	DTCA	Dhaka Chaka
1. CHU (DTCA)	-	-	(Partial involvement) 1 System Engineers	1: PTO Server	-
2. Bus Stop	About 40 veh./day	10 x 2 shift + 3 Operators	-	15:Fixed Handy R/W Set	Roll Paper: Necessary Amount
3. Ticket Counter	3 Recharge & Issue center	4 TOM Operators + 2 TOM Operators	(First 3 months only) (Partial involvement) 2 Operation Supervisors 2 TOM Operators	3 TOM Set	Roll Paper: Necessary Amount

Source: JICA Project Team

(3) Number of Rapid Pass Card Used

The number of Rapid Pass usage of cards in Dhaka Chaka buses are as follows.

Table 5.2-11 Monthly Card Tap Amount

Year 2017, 2018	Card Tap Count	Card Tap Amount (Tk)
May	-	-
June	-	-
July	-	-
August	-	-
September	-	-
October	-	-
November	-	-
December	1,088	16,080
January	6,828	101,790
February	5,534	82,230
March	6,112	91,125
April	5,035	73,770
Total	24,597	364,995

Source: JICA Project Team

(4) Lessons Learned

The management of Dhaka Chaka is, like Omama, consist of 15 small scale bus owners, which makes it difficult to have a shared long-term strategy among those bus owners, and showed tendency that their interest concentrated on a short-term profit. Because of this situation, their concerns on Rapid Pass System was inclined toward the increase of cost of operation, not toward the long-term benefit of the System.

This clearly shows that it is necessary for DTCA to convince Dhaka Chaka of the long-term benefit of Rapid Pass System. As DTCA concluded PTO Agreement and Agent Agreement with HR Transport, the purpose of this is to increase the number of Rapid Pass users by enabling the use of both Dhaka Chaka bus and HR Transport bus for one Rapid Pass card without purchasing tickets by cash. This is a good example of convincing the merit of using Rapid Pass for its users, and both Dhaka Chaka and HR Transport would be convinced of the

benefit of Rapid Pass by seeing increased number of Rapid Pass users. Such kind of approach by DTCA should be commended.

5.2.7 Comparison of Each Pilot Project

As described, JICA Project Team implemented six Pilot Projects using SPASS, T-ticket or Rapid Pass. **Table 5.2-12** shows comparison of key factors of each Pilot Project including BRTC and BR project analyzed in Activity C-1 and HR transport under commercial agreement.

(1) Assistance Rate from JICA

As shown in **Table 5.2-12** high rate of JICA assistance incurred resistance of field staff and led discontinuity of fare collection system. This is because fare collection system seemed to be job burglar for field staff and managements had no incentive to collect investment cost for introduction of fare collection system.

Although sunk cost had some effect for continuity of fare collection system installation high initial cost and operational cost were barriers against expansion of Rapid Pass system. Optimization of assistance rate from public sectors are required such as subsidy for installation, initial grace period or discount of equipment lease installment.

(2) Managements of PTOs

Managements of PTOs had huge influence on success of Pilot Project. Some case revealed noncooperation of managements prevented Rapid Pass card from penetration into passengers and weak managements had difficulty to continue bus operation on their routes and Rapid Pass system. However, power and intension of managements changes time after time. Strategical plan for expansion of Rapid Pass system without dependency on PTOs management are required such as mandatory of introduction of Rapid Pass system, optimization of bus transport in Dhaka City or introduction of elements of competition between bus operators.

(3) Rapid Pass User

Although Rapid Pass card provide its use in multiple PTOs and these PTOs connected their routes each other Rapid Pass use remained to be under 5% of total passengers because of inconvenience for limited area and usage for Rapid Pass card and less opportunity of recharge. Rapid Pass system is to satisfy keen demand for uses such as payment at AFC or retailer shops.

Table 5.2-12 Comparison of Each Pilot Project

PTO Name	PTO Type	Pilot Card Type	Ticket Type	TOM Operation by	PTO Operation Type	Operation Management	R/W QTY	Avg. Fare (BDT)	Staff from Project Team	Staff from PTO	Avg. Revenue /Day /Vehicle	Avg. ICT Card Use %	Status of Continuity	Remarks
BRTC SPASS	Public	SPASS	IC card	Project	Hand held	Project team	210	30	160	8	11,000	18	Discontinue	Resistance from field staff
BR Phase-1	Public	SPASS	e-ticket	Project	Hand held	Project team	18	12	20	0	29,000	-	Discontinue	Benefit/cost was low
BR Phase-2	Public	SPASS	IC card & e-ticket	PTO	Hand held	Project team	29	15	10	16	21,500	0.1	Discontinue	Benefit/cost was low
BIWTC	Public	SPASS	e-ticket	Project & PTO	Hand held	Project team	16	1320	18	90	400,000	-	Discontinue	Resistance from field staff
BRTC	Public	Rapid Pass	IC card	Project	Fixed type	Project team	27	35	17	55	11,000	1.5	Continue	Strong top management
Omama	Private	Rapid Pass	IC card	Project	Fixed type	Project team	35	40	6	30	8,000	2.5	Discontinue	Route operation give-up Weak Management
Dhaka Chaka	Private	Rapid Pass	IC card	Project & PTO	Hand held	PTO themselves	15	15	5	29	11,000	0.5	Continue	Resistance from Management Benefit/cost was low
HR Transport	Private	Rapid Pass Commercial Use	IC card	PTO	Fixed type	PTO themselves	15	15	0	34	9,000	3	Continue	Strong management Field staff cooperation

Source: Expert Project implementation and IC card operation Expert activity report 03.14, Extension Pilot Project with Bangladesh Railway Final Report 06.15
Introducing ICT Fare System using SPASS Card for BR Commuter Line Second Phase Final Report 06.15
BIWTC Pilot Project Phase-1 (e-ticketing) 04.16, Memorandum of Understanding with BRTC 03.17, Memorandum of Understanding with Omama
Memorandum of Understanding with Dhaka Chaka

5.3 [C-3]: Incentive System to PTOs is Developed

The JICA Project Team found out that for all government owned bodies, such as BRTC, BR, etc. the salaries are decided by the Government of Bangladesh as the Pay Scale according to Section 5 of Services (Reorganization and Conditions) Act 1975. Currently, the 8th Pay Scale 2015 is applied. In each government owned body, some minor modifications were made to the Pay Scale, but it is difficult for such body to deviate from the Pay Scale with such change as giving incentives to their employees.

On the other hand, for private sector firms, there is no such restriction and they are free to give incentives to its employees. Actually, sub-contractor for bus operation explained that they give additional sum to the driver based on the number of operation from the starting point to the terminal point.

However, Dhaka Chaka, which is a private operator, considered Rapid Pass System as increase of cost, and does not consider incentives for their employees. In future, when the use of Rapid Pass expands, particularly for private operators, it will be necessary to consider such incentives for their employees in order to stabilize the operation of fare collection and to avoid pilferage. DTCA shall advise private operators to consider such incentives for their employees.

5.4 [C-4]: Reshuffle Plan for PTO Staff is Developed:

JICA Project Team found out there was Government Servants (Efficiency and Discipline) Rules 1973, which stipulated the rule of employment and dismissal. According to Chapter 4 of this Rule, any employee without some grounds for penalty, such as (a) is inefficient or has ceased to be efficient; or (b) is guilty of misconduct; or (c) is corrupt, cannot be dismissed from service. Furthermore, it is required to follow very complexed procedure of inquiry and makes the dismissal or firing of employees difficult.

According to BRTC, this rule also applied to the employees of BRTC and they explained that at present, the number of buses under the Rapid Pass operation was very limited around 25 AC Buses and it was easy for BRTC to reshuffle those conductors, as BRTC was operating around 800 buses. Also it could be pointed out that BRTC was outsourcing the operation of bus to other private company and, in this case, there were no relocations of employees.

5.5 [C-5]: IC Card Procurement Procedure by Clearing House is Developed

5.5.1 IC Card Procurement by GOB

DTCA has procured ICT equipment shown in **Table 5.5-1** including 60,000 pieces of Rapid Pass Cards utilizing their own budget under TAPP.

Table 5.5-1 List ICT Equipment Procured by DTCA

Item No.	Description of Item	Unit	Quantity
1.	POS Terminal	no.	50
1a.	Optical mouse	no.	50
1b.	Cable security device	no.	50
1c.	IC Card reader/writer	no.	50
1d.	SAM reader	no.	50
1e.	SAM	no.	50
1f.	USB modem	no.	50
1g.	Anti-virus Software	no.	50
1h.	All in One Inkjet Printer	no.	50
1i.	Monitor for Customer	no.	50
1j	Thermal printer	no.	50
2.	IC Card (FeliCa)	no.	60,000
3.	Handy R/W	set	150
3a.	GPRS SIM	set	150
3b.	SAM	card	150
3c.	Battery	no.	150
3d.	Thermal printer	no.	50

Source: DTCA Bid Document prepared by JICA Project Team

JICA Project Team has supported DTCA for preparation of Tender Documents including specifications, support for tender evaluation, etc. The following rules and regulations of Bangladesh were studied and followed upon preparation of tender documents and implementation of tender process.

1. The Public Procurement Act, 2006
2. The Public Procurement Rules, 2008
3. The Public Procurement Regulations, 2003
4. The Procedures for Implementation of the Public Procurement Regulations, 2004

DTCA has followed the above procurement rules and regulations as usual and JICA Project Team found no problem in the procedure.

The Tender (re-tender) was announced on June 2, 2016, and Tender was opened on June 23, 2016. The Award was issued to NetWorld Bangladesh Limited on November 2, 2016. 60,000 pieces of IC Cards were delivered to DTCA on April 17, 2017, and the Acceptance Report was issued on May 15, 2017.

5.5.2 IC Card Procurement by DMTCL

MRTB had a series of discussions through various occasions with DTCA, DMTCL and JICA in order to implement Rapid Pass System in MRT Line 6. As the result, the parties involved agreed on the MOU, which was signed on March 31, 2016. The Parties understood that terms and conditions in the MOU would be further elaborated and detailed in PTO Agreement between DTCA and DMTCL.

It was also agreed in the MOU that DMTCL would procure 730,000 pieces of Rapid Pass card under the Contract Package CP-07: E&M Systems. DTCA provided necessary specifications for using Rapid Pass System in AFC to DMTCL in June 2015, and DMTCL incorporated them into the Tender Documents of CP-07.

In order to simplify the responsibility of Rapid Pass System, DTCA as CHCI should hold ownership of IC Card for Rapid Pass card. DMTCL is to transfer the ownership of Rapid Pass card to DTCA, after the procurement by DMTCL.

DTCA shall repay to DMTCL the cost of procurement of IC Card (including all duties, taxes and other incidental cost) together with interest, following the terms and conditions mentioned in the Subsidiary Loan Agreement for DMTCL with the Government of Bangladesh with related to the MRT Line 6 Project. Details of the loan from DMTCL to DTCA will be separately discussed and stipulated in the PTO Agreement which will be signed before the ownership transfer of Rapid Pass card.

The MOU agreed between DTCA and DMTCL is shown in **Appendix A3-8** while draft PTO agreement prepared by JICA Project Team is presented in **Appendix A3-9**.

5.5.3 IC Card Procurement by DBRT

With regard to BRT Line 3 Project, similar arrangements with MRT Line 6 Project were considered and basically agreed. The draft of MOU, almost identical content the one with DMTCL, was sent to DBRT by DTCA on March 28, 2017. However, as the consultant for designing and procurement assistance for AFC equipment is under employment procedure, it is difficult for DBRT to conclude the MOU. The draft MOU prepared by JICA Project Team is shown in **Appendix A3-8**.

DBRT is planning to procure around 200,000 pieces of Rapid Pass cards and to transfer the ownership of Rapid Pass card to DTCA. DTCA shall repay to DBRT the cost of procurement for IC Card (including all duties, taxes and other incidental cost) together with interest, following terms and conditions mentioned in the Subsidiary Loan Agreement for DBRT with the Government of Bangladesh with related to the BRT Line 3 Project.

Details of the loan from DBRT to DTCA will be separately discussed and stipulated in the PTO Agreement which will be signed before the ownership transfer of Rapid Pass card.

5.6 [C-6]: Information Sharing with Other Stakeholders is Strengthened

JICA Project Team had information sharing with various stake holders through entire period of the project. Stakeholders and the Project Team discussed and exchange information are summarized hereinafter, and with regard to those key players, such as DMTCL and DBRT, some notable accomplishments through information sharing are discussed in the succeeding sections.

5.6.1 Information Sharing with DMTCL for MRT-6

Information sharing with DMTCL was intensively carried out over entire Project period since DMTCL will be a first public transport operator that will adopt full scale Rapid Pass card use. The following topics were discussed with DMTCL during Project period.

1. Technical specification of Rapid Pass card that confirms technical requirements of DMTCL
2. Process of card procurement and card ownership transfer.
3. Card use category in the MRT-6 fare collection system.
4. Arrangement of ticket shop window at each station.

A joint meeting among JICA, DMTCL, NKDM, DTCA and JICA Project Team was held on

February 5, 2015. In this meeting, discussion were held on "1. Technical specification" and "2. Process of card procurement and card ownership transfer". Based on this meeting, the extract version of technical specification, which was required for preparation of ender documents, was submitted from DTCA to DMTCL, and with confirmation on the Non-Disclosure Agreement (NDA) delivered to NKDM on March 23, 2015.

It took some time to finalize "2. Process of card procurement and card ownership transfer" between JICA and DTCA, and JICA Project Team prepared the draft of MOU that prescribes process of Rapid Pass card procurement, transfer of ownership from MRT-6 to CHU and corresponding cost sharing method and DTCA submitted the draft to DMTCL on June 21, 2015. After in depth discussion among the parties, the MOU was signed among MRTB, DTCA and DMTCL on March 31, 2016.

JICA Project Team is still continuing to work so that DTCA and DMTCL would discuss for finalization of Rapid Pass card use category and ticket shop window arrangement. JICA Project Team prepared the draft of PTO Agreement between DTCA and DMTCL, and presented it to DTCA. The PTO Agreement will be signed after the pending issues are settled.

5.6.2 Information Sharing with DBRT for BRT-3

Information sharing with DBRT was also intensively carried out over entire Project period, even before the Project commenced in May 2014, because DBRT will be a possible PTO that may adopt full scale Rapid Pass card use.

On October 6, 2013, a joint meeting was held at ADB among ADB, SMEC (ADB Consultant) JICA and Katahira & Engineers International (KEI) Expert. In this meeting, it was agreed by both ADB and JICA including project teams would cooperate for the coming Project for establishing Clearing House.

On July 16, 2014, a meeting was held between ADB and JICA Project Team, in which the progress of the Project was explained and the process of card procurement was discussed. With regard to card procurement, there is a basic agreement on common card procurement and ADB side was advised to further discuss with DBRT. On February 3, 2015, a joint meeting among DBRT, GDSUTP (BRT, Gazipur -Airport), JICA and JICA Project Team was held to discuss the procedures for Clearing House operations and for procurement of card, which were similar topics with DMTCL.

Unfortunately, there were review and revision of project plan for WB Section of BRT-3 and the cost overrun for the ADB Section, and information sharing with both WB and ADB became difficult.

On March 23, 2017, JICA Project Team had a meeting with DBRT, in which the Team made explanation of current Clearing House system and card procurement and transfer of card based on DMTCL case. Basically, DBRT agreed to follow the way of DMTCL case. JICA Project Team explained that DTCA would issue a letter to DBRT to send the draft of MOU. Based on this meeting, JICA Project Team prepared draft of MOU similar to the MOU with DMTCL and forwarded to DTCA, who has sent to DBRT the draft of MOU on March 28, 2017 for their review and comment.

However, the consultant for Operational Design for Business Model (ODBM) in charge of system development had withdrawn from the BRT-3 Project and it was difficult for DBRT to discuss the detailed technical aspect with the consultant responsible to design AFC system of BRT-3. Up to the end of the Project, consultant procurement is still under process. DTCA and JICA Project Team would continuously keep contact with DBRT, and DTCA will resume discussion with BRT-3 once DBRT hires a new consultant for system development.

5.6.3 Information Sharing with PTOs

With extensive discussion with various PTOs, the following five PTOs had joined Pilot Project implementation as discussed in Activity C-2.

1. Bangladesh Railway: BR
2. Bangladesh Inland Water Transport Corporation: BIWTC
3. Bangladesh Road Transport corporation: BRTC
4. Omama International (PVT). Ltd.
5. Dhaka Chaka Co. Ltd.

In addition to above five PTOs, HR Transport signed PTO and Agent Agreements with DTCA/CHU on April 17, 2018 for use of Rapid Pass card on commercial bases without any financial assistance from JICA Project.

5.6.4 Information Sharing with Banks

JICA Project Team exchanged views with banking sector in Bangladesh seeking transport fare settlement procedures using IC cards. Several banks expressed their keen interest on transport fare settlement using IC cards. Detailed procedures for opening deposit account and settlement account, settlement process and countermeasure for unexpected incidents were discussed with several banks.

Based on the above discussions, TOR for CH Bank was prepared by JICA Project Team for use of DTCA to selected reliable commercial bank as CH Bank. DBBL was finally selected by DTCA as a CH Bank through competitive public bidding. DTCA and DBBL signed the "Contract for Clearing House Bank for Clearing, Settlement and related Services of Rapid Pass System" on January 25, 2017. DBBL is assuming Clearing House Bank role for Clearing House and providing services which are maintenance for necessary bank accounts and bank transfer under instructions by DTCA.

5.6.5 Information Sharing with Other Organization

With regard to the information sharing with other organizations, it is summarized in **Table 5.6-1** below.

Table 5.6-1 Information Sharing

Organization	Contents of Discussion	Date / venue
PTOs		
1. Trust Transport, Dhaka Cantonment	Explanation of Rapid Pass System has been done with Trust Transport.	5th Jan 2016
2. HR Transport	JICA Project Team meet with HR Transport on 28th Feb 2018 and discussed about Rapid Pass system. HR Transport interested for both PTO and Agent Agreement. After that JICA Project Team did a survey in Circular bus route workshop to how can fixed R/W device inside the buses. As a result DTCA completed both PTO and Agent Agreement with HR Transport on 17th Apr 2018 and started operation from 23rd Apr 2018.	28th Feb 2018
3. Sheetal A.C Transport Ltd.	JICA Project Team has been done several meeting with Sheetal. - Meet with Mr. Muktar Hossain, Managing Director, Sheetal A.C Transport Ltd. for the purpose of Rapid Pass system integration. - They are very much interested for both of PTO and Agent Agreement. So,	Sep, 2017 to Apr 2018

Organization	Contents of Discussion	Date / venue
	PD DTCA has been send PTO & Agent Agreement draft on 23rd April 2018. - Mr. Muktar also mentioned that, he will arrange a meeting with their Chairman as early as possible.	
4. Padma Bridge Toll Plaza under BBA	Project team visited Padma Bridge Toll Plaza area. The Padma Bridge is a multipurpose railroad bridge to be constructed across the Padma River in Bangladesh. The bridge will connect Mawa with Janjira, linking the south-west of the country to the northern and eastern regions. The Bangladesh Bridge Authority (BBA) is the executing agency of the project. A feasibility study conducted by JICA anticipated that the volume of traffic on the Padma Bridge will reach 21,300 vehicles a day upon the bridge's opening and 41,600 vehicles a day by 2025. Construction end expected in December 2018 and tentatively opened in August 2019. Toll plaza construction already completed for both sides of the bridge.	Dec 2017
5. Orion Infrastructure Limited.	JICA Project Team had several meeting with Orion regarding integration of Rapid Pass with Hanif Flyover Toll collection. - Orion currently under implementation by French vendor for their own Toll collection system. June/July, 2018 French vendor will hand over the system to Orion. In that time they may integrate other payment system. - JICA Project Team mentioned that, existing toll collection of Orion by Radio Frequency Identifier (RFID)/IC card fails when there is network problem. But Rapid Pass payment is settled offline; it does not require network connection. - JICA Project Team wants to hold a meeting with Orion in June/July (after hand over) to discuss further about integrating Rapid Pass with Orion toll collection system. - There are two types of Toll collection in Orion currently under implementation by French vendor. <u>Bike</u> 1. Toll collection is done by IC card because it is difficult to detect RFID tag in bike. 2. Bike riders purchase IC card (MiFare) from POS booth of Orion. No monetary value is written in the card. Card store the ID only. Monetary value is stored in the server. 3. Riders tap the card in Toll Gate's Touch & Go device. Payment is settled in real time by connecting to the server and deducting money in the server. Transaction data is not written in the card. <u>Car/Large Vehicle</u> 1. RFID tag is installed in the vehicle. 2. ID and Vehicle class is written in the tag. No monetary value written in the tag. 3. RFID is detected in the toll gate and payment is settled in real time by connecting to the server. 4. Driver has option to use IC card also. He can pay by tapping the card in the toll gate. This process is same as Bike.	Oct, 2017 to Apr 2018
6. Karim Group, Water Bus Service in Hatirjheel area	JICA Project Team had several meetings with Karim Group. - General Manager Major Niser said that, Water bus service also very much interested to integration with Rapid Pass system. - Project director of Water bus services will available in Dhaka from the 1st week of May, 2018. After that they will send the feedback letter of PTO agreement to DTCA.	Oct, 2017 to Apr 2018
Banks		
1. Mercantile Bank	Mr. Shamim Ahmed, Executive Vice President & Head of mobile banking division of Mercantile Bank, explained to project team that: - In order for DTCA to be Card Issuer, Card Issuer License is to be obtained from Bangladesh Bank. - For opening a bank account under name of DTCA, a policy stating purpose and operation method is required. Record for JCC`s approval of its policy	7th July 2014

Organization	Contents of Discussion	Date / venue
	may be enough for this purpose.	
2. Bangladesh Commercial Bank Limited	A meeting with BCBL was held to discuss Possible participation to Clearing House Project as an Agent Banking. It was necessary to explain what can be done by FeliCa and handy R/W. Last meeting with BCBL was held on 21 Jan 2015. They proposed to incorporate magnetic tape for ATM on the back of FeliCa. And also BCBL will prepare for FeliCa to use pass book for Agent Banking. Proposal in detailed use for Agent banking is to be made. It is necessary to procure FeliCa for use of BCBL pilot project.	18th Nov 2014 to 2015
IT Company		
1. IT Consultant Limited	ITCL shared the following information with JICA Project Team: Laws and regulations applicable to credit card and prepaid card are different. Both laws must be studied carefully. Payment services without using Bank account shall be sought in Bangladesh, because only 20% of the populations hold Bank account.	19th June 2014
2. DataSoft Systems Bangladesh Limited	The stress test of Rapid Pass system was developed by DataSoft.	2017 to 2018
3. BJIT Limited	System Test Tor was sent to BJIT and explained the overall of Rapid Pass system.	2017
4. Green Line Paribahan	Meeting was held on PD room with Mr. Monir Hossain, IT consultant, Green Line and their IT partner company Electro CRAFT Corporation Ltd. and project team. Green line wants to incorporate their portal www.paribahan.com with Rapid Pass system for Ticketing as well as Millage card through Application Programming Interface (API) access. At present they are in process of integrating different payment options like debit card & credit card. In the mean time they want to develop also Rapid Pass option. So, they requested PD to provide necessary specification and technical access of Rapid Pass under MoU. PD mentioned that, Green Line has to be submitting a letter to DTCA based on their detail requirements.	22nd Nov 2017
5. SHOHOZ.com	JICA Project Team had a meeting with Mis Maliha M. Quadir, Managing Directo and Sandeep Debnath, CTO regarding the web based Rapid Pass issue and recharge system. They expressed their interest to incorporate with this system but they seemed to want to get a bid from JICA or DTCA. They are committed to a sound business and they do not seem to take risk. Since there was also an instruction from PD, for the time being, JICA Project Team requested them to submit the proposal to DTCA.	25th Jan 2018
6. Business Automation Ltd.	JICA Project Team met with Mr. Jahidul Hasan, Managing Director & Chief Executive Officer (CEO) for information sharing and finding scope of future connection related CHU. Business Automation involve with various service oriented project in Bangladesh IT platform.	28th Nov 2017
7. Computer Network Systems	JICA Project Team met with Mr. Major Md. Ziaul Ashan Sarwar (Retd.), Executive Director, CNS about how to integrate Rapid Pass system with various toll collection. The discussion was as follows: - Meghna Gomti and Jamuna toll plaza both are operated by CNS and NRB Bank - Recently they have been introduced “Touch & Go Prepaid Card”. Now test is going on. Prepaid card is maintained by NRB Bank. CNS informed that, they are working to integrating toll system with prepaid card. - As a Rapid Pass integration process, Mr. Major Md. Ziaul suggested to arrange a coordination meeting with concern Government entity.	7th Oct 2017
Other Company		
1. Walton	JICA Project Team had a meeting with Md. Syeful Islam, First. Sr. Asst. Director, Cellular Phone R & D about how to integrate Rapid Pass with Walton mobile. They appreciated the Rapid Pass initiative in transport sector. He	Sep 2017

Organization	Contents of Discussion	Date / venue
	assured to discuss with their top management of this matter.	
2. Energypac	JICA Project Team had a meeting with Mr. Faiaz H Chowdhury, AGM of Energypac for confirmed about the new 10 chinses buses booking information by Omama which will schedule to add with Rapid Pass system.	27th Sep 2017
3. Maisha Group	Maisha Group discussed about proposed 4000 Bus Rationalization project and proposed BRT and Elevated Expressway project. How to integrate Rapid Pass system in near future for those mentioned project.	Jan 2018
4. Bangladesh Road Transport Labor Federation	JICA Project Team meet with Mr. Osman Ali, General secretary of Labor Federation for the purpose of toll collection under CHU. He appreciated Rapid Pass system and assure to support.	28th Nov 2017
5. RAJUK Hatirjheel Project	JICA Project Team met with Mr. Major Sadik, in charge of Circular bus route and Water bus service in Hatirjheel project. Team shared the information of Rapid Pass and Clearing House project. He assured to informed it to Army H/Q and arrange meeting with Bus companies operator and also Water bus operator for this purpose. He also expressed his interest about their multistoried Parking building payment system how to integrate with Rapid Pass system.	Oct 2017
6. Sumitomo Corporation Bangladesh branch	JICA Project Team discussed with Sumitomo regarding establishment of SPC. The discussion was as follows: - PPP Projects are classified into two schemes; public initiated schemes and private initiated schemes. Most PPP projects are public initiated schemes. Therefore, private sector can participate CH Project under PPP Scheme even public sector made initial investment. - Joint venture with DTCA (40%) and Sumitomo (60%) may be best scenario for Sumitomo. JICA can continue to support the project as assistance to DTCA. Bangladesh government also supports the project as a national project while Sumitomo can take initiative if share is more than 50%. -Sumitomo has no intention to join local firms. It may create more trouble. -JICA Project Team frankly informed that this topic is also discussed with other potential operators such as Marubeni, Sojitsu and Toppan Forms.	Jan 2017
7. Japan International Consultant for Transportation (JIC)	A meeting was held among JICA Project Team with JIC. The discussion was as follows: - Number of IC Card to be issued by MRT and BRT is estimated at 300,000 pcs. - Fare system will be established by Institutional Development Consultant (IDC) - Rules for AFC will be approved by the government by Aug 2014.	16th June 2014
8. Oriental Consultants Global	As stated in National Integrated Multimodal Transport Policy, a simple Smart Card Solution like “Touch and go” system is to be studied. If type of a vehicle is encoded in Smart Card, smooth flow of vehicles may be assured. Recharge facilities are also installed at gas (service)	July 2014
9. Asian Development Bank	Exchanged of information regarding fare collection system in BRT Using IC card. ADB informed that, System development and equipment procurement for fare collection system will be started beginning of 2015. Basic function requirements shall be determined within 2014.	Jun 2014
10. ALG	A meeting was held with ALG Mr. Mata, Project Manager of Package 3 ODBM of BRT Line 3. RHD portion, design of facility was completed and it was found that project cost exceeds pledged loan amount. Appraisal for additional funding is ongoing by ADB. Project team submitted extract version of specification and basic condition was made. Although civil works for depot (Local Government Engineering Department (LGED) portion) is ongoing, opening date will be Q4 2019, which will be late by two years.	31st May 2016
11. SunJin Engineering & Architecture Co., Ltd.	IC Card fare system for BRT will be studied in September 2014. The result of the study will be incorporated in the Ancillary Plan report.	9th June 2014

Organization	Contents of Discussion	Date / venue
Other Government Organization		
1. Dhaka North City Corporation	JICA Project Team has visited several time in DNCC for the following purposes: - For getting permission of space in road side area to development TOM shop and made route survey together with DNCC survey team. - DNCC is now planning to implement Bus Rationalization Project that integrate numerous small scale bus companies into four major bus companies with infusion of public fund to replace dilapidated old buses with new ones. Upon introduction of new buses to newly re-organized bus companies, the city corporation is planning to introduce ICT fare collection system using Rapid Pass. JICA Project Team will continue to discuss with DNCC for introduction Rapid Pass Card to the Bus Rationalization Project. - For the purpose of Rapid Pass Campaign	July 2017 to Apr 2018
2. JETRO Bangladesh Office	JICA Project Team had a meeting with Japan External Trade Organization (JETRO) official of Bangladesh office regarding SPC. They said It is possible to make JV project/Company with Govt. authority.	Dec 2017
3. Board of Investment	JICA Project Team discussed with BOI regarding SPC. They said, JV Public Limited Co. will be suitable for operation of Clearing House or, 100% Foreign Investment Company.	Dec 2017
4. Military Institute of Science and Technology (MIST)	JICA Project Team has been discussed several times with MIST and DBBL how to integrate Rapid Pass system with their Student ID Card as well as DBBL Bank card. In that case they need hybrid card to introduce the system.	2016 to 2017
5. Public Private Partnership Authority (PPPA)	JICA Project Team had a meeting with Public Private Partnership Authority (PPPA) regarding SPC. The discussion was as follows: <u>Bangladesh – Japan Joint PPP Platform Management Rules:</u> PPPA said above rules to be obtained from either Embassy of Japan or MLIT. PPPA cannot provide sensitive information to potential Japanese investors without consent of Government of Japan (GOJ). <u>Operation of CH as PPP Scheme:</u> PPPA said magnitude of investment is quite small compare with anticipated projects stated in G2G Policy. Investment amount more than TK 2,000 Crore (32billion Yen) can be a target project of G2G. PPPA recommended to consult with A2I (Access to Information) Program in Prime Minister's office because CH operation is service oriented project not investment oriented project. http://a2i.pmo.gov.bd/ https://www.youtube.com/user/a2ibangladesh https://en.wikipedia.org/wiki/Access_to_information_in_Bangladesh https://en.wikipedia.org/wiki/Freedom_of_information_laws_by_country	15th Jan 2018
6. World Bank Group	JICA Project Team met with Mr. Shige Sakaki, Sr. Urban Transport Specialist, South Asia Region. Main discussion was how to integrate Rapid Pass system in Chittagong. Project team attended Chittagong strategic Urban Transport Master Plan Visioning workshop. The basic need of a vision was to guide the Chittagong Strategic Urban Transport Master Plan (CSUTMP) study team when developing potential solution to the current urban transport challenges in Chittagong. May 2018, Rapid Pass system has been also introduced in one of the World Bank project name as "Nationwide Interoperability in Fare Collection Critical Success Factors for Bangladesh"	24th Sep 2017

Source: JICA Project Team

5.7 [C-7]: IT System Operation Manuals are Prepared

Under this activity, the following three types of manuals were prepared.

1. Technical Manual
2. Standard Operation Procedure (SOP) Manual
3. Training Manual

Full set of above manuals were presented in Technical Assistance Reports while description of each manual is discussed in the succeeding sections.

5.7.1 Technical Manuals

Total 9 technical manuals were prepared for the purpose of appropriate operation and maintenance of ICT equipment and software for the use of field operators, TOM operators, system engineers and IT engineers in server room etc. **Table 5.7-1** shows list of technical manuals with brief description.

Table 5.7-1 List of Technical Manuals

Document Number	Document Name	Target Users	Description
DCHK01-MANTC-0001	Network Diagram	Network Administrator, Network Engineer	This Network Diagram describes both local network and VPN network which connect hardware of Rapid Pass system such as IDMS, SS, and PTO servers, handy R/W , TOMs and monitoring terminals. It also discusses IP scheme, switch layout and firewall settings.
DCHK01-MANTC-0002	CH Terminal Operator Manual	System Administrators, System Engineer	This manual describes procedure of program installation and configuration for monitoring terminal. It also discusses how to operate monitoring terminal program.
DCHK01-MANTC-0003	Handy Terminal User Manual	System Engineer	This manual describes how to install and configure handy R/W program and how to use it.
DCHK01-MANTC-0004	IDMS Administrator Manual	System Engineer	This manual is a technical operational guide for operation of ID Management Server (IDMS). It includes hardware and software information, software update, how to startup and shut down the system, clean up and purge operation and backup/restore/security measures.
DCHK01-MANTC-0004	SS Administrator Manual	System Engineer	This manual is a technical operational guide for operation of Settlement Server (SS). It includes hardware and software information, software update, how to startup and shut down the system, clean up and purge operation and backup/restore/security measures.
DCHK01-MANTC-0005	PTO Server Administrator Manual	System Engineer	This manual is a technical operational guide for operation of PTO Server. It includes hardware and software information, software update, how to startup and shut down the system, clean up and purge operation and backup/restore/security measures.
DCHK01-MANTC-0006	Monitoring Backup Server Administrator Manual	System Engineer	This manual is a technical operational guide for operation of Monitoring Back Up Server. It includes hardware and software information, software update, how to startup and shut down the system, clean up and purge operation and backup/restore/security measures.
DCHK01-MANTC-0007	Monitoring Terminal Operator Manual	System Engineer	This operation manual describes how to login Monitoring Terminal and how to operate application monitoring and network and system monitoring including description of error messages.
DCHK01-MANTC-0008	PTO Terminal Operator Manual	PTO Engineer, System Engineer	This manual describes about how to use PTO terminal under PTO server such as create user, assign privileges, get daily report, transaction data, settlement data, master upload or download etc.
DCHK01-MANTC-0009	TOM: Ticket Office Machine User Manual	System Engineer	This manual was prepared for use of Ticket Office Machine (TOM) . It shows how to install and configure program, how to login, how to issue Rapid Pass card, how to recharge and how to re-issue the card. It also presents how to view transaction log and network communication log.

Source: JICA Project Team

5.7.2 Standard Operation Procedure (SOP) Manuals

Standard Operation Procedure (SOP) Manuals were prepared for the purpose of operation of Rapid Pass System using ICT equipment and software installed/developed under this project. These manuals focus on standard rules and regulations on Rapid Pass System including future updating procedures of the System. Total 15 SOP manuals were prepared. List of SOP manuals were presented in **Table 5.7-2** including brief description of each manual.

5.7.3 Training Manuals

Training manuals were prepared for the purpose of Training of Trainers (TOT). The training

materials were prepared for the use of CH operators, PTO operators and Agent operators etc. With these manuals, CHU, PTOs and Agents will be able to train their new staff without assistance from JICA Project Team after the Project. Total six manuals were prepared as shown in **Table 5.7-3**.

Table 5.7-2 List of Standard Operation Procedure (SOP) Manuals

Document Number	Document Name	Target Users	Description
DCHK01-MANOP-0001	Systems Maintenance	System Engineer	This manual describes detailed procedures for maintenance of the system including daily, weekly, monthly and annual maintenance of software, hardware, database, network and electricity.
DCHK01-MANOP-0002	Systems Change Control (Routine Work)	System Administrators, System Engineer	This document presents how to control system changes using change control formats. I discusses software change control, document change control, contractual change control and network change control.
DCHK01-MANOP-0003	Problem Management of Client	System Administrators, System Engineer	This manual presents how to prevent problems, how to eliminate recurring incidents and how to minimize impact of incidents. It presents procedures of problem management by internal problems and external problems.
DCHK01-MANOP-0004	Monitoring and Settlement	Maintenance Engineer	This manual describes how to check and monitor Rapid Pass System servers including IDMS, SS, PTO servers and UPS as daily routines. It also presents procedure for monitoring daily settlement transactions.
DCHK01-MANOP-0005	Operational Process for Lost Card	System Engineer, TOM Operator	This manual describes how to secure and recover monetary value stored in a Rapid Pass card accidentally lost.
DCHK01-MANOP-0006	Source Management	System Administrators, System Engineer	This document shows source code structure of various programs of Rapid Pass System for future update/revision of the program. It also discusses how to maintain source code efficiently.
DCHK01-MANOP-0007	Source Management Bitbucket	System Administrators, System Engineer	This document gives a detailed explanation of source code management technique not by File system but by Bitbucket system.
DCHK01-MANOP-0008	2nd Issue Process	System Engineer, TOM Operator	This manual shows detailed procedures for issuance of Rapid Pass Card by card issuer such as CHCI. First card issue was made by card manufacturers and second issue shall be made by card issuer authorized by card manufacturer.
DCHK01-MANOP-0009	Business Continuity Contingency Plan	CHU Staff	Business continuity encompasses planning and preparation to ensure that an organization can continue to operate in case of serious incidents or disasters and is able to recover to an operational state within a reasonably short period.
DCHK01-MANOP-0010	SOP of Re-Cycling of Rapid Pass	CHU Staff	Unusable cards are kept by CHU for one year. After the retention period these card are recycled by using special tool in TOM software. Only CHU staff has access to this special tool in TOM. Recycle SOP only deals with the unusable cards those are collected by CHU operator.
DCHK01-MANOP-0011	Blacklist Operation	CHU Operator	This manual describes procedures how to identify misuse/abuse of card and how to invalidate the misused card. It also discusses how to revalidate the card of honest users that is accidentally blacklisted.
DCHK01-MANOP-0012	SOP of Abnormal Transaction	System Engineer	This manual describes how to check for irregular card transaction and related action to be taken.
DCHK01-MANOP-0013	SOP for Card/SAM Inventory Management	CHU Staff	This manual describes the procedure to manage, update and handing over SAM Card
DCHK01-MANOP-0014	SOP for Card/SAM Procurement	CHU Staff	This document shows standard procedure of IC Card and SAM card procurements
DCHK01-MANOP-0015	Guideline for Switch Over the Servers	System Engineer	This guideline describes how to switching over servers in a cluster by switching from location A to location B during exceptional situation such as disaster.
DCHK01-MANOP-0016	Documentation of Preventing Unauthorized Access	System Engineer	This document shows how to prevent unauthorized access to Rapid Pass System particularly IDMS and SS servers.

Source: JICA Project Team

Table 5.7-3 List of Training Materials

Document Number	Document Name	Target User	Description
DCHK01-MANTR-0001	Trainer's plan and manual for CH Operators	CHU staff (trainer)	This document shows typical training plans and notes for training CHU engineers in order to promote comprehension.
DCHK01-MANTR-0002	Trainer's plan and manual for Agent Operators	CHU trainer for TOM operator	This document shows typical training plans and notes for training TOM operators in order to promote comprehension.
DCHK01-MANTR-0003	Trainer's plan and manual for PTO Operators	CHU trainer for PTO operator	This document shows typical training plans and notes for training PTO operators in order to promote comprehension.
DCHK01-MANTR-0004	Materials for CHU staff training for updating RP Website	CHU System Engineer	This document describes the procedure how to update rapid Pass website for better comprehension.
DCHK01-MANTR-0005	Materials for CHU staff training for PTO operator	PTO Operator (trainee)	This document describes the procedure how to operate handy R/W for better comprehension at the training by CHU trainer.
DCHK01-MANTR-0006	Materials for CHU staff training for Agent operator	TOM operator (trainee)	This document describes the procedure how to operate TOM for better comprehension.

Source: JICA Project Team

5.8 [C-8]: Appropriate Trainings are Conducted to PTOs

5.8.1 Training for PTOs Staff and Other Related Organization

Based on the manuals and training materials prepared in Activity C-7, ICT fare collection training were conducted mainly for staff of the following PTOs who joined the Rapid Pass Pilot Project implementation.

1. BRTC (Pilot Project period: May 2017 ~ April 2018): 164 trainees
2. Omama (Pilot Project period: June 2017 ~ April 2018): 34 trainees
3. Dhaka Chaka (Pilot Project period: January ~ April 2018): 47 trainees

In addition to staff of above PTOs, TOM operation trainings were conducted for 14 staff of N-Wave BD, local service provider of Package 3 Pilot Project, and 18 staff of DBBL, the Clearing House Bank. Total 277 staff were trained by JICA Project Team.

Table 5.8-1 shows summary of trainings conducted by JICA Project Team. Report of each training is presented in Technical Assistance Report.

Table 5.8-1 Summary of ICT Fare Collection Training for PTOs

Name of Trainee Company	Position	Date	Number of Trainees
1 BRTC	1-1 Conductor	16-19 April 2017	55
	1-2 Maintenance	23 April 2017	2
	1-3 Live Demo for Conductors	15 April 2017	51
	1-4 Driver	28 & 30 September 2017	52
	1-5 Conductor	22 November 2017	4
		Sub Total	**164**
2 Omama	2-1 Conductor	21 May 2017	34
		Sub Total	**34**
3 Dhaka Chaka	3-1 Conductor & Lineman	19 December 2017	37
	3-1 Tom Operator	20 December 2017	3
	3-1 Tom Operator	21 December 2017	5
	3-1 Foreman & Security	23 December 2017	2
		Sub Total	**47**
4 NWBD	5-1 Tom Operator	13 April 2017	14
		Sub Total	**14**
5 DBBL	4-1 Officials	10 April 2017	18
		Sub Total	**18**
Total			**277**

Source: JICA Project Team

Source: JICA Project Team (18,19 April 2017)

Photo 5.8-1 ICT Fare Collection Training for BRTC Staff

Chapter 6 Activities for Output-D

6.1 Contents of Activities

This output was added as Output-D during first SC meeting by SC members and also incorporated in the TAPP approved by Government of Bangladesh. Output-D consists of the following two activities;

Activity D-1: Train GOB counterpart personnel related to operation of Clearing House properly.

Activity D-2: Train counterpart personnel adequately on different aspects for running and maintaining Clearing House.

Since this project is a technical cooperation project, above activities are already implicitly included in activities in Output-A to C from the beginning, but the SC members preferred to have new output that explicitly describes activities for capacity enhancement of counterpart personnel.

Under activities of Output-D, the trainings shown in **Table 6.1-1** were conducted. Details of each training is discussed in the succeeding sections.

Table 6.1-1 Trainings Conducted by the Project

Type of Training	Target Staff	Purpose of the Training	Date Conducted
Activity D-1: Orientation Visit to Foreign Countries			
1.1 Orientation Visit to Hong Kong	Staff form JCC members' office. (6 personnel)	Observe actual operation of common IC card (Octopus Card) operation by different transport operators	Oct. 27 ~ Nov. 2, 2014
1.2 Orientation Visit to Japan	Staff from JCC members' office (10 personnel)	Observe integrated Clearing House System by various IC card operators	Sept.5 ~ 13, 2015
Activity D-2: Staff Training to CHU			
2.1 Class Room Training	CHU Staff (8 personnel)	Train different aspects (technical & managerial) for running and maintaining Clearing House	Jan. 24 ~Mar. 20, 2018 11 days
2.2 On the Job Training	CHU Staff (8 personnel)	Train different aspects (technical & managerial) for running and maintaining Clearing House	Jan. 2018 ~ June 2018

Source: JICA Project Team

6.2 [D-1] Train GOB Counterpart Personnel Related to Operation of Clearing House Properly.

6.2.1 Third Country Orientation Visit to Hong Kong

The Third Country Orientation Visit was undertaken from October 27 to November 2, 2014 in Hong Kong. Program objective and activities are;

Program Objective:

Observe and experience conveniences Octopus Card use through site visit and trial ride on public transport and learn history of Octopus Card introduction effort for introduction of common IC cards to Bangladesh.

Program Activities

1. Use an Octopus Card as a passenger by trial ride on public transports and experience conveniences of IC card use.
2. Visit an Octopus Card operator and learn history of Octopus Card introduction efforts made by them.

3. Interview to PTOs regarding issues and challenges on introduction of common IC card to transport services.
4. Visit a undersea tunnel operator and observe how staff management is being transformed after expiration of 30 years franchise period under Build Operate Transfer (BOT) scheme.

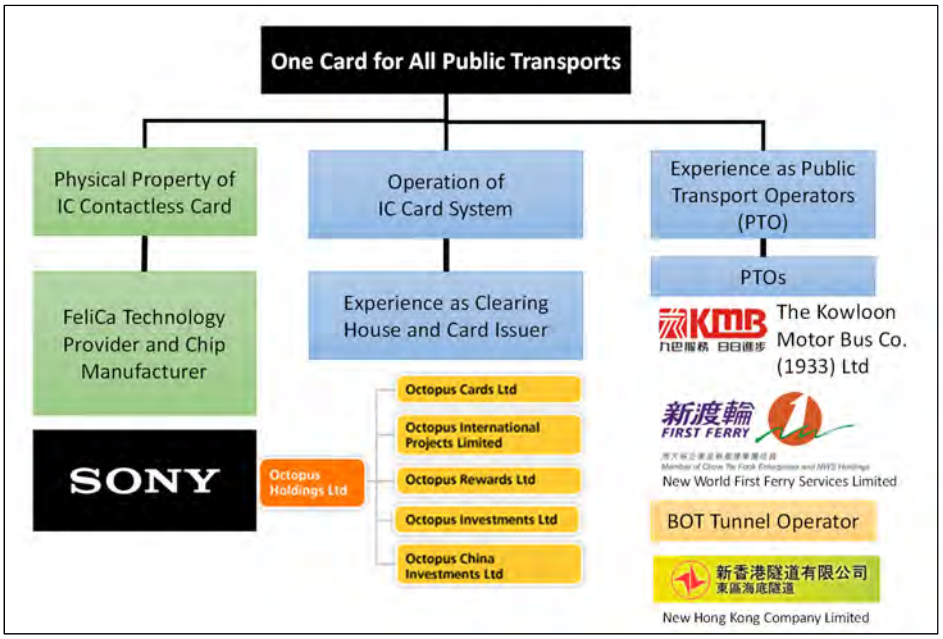
Six officials of the Bangladesh Government, including Secretary, Road Transport and Highways Division, Ministry of Road Transport & Bridge have participated the visit. The Officials participated in the Program is shown in **Table 6.2-1**.

Table 6.2-1 List of Participants for Orientation Visit to Hong Kong

Name	Potion/Agency
1. Mr. M.A.N. Siddique	Secretary, Road Transport and Highway Division, Ministry of Road Transport and Bridges (MRTB)
2. Mr. Md. Kaikobad Hossain	Executive Director, Dhaka Transport Coordination Authority (DTCA)
3. Mr. Md. Mizanur Rahman	Chairman, Bangladesh Road Transport Corporation (BRTC)
4. Mr. Md. Mizanur Rahman	Chairman, Bangladesh Inland Water Transport Corporation (BIWTC)
5. Mr. Md. Amjad H. Khan	Director (Administration), DTCA
6. Mr. Mihir Kanti Guha	Joint Director General, Bangladesh Railway (BR)

Source: JICA Project Team

Contents and flow of the Program is shown in **Figure 6.2-1**.



Source: JICA Project Team

Figure 6.2-1 Flow of Orientation Visit to Hong Kong

Table 6.2-2 shows the schedule for the Program.

Table 6.2-2 Schedule of Orientation Visit to Hong Kong

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
	2014/10/27	10/28	10/29	10/30	10/31	11/1	11/2
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Morning Time	CX5191 Dhaka 01:55 ⇒08:05 Hong Kong Pre-Study	Visit to Sky 100 in International Commercial Center at Kowloon Station	New Hong Kong Tunnel Company Limited Yau Tong **11:00 to 12:10** Ms. Becky Fung Mr. Sunny Hui	Visit China Border at Lok Ma Chau by East Rail Line (ex-Kowloon Canton Railway)	Summary of previous day's Visit and Pre-Study of next Visit	Internal Discussions and Preparation of Reports	Free time in Hong Kong
	Lunch Break						
Afternoon	Sony Corporation Hong Kong Limited Tsuim Sha Tsui **16:00 to 17:30** Mr. Kondo & Ms. Kanazawa	Octopus International Project Limited Kowloon Bay **15:00 to 17:30** Mr. Brian Chambers & Mr. Kris Chan	Trial Ride for using Oct0pus Card	New World First Ferry Services Limited Nam Cheong **16:00 to 18:30** Mr. Demen Cheung Mr. Kenneth Ko	The Kowloon Motor Bus (1933) Co., Ltd. Kowloon Bay **14:30 to 15:50** Mr. Daisy Chow		CX5192 Hong Kong 17:35 ⇒Dhaka 20:00

Source: JICA Project Team

Source: JICA Project Team

Photo 6.2-1 Orientation Visit to Hong Kong at Sony Corporation

Achievement of the Orientation Visit is summarized in **Table 6.2-3**.

Table 6.2-3 Achievements of Orientation Visit to Hong Kong

Objective and Activities	Achievement
Objective: Observe and experience conveniences Octopus Card use through site visit and trial ride on public transport and learn history of Octopus Card introduction effort for introduction of common IC cards to Bangladesh.	Participants used subway (MRT) and bus by Octopus Card not taxi during site visit inside Hong Kong. All of participants could experience conveniences of IC card. They also learned the history of Octopus Card introduction to Hong Kong. These experiences can be utilized for introduction of common IC card to Bangladesh.
1. Use Octopus Card as a passenger by trial ride on public transports and experience conveniences of IC card use.	Same as above.
2. Visit Octopus Card operator and learn history of Octopus Card introduction efforts made by them.	Participants received a lecture from Mr. Brian Chambers of Octopus Cards Ltd. and learned the operation of IC card system.
3. Interview to PTOs regarding issues and challenges on introduction of common IC card to transport services.	The participants understood that introduction of common Octopus Card was finally decided/approved upon confirming cost effective operation would be assured if business-driven private firms would be operators.
4. Visit undersea tunnel operator and observe how staff management is being transformed after expiration of 30 years franchise period under BOT scheme.	It was confirmed that directors dispatched by the Government contributed the operation properly and BOT operation worked adequately for past 28 years. However, the Government has yet to be announced the definite commitment on continued employment of current staff beyond expiration of BOT franchise period.

Source: JICA Project Team

6.2.2 Orientation Visit to Japan to Understand IC Card and Clearing House Operation

The Orientation Visit to Japan was undertaken as a training course of JICA, namely Invitation to Japan for the Bangladesh government officials, including Mr. Md. Faruque Jalil, Additional Secretary, Road Transport and Highway Division, Ministry of Roads, Transport and Bridges, from September 5 to September 13, 2015 with 10 officials of the Government of Bangladesh. The officials participated in the Program are listed in **Table 6.2-4**.

The activities of the program included site visits to;

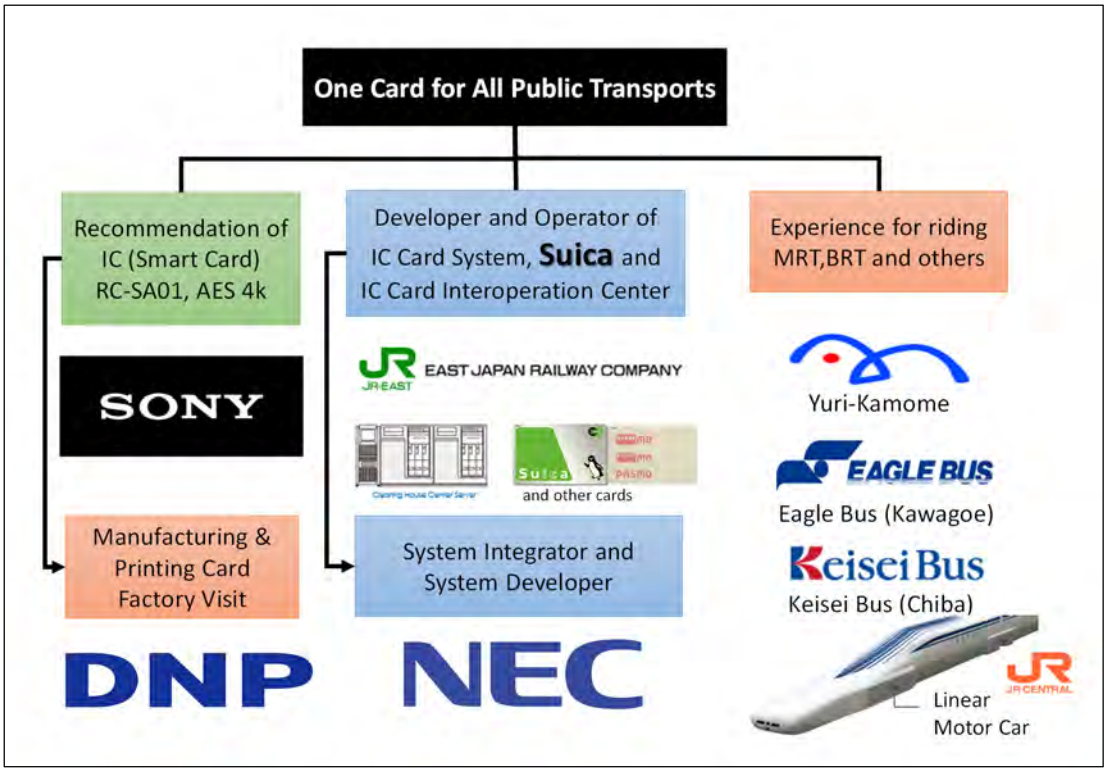
1. Automatic Fare Collection operated by JR East,
2. Development and implementation of Suica service by JR East Mechatronics,
3. Process of manufacturing IC Card by Dainippon Printing Company Ltd. (DNP),
4. Introduction of NFC of FaliCa by SONY, etc.

Table 6.2-4 List of Participants for Orientation Visit to Japan

Name	Position
1. Mr. Md. Faruque Jalil	Additional Secretary, Road Transport and Highway Division, Ministry of Road Transport and Bridges (MRTB)
2. Mr. Md. Mizanur Rahman	Chairman, Bangladesh Road Transport Corporation (BRTC)
3. Mr. Md. Rafiqul Islam	Additional Executive Director/CH-Project Director, Dhaka Transport Coordination Authority (DTCA)
4. Mr. Monoranjan Biswas	Joint Secretary, Economic Relation Division (ERD)
5. Mr. Md. Anisur Rahman	Project Manager, CH-DTCA
6. Dr. Mohammad Mohiuddin	Deputy Secretary, Legislative & Parliamentary Affairs Division, Ministry of Laws
7. Mr. Md. Sabuj Uddin Khan	Executive Engineer, Roads and Highways Department (RHD) (Gazipur Road Division), MRTB
8. Ms. Nahid Sultana	Sub-Divisional Engineer, BRT (Gazipur-Airport), Greater Dhaka Sustainable Urban Transport Project (GDSUTP) BRT Operator
9. Mr. Rony Rahman	Assistant Chief, Physical Infrastructure Division, Planning Commission
10. Ms. Kamrun Nahar	Assistant Manager (Civil), Dhaka Mass Rapid Transit Development Project (DMRTDP), MRT Operator

Source: JICA Project Team

Contents and flow of the Program is shown in **Figure 6.2-2**.



Source: JICA Project Team

Figure 6.2-2 Flow of Orientation Visit to Japan

The schedule of the program is shown in **Table 6.2-5**.

Table 6.2-5 Schedule Orientation Visit to Japan

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9
	2015/9/5	9/6	9/7	9/8	9/9	9/10	9/11	9/12	9/13
	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Morning	Preparation for Departure	Arrival Tokyo ↓ Hotel	**JICA** Headquarters Orientation	**DNP** Ushiku Factory, Ibaraki Lecture & Factory Tour	**SONY** Shinagawa Headquarters Lecture by Mr. Kondo & Show-room Tour	Shinjyuku Station Observation ↓ **Eagle Bus** Test-ride	**NEC** Lecture by Mr. Lin and Colleagues Shinagawa Innovation Center	Mt. Fuji (World Heritage) Narusawa Ice Cave ↓ Mt. Fuji ↓ Gotemba Outlet ↓ (Tomei Expressway) ↓ Oedo Onsen (Tokyo) ↓ Haneda Airport	Departure Tokyo
Lunch Break									
Afternoon	Departure Dhaka	Free	**JR East** Courtesy visit to Executive Officer Mr. Noguchi ↓ Lecture by Executive Officer Mr. Otsuki of **JR East Mechatronics**	**Keisei Bus** Test-ride Makuhari, Hongo – Kaihin Makuhari)	Yurikamome Test-ride (Shinbashi - Toyosu)	Kawagoe City / Koedo Sightseeing	(Chuo Expressway) ↓ The Yamanashi Maglev Test Line ↓ Mt. Fuji (World Heritage)		Arrival Dhaka

Source: JICA Project Team

At NEC Corporation

Trial Ride on Yurikamome Mono-Rail

Source: JICA Project Team

Photo 6.2-2 Orientation Visit to Japan

Achievement of the orientation visit to Japan is summarized and discussed below.

1. Better Understanding on Suica Operation

- Transaction volume of Suica card has drastically increased once mutual use with Pasmo card was attained.

↓

This implies that introduction of common IC card is a key to success.

- If multiple card issuers will be integrated into a single card issuer, cost of card issue and card management can be reduced.

↓

If the common card is adopted in Dhaka, unnecessary card issue and management costs can be curtailed.

- The biggest advantage of Suica Card is to reduce maintenance cost of magnetic ticket machine.

  ↓

  Installation of magnetic ticket machine shall be minimized in Bangladesh.

- After mutual use was agreed with Pasmo Card, card procurement was tasked to only JREM to avoid different price of card issue and deposit.

  ↓

  There must be only one entity for card procurement, preferably DTCA will be the Clearing House and Card Issuer (CHCI).

6.3 [D-2] Train Counterpart Personnel Adequately on Different Aspects for Running and Maintaining Clearing House.

6.3.1 Class Room Training for CHU Staff

The recruitment of staff of CHU was delayed due to late approval of TAPP and ensuing delay in fund allocation. Eight new staff were employed only in January 2018. The Project Team commenced the training for those newly recruited staff members from January 2018, and the schedule of the training is shown in **Table 6.3-1**.

Table 6.3-1 Schedule of Training Offered to CHU Staff

Date	Topics
24th January, 2018	Rapid Pass Reporting System. Explanation of Daily Sales report, Agent Report, Settlement Report
	CH Terminal operations explanation
	Personal information registration
28th January, 2018	Network Diagram
30th January, 2018	Operator Manual (TOM and PTO)
25th February, 2018	Administrator Manual IDMS, SS, PTO
13th March, 2018	Fare Chart preparation, Terminal Master preparation, PTO Terminal Master Table update
14th March, 2018	Procedure of new PTO and Agent inclusion in Rapid Pass System
14th March, 2018	Training Manual explanation
15th March, 2018	Rapid Pass Home Page Update Method (News, Picture, Notice)
18th March, 2018	Documents explanation (Internal Design, External Design)
19th March, 2018	Rapid Pass SOP manual explanation
20th March, 2018	Rapid Pass offline batch process system

Source: JICA Project Team

Based on this training, those staff of CHU have supported a new PTO, namely HR Transport, and HR Transport has concluded PTO Agreement and Agent Agreement on April 17, 2018 and had started operation of Rapid Pass cards from April 23, 2018.


Source: JICA Project Team

Photo 6.3-1 CHU Staff Conducted Trainings to Staff of HR Transport

6.3.2 On the Job Training for CHU Staff

JICA Project Team worked with newly employed CHU staff since their employment in January 2018 until June. Unfortunately, employment of CHU staff delayed significantly and on the job training period could have only six months in four years project period. However, during this period the CHU staff work with JICA Project Team for implementation of Pilot Project with PTOs namely, BRTC, Omama and Dhaka Chaka.

Through monitoring/supervision of Pilot Project implementation, the CHU staff learned the following items that may be essential for operation of Clearing House.

1. Technical procedures to handle hardware and software of Rapid Pass System.
2. Operational procedures for card issue, card re-issue, and blacklisting including future update/revision of the System.
3. Training method using training manuals to offer trainings to staff of PTOs that may join Rapid Pass System.

Chapter 7 Operational Challenges and Lessons Learned

7.1 CHU Business Plan

The revised DTCA organogram, which was approved by the government, has provision for 8 personnel for CHU. However, frequent transfer/replacement of DTCA's managerial personnel and lengthy process of new personnel recruitment may be a potential risk for continuous and sustainable operation of CHU.

When MRT and BRT become operational and if 60% of passengers of about 10 major bus companies start using Rapid Pass Card, it may be possible that CHU operation will be black ink with 3% of CH fee. However, in this project, the number of Rapid Pass Card users was less than 5% of total passengers because MRT and BRT were not operational yet. Therefore, the business plan was reviewed with the assumption that card usage rate at the time of MRT opening was reduced to 30%. Result of review revealed that continuous CHU operation was narrowly possible if number of passengers did not decrease due to general strike (Hartal).

Considering that Octopus and Suica started E-money service within three years after commercial operation, it can be said that introduction of additional services is essential for expansion of Rapid Pass Card. DTCA's mandate as a traffic control agency may be a bottleneck for business expansion.

In order to solve the above problems, establishment of SPC was proposed to DTCA. The proposed SPC may be joint venture of public and private sectors. Public sector will coordinate with public transport operators for increase of Rapid Pass Card passengers while private sector will coordinate with private entrepreneurs for E-money and other additional services for further expansion of Rapid Pass Card.

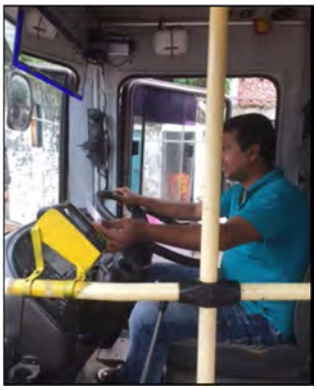
It is necessary to discuss the desirable form of the SPC and delegation of CHU tasks to the SPC with coordinating related stakeholders.

7.2 Introduction Fixed Handy R/W to Bus Company

Pilot Projects implemented in BRTC, BR, and BIWTC using SPASS and/or e-ticket for fare collection substituted traditional paper tickets. This introduction of SPASS together with e-ticket triggered strong opposition from conductors who engaged in conventional fare collection system using papers tickets.

Therefore, Rapid Pass System was designed with a view to replacing paper ticket by handy R/W and simultaneously retaining the functionality of the conductors. Operation of handy R/W was designed as simple as possible so that paper ticket conductors who are not familiar with handy R/W can manage to operate it. Nonetheless, operation of the handy R/W still required introductory trainings and technical knowledge which the traditional conductors are lacking. Assignment of competent operators was inevitable and this requirement entailed additional cost to PTOs.

PTO management sought elimination of R/W operators to curtail the operation cost. With strong request from PTO management, handy R/W was fixed beside bus driver's seat so that the deriver could operate the device without assistance from device operator. Under this operational set up, no confusion to passengers occurred except late tap response of R/W device. handy R/W with relatively late tap response was selected on the assumption that the device would be operated by dedicated operators. Therefore, improvement of tap response was necessary for convenience of Rapid Pass Card users by selecting quick response device and updating related software.

Source: JICA Project Team

Photo 7.2-1 Fixed Handy R/W inside the Bus

Based on the above experiences, it can be concluded that reduction of current employees may be minimal even ICT fare collection system is introduced to bus operators. Rather, new employment opportunities could be created by offering trainings to the staff and acquiring PC operation skills at ticket shops and R/W operation skills in buses as observed in HR Transport.

7.3 Introduction of Test Server for Future System Update

Main business partners of CHU were initially assumed as MRT-6, BRT-3 and PTOs in Dhaka City and Clearing House System was developed based on the transactions with these transport operators. However, once Clearing House System had been established and CH Bank (DBBL) was selected, numerous means of Rapid Pass Card use were proposed such as E-money, ATM, ID card, etc. System update is needed if CH System is to accommodate such new services.

It is quite risky to update the system using servers currently operational serving to PTO operation, there might be a risk that serious system failure would happen that may lead to paralysis of PTO operation. If system for additional service would be developed by third party, risk of failure would be higher during migration to the Clearing House System. Therefore, installation of test server that simulate updated system under virtual operational situation prior to migration to CH System is definitely needed. JICA Project Team installed test server in DBBL data center for system update purpose.


Source: JICA Project Team

Photo 7.3-1 Test Server Installed in the Data Center of DBBL

Stress test was implemented assuming increase in the number of transaction data after opening MRT. As mentioned in previous section, there was no major problem and it was confirmed that the CH System was designed and developed that can handle MRT transaction data sufficiently. This system test was contracted out to a company different from the company in charge of system development. As a result, technology transfer to local system company regarding FeliCa specification which is the core technology of Rapid Pass System was achieved up to certain degree. In future, it is expected that development of new functions can be implemented by these local system companies.

7.4 Future Expansion Plan

DBBL and Military Institute of Science and Technology (MIST) have a business alliance regarding issuance of card combining student ID are seeking to issue a card combining Rapid Pass with this student ID/B-Cash card. It is necessary to consider such expansion plans other than transport use for self-reliant and sustainable CH operation.

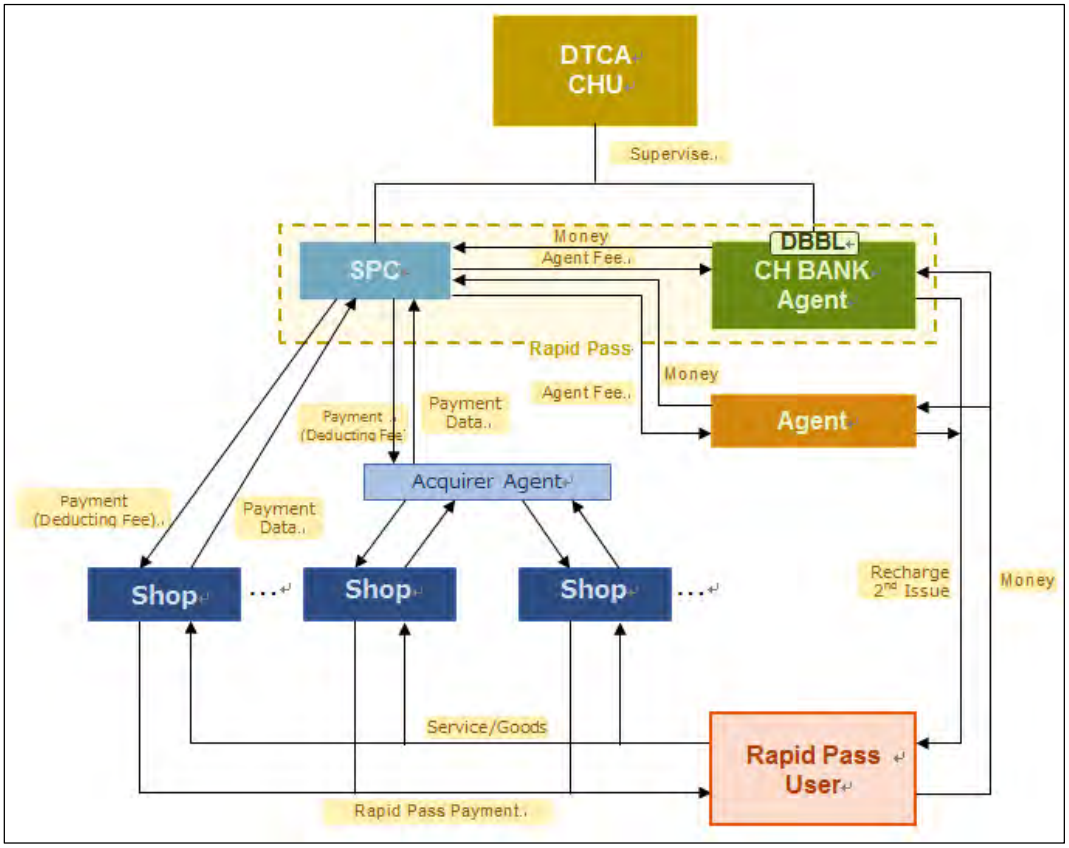
Source: Courtesy of DBBL

Figure 7.4-1 Sample of Student ID

Such expansion plan shall be formulated and implemented in a way that each stakeholder can manage the card use with limited JICA's technical assistance or independently, but private entrepreneurs tend to avoid initial investment burden. Since current CH System does not take into consideration the possible collaboration with other business project, development cost for system that can be migrated into Rapid Pass System becomes high.

Development of Application Program Interface[1] (API), that encrypts FeliCa specification and embedded into software development kit, may be one of the most suitable solutions to curtail development cost. With this API, third party investors can develop their own system compatible to Rapid Pass System without disclosing FeliCa specification with less development cost. Furthermore, SPC can earn profit by providing API to third party developers.

[1] Application Program Interface: By encrypting the technical specification of Rapid Pass and incorporating it into the development kit, it is possible to develop a program development kit that can develop related systems without disclosing technical specifications of Rapid Pass.



Source: JICA Project Team

Figure 7.4-2 Model for Provision Rapid Pass Platform

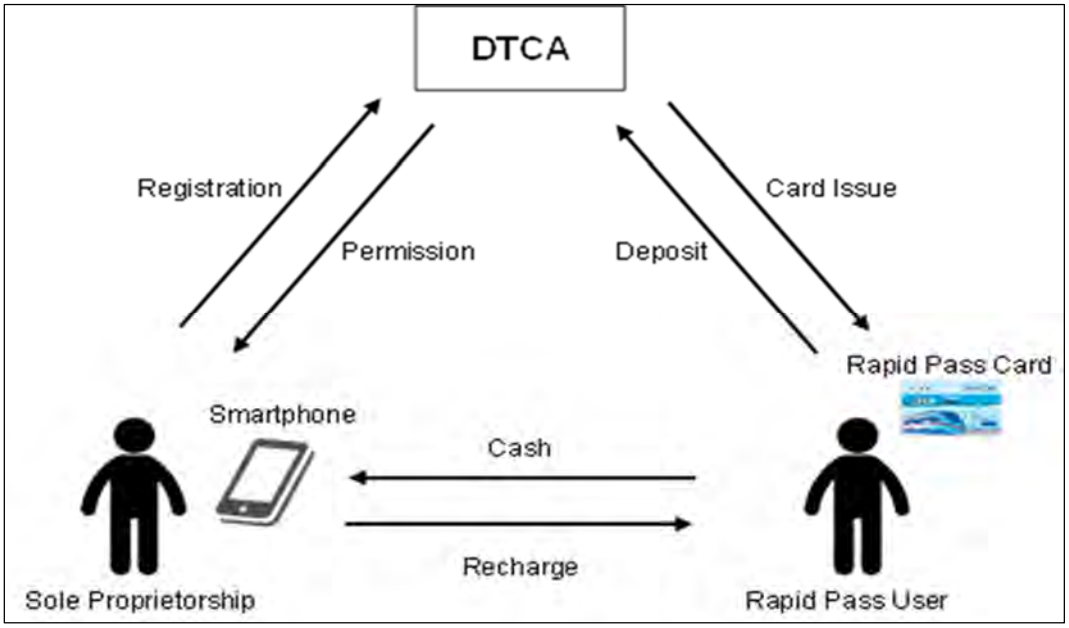
Octopus and Suica began provision of E-money service within three years after commercial operation, and Pasmo started E-money service together with transport service at the same time for the purpose of increasing the number of new card users. Since amount per transaction for E-money tends to be higher than transport fare, profitability of SPC will be improved if E-money service is added. It is preferable to develop E-money system and conduct trial operation at two or three places before the opening of MRT.

7.5 Expansion of Recharge Area

During Pilot Project implementation, operation and maintenance of Ticket Office Machine (TOM) was always the hot issue. Because TOM shall be installed at ticket shops near bus routes where Rapid Pass Card users can access easily. Operation and maintenance of TOM in these ticket shops is difficult and costly because of absence of power supply and lack of security measures. Cost of TOM rent and TOM operator is also another issue. 0.83% of a deposit amount and recharge amount is to be paid to agency, but this amount is not enough to cover necessary cost under present situation with few Rapid Pass Card users, and eventually possible agent becomes only transport operators and DBBL.

If SPC is able to provide an application that can recharge Rapid Pass Card through smartphones, it is possible to recharge using mobile banking or debit card, and there will be no problems even if there are no ticket shops along bus routes. However, in this case, the smartphone needs to have NFC function which is few in Bangladesh.

However, it is possible for a person who have NFC-equipped smartphone to recharge another person's Rapid Pass Card by using his/her NFC-equipped smartphone. So, it is worthwhile to study whether this type of service to be developed together with incentive system for this service.

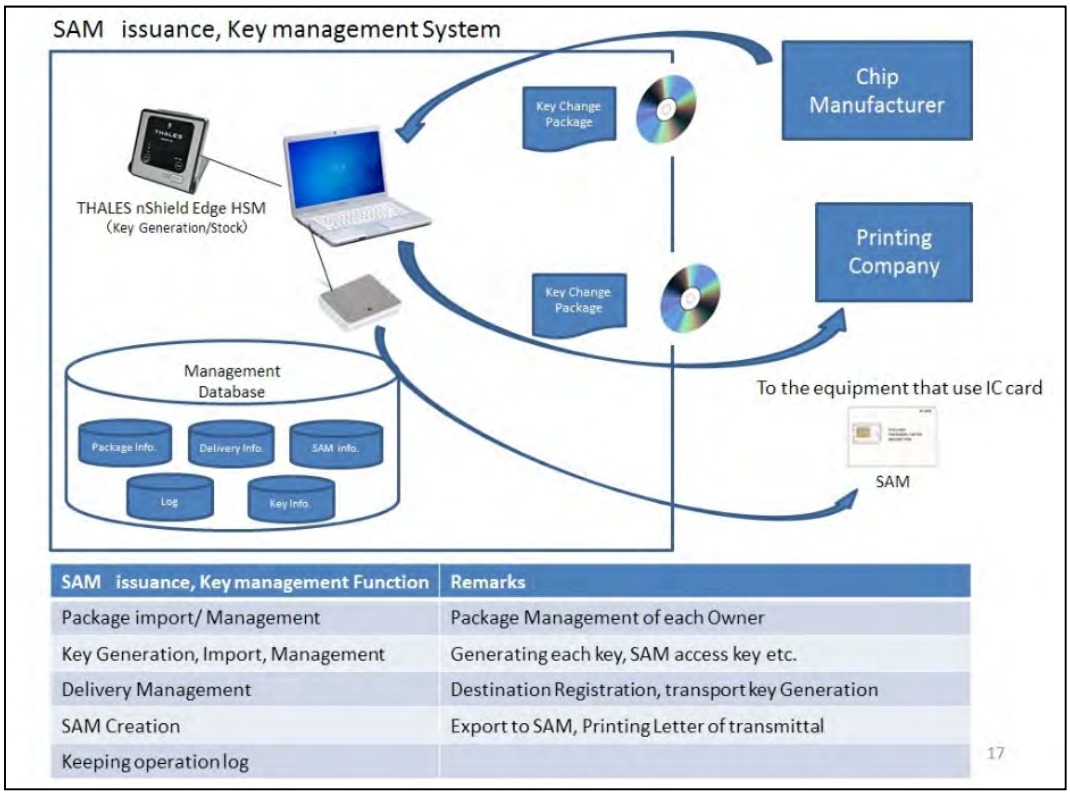


Source: JICA Project Team

Figure 7.5-1 Rapid Pass Card Recharge Using Smartphone

7.6 Management of Security Key

After transferring substantial part of CHU operation to SPC, CHU will mainly manage the security key as the sole Rapid Pass Card issuer. Currently the number of cards issued is small, so even if a security key leaks, cost of collecting and replacing all cards are relatively small, the cost will increase rapidly after MRT operation opening. In future, it is desirable to introduce a dedicated security key management system prior to MRT operation opening.



Source: JICA Project Team

Figure 7.6-1 Card Security Key Management

Chapter 8 Result of Terminal Evaluation

8.1 Objectives of the Terminal Evaluation

The Terminal Evaluation was performed with the following objectives;

1. Review the progress of the Project and evaluate the achievement from the viewpoints of the followings five evaluation criteria,
2. Analyze the factors to promote/impede the effects,
3. Itemize necessary actions to be taken and make recommendation for the Project,
4. Revise the PDM and the Plan of Operation (PO) if necessary, and,
5. Summarize results of the study in a joint evaluation report.

8.2 Method of Terminal Evaluation

The Terminal Evaluation studied a planned schedule and progress of the designated activities for each output based on PDM and PO of the Project up to April 2018. The implementation process of the Project was also examined from various viewpoints including the means of transferring technical skills, communication among the related parties and the monitoring of the project implementation.

The Project was evaluated based on the following five evaluation criteria.

Table 8.2-1 Five Evaluation Criteria

Criteria	Viewpoint
Relevance	Relevance of the Project is reviewed by the validity of the Project Purpose and Overall Goal in connection with the development policy and the needs of Bangladesh.
Effectiveness	Effectiveness is assessed to what extent the Project has achieved its Project Purpose, clarifying the relationship between the Project Purpose and Outputs.
Efficiency	Efficiency of the Project implementation is analyzed with emphasis on the relationship between Outputs and Inputs in terms of timing, quality and quantity.
Impact	Impact of the Project is assessed in terms of positive/negative and intended/unintended changes taken place as a result of the Project.
Sustainability	Sustainability of the Project is assessed in terms of institutional/political, financial and technical aspects by examining the extent to which the achievement of the Project will be sustained after the Project is completed.

Source: Terminal Evaluation Report, JICA, June 2018

8.3 Achievements of the Project

8.3.1 Achievement of Output-A

The achievement of outputs, over the entire Project period is summarized as follows:

Output A: DTCA`s Clearing House strategy is developed

Table 8.3-1 Achievement of Output-A

Activity		Activity Target	Achievement
A.1	Self-reliant management-plan (include operation and outsourcing) is developed	Draw up a business plan of DTCA as CHCI which is to be self-reliant and sustainable.	The activity target is achieved with potential for further rationalization of new and emerging transport modes
A.2	Business plan (include fare, service charge and deposit) is developed	Establish a business model for business plan above. The following factors are to be considered: i) Fare Structure, ii) Clearing House Fees, iii) Deposit and Issuance of common IC card, and iv) function and service to be provided by CHCI.	The activity target is achieved with potential for further rationalization of new and emerging transport modes
A.3	Basic framework for operators and contractors (MOU, etc.) is formulated	A clear presentation of a framework for potential public transport operators (PTOs) to join and accept ICT Fare System. Procedures to do so are to be proposed	Achieved
A.4	PR strategy is developed and implemented	Making public relation strategy and support DTCA for its execution.	Moderately achieved
A.5	Long term expansion plan (include BRT, MRT, etc.) is developed	A long-term road map is to be established to achieve “one card for all transport” which includes BRT operation, MRT operation and operations of potential PTOs.	Achieved
A.6	Additional transport service (monthly pass, discount ticket, online recharge) is considered	Study value added services in transport field such as Monthly Pass, various discounts, online (auto) recharge etc.	Achieved
A.7	Data analysis strategy for future transport plan is developed	Develop a strategy for analyzing transport data accumulated in ICT Fare System for utilization of future traffic plans	Partially achieved
A.8	Future expansion idea (apply to other sectors such as e-Money, mobile phone) is considered	Study value added services other than in transport field, such as e-money, IC chip on mobile phones, and other applications in other sectors.	Partially achieved

Source: Terminal Evaluation Report, JICA, June 2018

Table 8.3-2 Indicators Progress for Output-A

Indicator		Progress
A.1	Long and short-term business management plan is prepared	Moderate.
A.2	Framework/guideline for operations is prepared	Achievement of the indicator targets is high with potential for institutionalization/mainstreaming
A.3	Additional transport services (monthly pass, discount ticket, online recharge) are started	Moderate
A.4	Awareness/PR activities are appropriately concluded	Moderate.

Source: Terminal Evaluation Report, JICA, June 2018

8.3.2 Achievement of Output-B

Output B: Integrated Clearing House is established

Table 8.3-3 Achievement of Output-B

Activity		Activity Target	Achievement
B.1	Rules and regulations of Clearing House is prepared	Case study for Hong Kong Octopus Card is to be made for design rules and system of CHCI	Achieved
B.2	regulation of technical specification (AFC) is decided	Compiling technical specification of AFC for BRT and coordinate with stakeholders of DBRT, such as ADB	Partially achieved
B.3	Relations to rules and regulations of MRT are clarified	Study laws and regulations relevant to CHCI, relationship between PTOs, especially new models of transport, such as BRT, MRT, etc.	Partially achieved
B.4	IT system structure (server, security, backup, etc.) is designed and specifications are developed	Design configuration of IT system and compiling technical specification of IT equipment. Support JICA to procure such equipment.	Achieved
B.5	Clearing House IT system (software, hardware) is developed	Development ICT fare system including software development and its installation onto hardware. Carry out commissioning and trail operations from one year.	Achieved
B.6	Relationship with agent bank (money transaction, interest rate, etc.) is reconsidered	Review of policy for a selection of bank as 'clearing house agent bank' (money flow interest on recharge amount, bank transfer fee, etc.).	Achieved
B.7	Card issuance management (security key installation, etc.) is considered	Prepare procedures for card issue management including IC card procurement, card key management, printing onto blank card surface	Partially achieved
B.8	IC card design strategy is prepared	Review a policy of IC card design and naming etc.	Partially achieved

Source: Terminal Evaluation Report, JICA, June 2018

Table 8.3-4 Indicators Progress for Output-B

Indicators		Progress
B.1	Rules and Regulations of Clearing House become apparent	Moderate
B.2	Clearing House's IT system is developed	High
B.3	Operation flow is developed	High

Source: Terminal Evaluation Report, JICA, June 2018

8.3.3 Achievement of Output-C

Output C: Existing operations of ICT Fare collection are improved

Table 8.3-5 Achievement of Output-C

Activity		Activity Target	Achievement
C.1	Analysis for existing services (effect, challenges)	Study existing ICT fare collection system for BRTC and analyze its effect and issues to be solved	Achieved
C.2	Support for transport operators (equipment, value added service, business model)	Support PTO who already introduced ICT fare system in respect of equipment, value added services, business model, etc.	Achieved
C.3	Incentive strategy for operating company staff is developed	Study and make recommendation for an incentive scheme to PTO who introduces ICT fare system	Partially achieved
C.4	Resettlement strategy for affected staff is developed	Study and make recommendation for a kind of compensation scheme to PTO staff who will be affected by an introduction of ICT fare system	Partially achieved
C.5	IC card procurement procedure of clearing house is prepared	Establish procedures for procurement of IC cards and support DTCA counterparts to apply budget and subsequent process until delivery of IC card	Achieved
C.6	Collaboration with concerned parties (esp. BRT, MRT) is strengthened	Keep a tight relationship with stakeholders, such as Dhaka BRT and DMTCL (MRT)	Achieved
C.7	Operation manuals are prepared	Compile and test operation manual of ICT fare system	Achieved
C.8	Appropriate trainings are conducted	Conduct training in respect of ICT Fare System (once in Japan, once in third country)	Achieved

Source: Terminal Evaluation Report, JICA, June 2018

Table 8.3-6 Indicators Progress for Output-C

Indicators		Progress
C.1	No. of IC card and handy R/W are increased	Moderate
C.2	IC card procurement process is settled	High
C.3	Operational manuals are prepared	High
C.4	DTCA and operator staff's trainings are conducted sufficiently	High
C.5	Passengers satisfaction is ensured	Moderate

Source: Terminal Evaluation Report, JICA, June 2018

8.3.4 Achievement of Output-D

Output D: Capacity of GOB counterpart personnel developed to run and maintain Clearing House effectively after completion of project

This output was not planned in the PDM (version 0.7 and revised version 2.0) but included in the TPP. Activity targets were set out in the TPP but no indicators were established for this output. Therefore, the monthly and periodic progress reports did not report the progress of the outputs accordingly.

Table 8.3-7 Achievement of Output-D

Activity		Activity Target	Achievement
D.1	Train GOB counterpart technical personnel adequately	Training for GoB Person	The activity target is Low
D.2	Train management related personnel adequately on different aspects running and maintaining Clearing House	Training for management related personnel	Adequate number of in-house and hands on training was provided to the outsourced CHU staff.

Source: Terminal Evaluation Report, JICA, June 2018

8.4 Achieving the Project Purpose

The purpose of the project is to develop a 'self-reliant, strategically stable Clearing House with improved ICT Fare Collection capacity'.

The project has studied the issues and complexities with the earlier IC card system introduced during 2012 named SPASS. Using the learning, the IT system infrastructure, software's, networks, servers, necessary equipment, and IC card were developed. But the human resource for the Clearing House is approved only recently. The recruitment of the approved positions will happen only after the project ends. The income from the services provided by the Clearing House is now insignificant as the card usage is still fairly limited due to small number of PTO and agent operators. As per the business plan prepared by the project, the CHU will be financially self-reliant only after 2027 when the daily passenger/day will be 63,034 for MRT out of which at least 30% will use the IC card; 568,800 for BRT out of which at least 25% (140,759) will use the IC card.

Concerning the appropriate institutional home for the Clearing House, DTCA has decided to go for a SPC as the CH will perform commercial activities. This will take considerable time and must be in place before the opening of MRT and BRT. The composition, functions, and action plan to establish the SPC are yet to be developed.

On the other hand, collaboration with MRT has progressed (PTO agreement signed, IC cards procured) but the engagement with BRT remained at its initial stage. This needs to be further strengthened by DTCA beyond the existing project support. Also expanding the PTO network with additional private bus companies prior to the opening of MRT and BRT will provide further opportunities to test the capacity of the CHU to manage large volume of card usage. Also, additional services (commuter pass, day ticket, vending machines, online recharge, discounts, etc.) with the Rapid Pass are yet to be introduced by the PTOs.

Therefore, although the project has made significant success in the areas of establishing IT infrastructure for CH, developing technical and operational guidelines and manuals for AFC operation, mobilized several PTOs and agents for pilot, the project has left several loose ends which DTCA has to tighten after the project ends in June 2018, and until another support project is operational. Therefore, the project purpose was Moderately achieved.

8.5 Fulfilling the Overall Goal

The project goal is to 'establish an effective and efficient transport system with variety of transport modes in Dhaka Metropolitan Area through ICT Fare system to facilitate transport in Dhaka'.

The ICT fare system is developed by the project through a pilot Rapid pass card phase which was further tested in a controlled environment for MRT and BRT. Several other PTO`s have already used this system. The users of Rapid pass are progressing gradually and will continue to rise as more communication is done. A comprehensive set of guidelines, manuals and standard operating procedures are developed for the establishment and operations of CHU. Broad frameworks are already in place towards a self-reliant Clearing House.

The project has established PTO and Agent agreements with three bus transport operators. Collaboration with MRT has progressed from MOU to a PTO agreement. Engagement with BRT has fallen short after several attempts. Several meetings with BIWTC was not enough for them to join with the CHU-AFC, which seemed to be a distant possibility now. BR did not get adequate momentum to be persuaded for inclusion in the AFC system. Several meetings took place with several key stakeholders such as the road and bridges toll plaza leasing companies for the introduction of Rapid Pass system but did not see any light by this stage of project operation.

It is to be noted that attaining the overall goal is often beyond the project control. Several uncertainties contributed to the project failure. That includes, delayed schedule of MRT and BRT for operation beyond project life. Therefore, the contribution towards achieving the overall goal was Moderate.

8.6 Review Based on Five Evaluation Criteria

The evaluation based on five evaluation criteria is presented below:

Table 8.6-1 Review Based on Five Evaluation Criteria

Criteria	Evaluation Result
Relevance	The relevance of the project is **very high** because of the following reasons. 1. Consistency with the Bangladesh Government policy 2. Consistency with needs of the country and beneficiaries 3. Consistency with ODA policy of Japanese Government
Effectiveness	The evaluation considers that effectiveness of the project is **fair**, based on the current state of the achievement of the project purpose.
Efficiency	The degree of efficiency of the project is assumed to be **fair**, judging from the performances of appropriateness of inputs and achievement of outputs.
Impact	It is difficult to judge whether the overall goal of the project will be achieved in 3 to 5 years after the completion of the project. The evaluation also found that implementation of the project has some positive impacts as below. No negative impacts have been observed. 1. Establishment of CHU in DTCA 2. Expansion plan for CHU operation
Sustainability	The sustainability of the project will be **generally high**, although there are some uncertain factors in policy and institutional factors.

Source: Terminal Evaluation Report, JICA, June 2018

8.7 Conclusion

As conclusion, the project is evaluated to be 'on track, but yet to be successful'. Some outcomes are insufficient mainly because of the uncontrollable delay in TAPP approval, terrorist attack during July 2016, and recruitment and procurement process of CHU staff and equipment. The project purpose is not fully secured at present and there are strong needs to fulfil the unmet outcomes for achieving the project purpose.

The project has been planned and conducted based on the strong relationship between JICA and the RTHD following series of cooperation since early 90s. The good mutual relationship and deep conviction of JICA team members for Clearing House capacity development in Bangladesh are the important foundation of the project.

Based on the strong cooperation and relationship between Japanese team and DTCA, the capacity of fundamental knowledge and skills of DTCA-CHU staff to implement the Clearing House project have been developed. However, despite the efforts to compensate the gap, some of the expected outcomes have not been observed fully yet. The knowledge and skills should be strengthened not only by the training, but also by the repeated experience through OJT. In this regard, OJT for the newly approved positions is yet to be executed. The necessity of planning and management skills is another important factor to achieve the project purpose and overall goal.

The result of Pilot project stress test report and the fact that CHU staff was able to operate Clearing House by short training using various guidelines, manuals and standard operating procedures reveal the main outputs of this project "Rapid Pass System" can be tolerant for prompt introduction of MRT / BRT after their operation commencement.

8.8 Recommendation

The following recommendation was coming up from the evaluation report.

1. Follow-up project for DTCA-CHU
2. The project needs to continue to utilize local resources in system development part
3. Pilot Project selection should be careful before commencement
4. Interim arrangement for CHU-DTCA from their own budget
5. Establishment of a Special Purpose Company for CHU
6. Close collaboration between and among CHU, MRT and BRT

Chapter 9 Recommendations to Achieve Overall Goal

Overall goal and its indicator of the Project are as follows;

Overall Goal:
Effective and efficient public transport system with variety of transport modes in Dhaka Metropolitan Area will be established through ICT Fare System in order to facilitate transport in Dhaka

<Indicator>
ICT fare system is introduced to all major transport modes such as BRT and MRT.

The procurement of contractors and construction supervision of MRT Line-6 commenced in June 2016 with the financial assistance of JICA, while tendering and construction of BRT Line-3 commenced in July 2016 with an ADB loan. The introduction of the Rapid Pass System on both MRT and BRT is crucial for the sustainability of CHU. AFC machines will be installed at each station of the MRT Line-6 and BRT Line-3, where 0.8 to 0.9 million passengers are expected to use every day. These passengers will be the main source of income for the Clearing House business.

However, partial operation of MRT Line-6 is scheduled to start at the end of 2019 while the opening of BRT Line-3 is expected to be postponed for two years due to delays in construction. Therefore, negotiations with DMTCL and DBRT for the introduction of the Rapid Pass System are still at an initial stage because no detailed operation plan for MRT and BRT has been established yet and a mutual agreement has not been finalized.

On the other hand, the Rapid Pass System has been introduced, not only to public bus operators, but also to private bus operators. Moreover, DTCA commenced negotiations for the introduction of the Rapid Pass System to water bus transport and planning for the introduction of toll gate services is under progress. Compared to MRT and BRT, the CHU fee from these operators is not a large amount. However, in order to establish an effective and efficient public transport system, the introduction to these PTOs is also necessary because the MRT and BRT cannot cover all transport demands in Dhaka, additionally the use of E-money by other transport operators will contribute to the introduction of the Rapid Pass System to MRT and BRT.

Through the implementation of Pilot Project, the JICA Project Team faced the following difficulties:

1. DTCA staff showed keen interest in technical aspect of CH operation but showed little interest in the managerial aspect including business-oriented activities. This imbalanced attitude from the CH staff may hamper sustainable operation of Clearing House.

2. Transport passengers in Dhaka are not used to cashless transactions when they use buses and they still largely rely on cash transactions. This cash-oriented habit may deter expansion of the Rapid Pass System as symbolically observed during a discount campaign conducted by the JICA Project Team where only 250 Rapid Pass Cards were issued against the expected number of 1,000 even when card deposit amount was discounted by 30BDT during the promotion campaign.

3. Management of transport operators is not serious about the elimination of toll collection leakage, hence, the necessity of an ICT fare collection system that can prevent leakage is not fully recognized. Furthermore, cost reduction by the introduction of the ICT fare collection system is limited because paper ticket sales are not being totally replaced by ICT fare collection. Co-existence of the two types of fare collection system rather entails an increase in operation cost.

As discussed above, there are several uncertainties for attaining the overall goal. The following sections present recommendations for attaining the overall goal taking into account the issues mentioned above.

9.1 Collaboration with Private Sector

JICA Project Team made a proposal to DTCA for the establishment of SPC in March 2018. The establishment of SPC was proposed for the efficient operation and future expansion of the Clearing House business. The main point of discussion was collaboration with the private sector.

Although establishment of the Clearing House Unit was formally approved by the government, participation of the business-oriented private sector for the operation of CH may be imperative for expansion of the Rapid Pass System to different transport operators with continuous technological updates/upgrades and a flexible operation.

Currently, DBBL is the only private firm who has joined the Rapid Pass System as Clearing House Bank. The primary concern of the SPC establishment plan is to formulate a strong cooperative relationship with private enterprises that can participate in the CH operation with a long-term perspective. With the cooperative effort of the business-oriented private sector and coordinating the capacity of the public sector, a self-reliant and sustainable operation of CH shall be attained and the overall goals of “effective and efficient public transport system” shall also be achieved. Candidate for private enterprises may be banks, major public transport operators and IT development and service companies. But considering the uniqueness of IC card technology that is not available now in Bangladesh, participation of private firms in Japan or the U.K. that have abundant technical know-how may be needed.

One of the most important factors for the cooperation with the private sector is the formulation of a strategy on wining customers’ loyalty or enclosing customers to a particular IC card. In Japan, transportation-related IC cards were often introduced not only for the convenience of users but also for the purpose of customer enclosure. Each company introduced its own IC card to enclose customers and, as a result, numerous types of IC cards were issued by different transport operators. This co-existence of various types of cards in the market eventually deprived convenience from the card users and transport operators were forced to spend huge amounts of investment for the development of a system that could handle different types of cards for shared use. Based on this lesson in Japan, Prime Minister Sheikh Hasina declared that the Rapid Pass Card should be used by all transport operators in Bangladesh. It is important to keep this policy to avoid unnecessary investment in the future.

However, at the initial stage of the Rapid Pass Card introduction, customer enclosure has a high market appeal and worth to consider. Additional services in collaboration with transportation IC cards is common in other countries. Transportation IC cards alongside credit card services and E-money point cards for retail stores are typical examples of additional services. These additional services are one type of customer enclosure. Even with SPC, such additional services may lure more card users and lead to the increase in the number of issued cards and card usage, which may be desirable from the viewpoint of the financial stability of SPC.

As a matter of fact, MIST and DBBL proposed for a collaboration between the IC card service and their own services. This may indicate that there may be several businesses that are interested in offering such type of services. However, as for the SPC, where the human resources are not abundant, it takes time to examine and respond to all these requests and demands, which in turn will have an adverse effect on the expansion of the Rapid Pass. It is beneficial for SPC that the Rapid Pass System is provided as a platform to such business operators and that each business enterprise can generate its own development from the perspective of a private partnership. For that purpose, it is necessary not only to develop the platform but also to study the business model of the platform provision service by considering cost and profit sharing between SPC and Clearing House Bank.

9.2 IC Card Use in or near MRT/BRT Stations

Most of Dhaka City residents still largely rely on cash transactions for settlement purposes, and even with the opening of MRT / BRT passengers may tend to purchase tickets for every single journey, resulting in Rapid Pass Card usage rates not increasing as expected. To discourage use of single journey tickets and encourage the use of the Rapid Pass Card, introduction of a deposit system may be a useful option, deposit is collected upon issuing a single journey ticket and refunded upon arriving at the destination station. However, such deposit system may discourage passengers to ride MRT/BRT and may not be a wise option.

On the other hand, large volumes of single journey tickets will increase transactions cost, therefore it is not a preferable option for transport operators. Hence, the use of Rapid Pass Card by MRT / BRT passengers must be promoted by providing services such as lockers and vending machines that can be paid by using a Rapid Pass Card.

Since MRT / BRT provide transport service for relatively long distance trips, provision of feeder transport service such as bus and taxi is essential. In this case, passengers of MRT / BRT will be transferred to the bus, but at that time, the purchase of drinks, snacks and other daily necessities is a common phenomenon also seen in other countries. If these passengers can pay these necessities by using Rapid Pass Card, it will contribute to the improvement of convenience.

JR East and Octopus Card started E-money service in retailing shops in train stations three years after the commencement of commercial operations. It is desirable for Rapid Pass Card to start E-money service by January 2021 three years after declaration of Prime Minister Hasina in January 2018. If the launch of the E-money service delays beyond January 2021, a negative impression will be engraved in passengers' minds and incentive of Rapid Pass Card use will be discouraged.

Passengers' OD data will be provided to transport operators by CHU, but other customer data such as purchase records with the E-money service will not be provided to transport operators to secure passengers' privacy. However, the use of this data for statistical analysis may be useful to grasp passenger flow per hour at station gates. This information can be displayed or announced to passengers in order to disperse peak hour congestion.

9.3 Increase in Rapid Pass Card Users' Convenience

It is frequently observed in other countries that when the balance of money in the prepaid card is not enough to pay, the card user is forced to pay in cash since recharge shop is not near to the card user. To avoid such inconvenience in Dhaka, IC card recharge shops must be located near the IC card user. If passengers want to use IC card at an MRT/BRT station, a recharge shop must also be located in the same station and this arrangement may be possible. However, installation of recharge shops along the city bus routes may be difficult. Most of the conventional ticket shops along city bus route are improvised ticket shops without electricity supply and communication network, sometimes even without a roof and walls. Additionally, wages of ticket shop operators are relatively low.

On the other hand, ticket shops for Rapid Pass system need electricity supply and communication connection, as well as, ticket shop operators who can operate computers, which also deserve higher wages. Ticket office agents have to pay a monthly lease fee of TOM to DTCA based on an agent agreement. Considering the current situation of ticket shop operations by such bus operators, it is practically impossible to set up Rapid Pass ticket shops at all the ticket shops of the bus routes. Location of the Rapid Pass ticket shops is limited to ticket shops where a large number of passengers will visit. This limited location of Rapid Pass ticket shops will be one of the impediments in expansion of Rapid Pass Card usage.

According to "The Project on the Revision and Updating of the Strategic Transport Plan for

Dhaka, November 2016" by JICA, even with the complete operation of the proposed MRT and BRT a 47% of bus transport demand is estimated to remain. Therefore, efforts to improve the bus operation system must be continued to be sought. Transparency of the fare collection system in the bus operation is one of the challenges to solve. Key to the expansion of the Rapid Pass Card in bus operation is to show tangible improvement on bus operation by reducing the initial introduction cost and maintenance costs.

The most effective way to reduce installation and maintenance costs of ticket shops is with the provision of an auto-recharge service by banking institutions, transport operators or the CHU. CHU has not enough financial resources to offer auto-recharge services. Credit card service is needed if a banking institution such as CH Bank (DBBL) offers auto-recharge service but the use of credit cards in Bangladesh is still limited. Additionally, it is not foreseeable that transport operators will take the risk of auto-recharge services as of now. However, as observed in other countries, the provision of an auto-recharge service will soon be a common service considering the rapid economic growth of the country. For future use of an auto-recharge service, the Rapid Pass Card shall be formatted to accommodate auto-recharge service with a system update for instant credit control.

In addition to the above auto-recharge service, recharge service using PC or smart phones may be another attractive service. To provide this service, system development for SAM control is needed and a smart phone equipped with a FeliCa chip or handy R/W for home-use shall be available in the market. Smart phone with NFC chip (not FeliCa) is now available in Bangladesh market and hopefully FeliCa chip smart phones may be available in the near future.

Above services are attractive to users if they are economically viable. Economic viability may be dependent on maturity of the market for a related equipment and banking services. The most economically and technically viable services will be selected in accordance with the economic growth of the country and the corresponding maturity of the market.

9.4 Introduction of Model Bus

Current bus operators in Dhaka tend to prefer to keep the current bus operation system rather than introducing a new system or technology because they lean towards eliminating uncertainties that may affect the current income level or profit. The introduction of the Rapid Pass System is not attractive to most bus operators because they cannot draw a clear image of the Rapid Pass operation and its positive impacts, and they are rather anxious for an unforeseeable effect.

One effective way to eliminate this anxiety regarding the Rapid Pass System is to show them good practices or presenting them a good example by introducing the operation model by DTCA. The model bus with Rapid Pass equipment accepts only Rapid Pass users and the objective is to show bus operators and their passengers how efficient, convenient and comfortable the system can be for both bus operators and passengers.