Technical Assistance Consultant's Report

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Thailand: Integrated Ticketing Terms of Reference
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1. Introduction

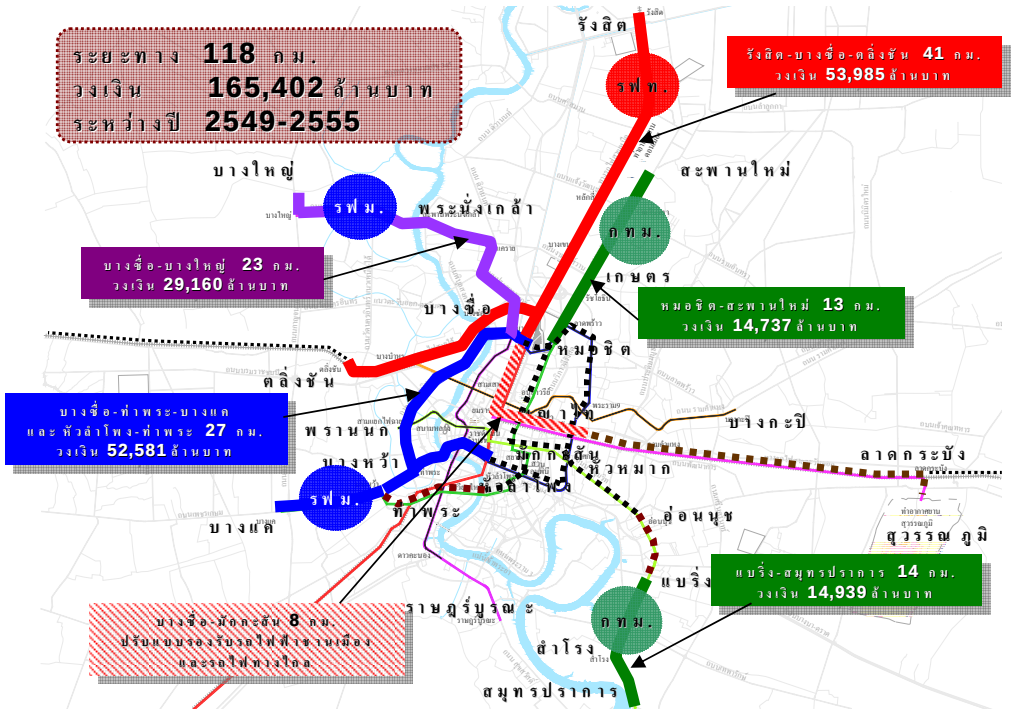
1.1 Background

At the end of 2006, The Royal Thai Government approved a new plan for the proposed five priority line mass rapid transit (MRT) system for the Bangkok Metropolitan Region with a total length of 118 km and an estimated total investment of around US$4.5 billion. This was a revision of the previous MRT 10 line MRT plan proposed by the previous government during 2005.

All of the projects in the 2006 plan are intended to proceed in parallel and be implemented by 2012 or thereafter and consist of the MRT lines shown in Figure 1.1. Figure 1.1 also shows a proposed additional 8km connection between the airport line (under construction) and the northern red line (Bang Su to Hua Mark).

The completion of priority MRT lines quickly and in a coordinated way can serve to provide valuable support to the road system through providing a "relief valve" for congestion thus better integrating Bangkok and supporting the economy.

Figure 1.1: Rail Mass Rapid Transit Network Approved in November 2006



Source: OTP 2006

1.2 Technical Assistance

Until recently undue emphasis has been focused on MRT infrastructure at the expense of MRT services, the way passengers would use them, and how they would access stations. Recognizing the important developmental benefits of well implemented and integrated MRT, ADB undertook technical assistance TA 4676-THA from late 2005 through to mid 2006 (refer to ADB 2006a and 2006b).

The new Government established an MRT committee in late 2006 to oversee implementation of the MRT lines (the civil works) and to confirm the form of MRT operating concessions and how they would be financed. Under this committee, a sub-committee focusing on Finance and Operations of MRT lines was also established to integrate and standardize the approaches of the three[1] responsible government agencies to concessioning MRT and to integrated ticketing.

Subsequently, the current Technical Assistance (TA 4904: THA for Infrastructure Investment Advisory Assistance – Phase II) by the Asian Development Bank was established to continue to support Government efforts to identify and resolve challenges to successful delivery and integration of the new rail MRT and associated wider public transport system.

The TA provides analytical and advisory support to Public Debt Management Office (PDMO) of Ministry of Finance (MoF) and The Office of Transport and Traffic Policy and Planning (OTP) in applying specific techniques and procedures to structure private concessions for the operations and maintenance of new rail lines, and to integrate the rail MRT network through the introduction of a single ticketing system (refer to ADB 2007a and ADB 2007b).

1.3 This Terms of Reference

This Terms of Reference is focused on the implementation of integrated ticketing in Bangkok. It describes the activities that must be considered for that implementation to be successful.

The development and implementation of an integrated ticketing system for any city is much more complex than the simple procurement of ticketing technology. Integrated ticketing and particularly integrated fares are social objectives whose design will utilize technologies which will, in turn be implemented through an institutional framework.

[1] Mass Rapid Transit Authority of Thailand (MRTA); State Railways of Thailand (SRT) and Bangkok Metropolitan Administration (BMA).

Thus this Terms of Reference represents a 'road map' of those issues which will need to be resolved in order to implement integrated ticketing in Bangkok. These issues will include:

- development of an integrated ticketing policy;
- development of a procurement process for an appropriate solution;
- adoption of an interoperability standard;
- consideration of financing requirements and the development of a funding strategy;
- development of a system management model;
- consideration of possible future non-transit applications; and
- the institutional considerations arising from the above.

2. Integrated Ticketing Policy

An integrated ticketing policy relevant to MRT in Bangkok will need to be developed and documented. The considerations discussed below will need to be verified and developed further in the Bangkok context

2.1 Social Objectives

The implementation of integrated ticketing in any city is a largely social objective that will provide greater utility for MRT customers through:

- using one smartcard to access any MRT concession for their travel purposes; and
- minimizing the need for MRT customers to require small change to purchase a fare.

Integrated ticketing also provides advantages to government, in that the customer benefits above can be provided by an MRT network that has been delivered in a financially efficient manner based on the development of a number of independent MRT concessions.

The economy will also benefit from increased MRT usage and the resultant decrease in road traffic.

2.2 Financial Objectives

The implementation of integrated ticketing will also have a number of financial aspects, ranging from the cost of the integrated ticketing itself (both in terms of capital and operating costs) through revenues forgone from the introduction of integrated fares, to increased revenues due to increased MRT patronage.

It will be imperative for a range of appropriate financial objectives to be documented to provide guidance to policy development.

2.3 Integrated Ticketing

The concept of integrated ticketing would allow a single smartcard to provide access to use any Bangkok MRT concession.

Thus, from an MRT customer's perspective, no knowledge of the particular MRT concession is required – the smartcard is simply presented to the fare gates (or other similar devices) and entry and exit to the system is facilitated.

From a technical perspective however, to achieve this requires consideration of:

- fare products;
- fare formulation; and

- other detailed business rules.

2.4 Integrated Fares

Integrated fares can be implemented in which an MRT customer traveling from A to C via B using two concessions is charged a single fare for the journey (as distinct from the alternative of charging two fares – A to B + B to C).

Thus, an integrated fares methodology is one which reduces the financial interchange penalty often experienced in multi-operator (or –concession) journeys.

In the case of the government's desire provide a single MRT system, but as separate concessions, integrated fares would be required. In this way equity would be provided for MRT customers who could be forced to interchange by the outcome of customer's travel need and the physical aspects of the MRT network.

2.5 Fare Formulation

Once the integrated fare question is resolved, it will then be necessary to consider the preferred fare calculation formulation.

The range of formulations available is broadly discussed in ADB 2007a (Appendix C). However the parameters involved can be typically distilled to:

- distance-based vs. zonal-based (currently BTS and BMCL fares are distance-based);
- time-based fares (eg. off-peak vs. peak fares); and
- discount categories (eg. children, elderly, monks, etc).

The setting of fare levels themselves will require the development of an econometric model with the ability to predict the fare revenues expected from a number of scenarios – typically seeking a revenue neutral outcome. This is particularly important during consideration of the financial impacts of integrated fares (ie. forgoing the 2nd and subsequent flag-fall/boarding charge).

2.6 Integrated Products

The implementation of integrated ticketing will also require the adoption of common fare products. Fare products used within a smartcard system are either:

- stored value – where value stored on the smartcard is used to purchase a fare; or

- period pass – where a period pass (weekly, monthly, 30 days, etc) is purchased and its expiry date (and other relevant information) encoded on the smartcard which is validated upon presentation to a reader; or

- stored rides – where a number of rides of a particular nature (eg. 5 stations) are pre-purchased and encoded on the smartcard (eg. 10-trip, 30-trip), with the number of rides being decremented when presented to a reader.

There is a developing trend globally to rationalize fare products toward a stored value with some form of discount – typically based upon usage – to replicate the discounts often provided with the other product types.

Itinerant MRT customers (eg. tourists) and those customers who do not wish to use a smartcard will also require consideration. This generally requires the definition of a 'cash fare' product to accommodate these customer needs (currently BTS use magnetic stripe cards and BMCL uses recycleable tokens for these purposes).

2.7 Common Brand

Integrated ticketing may also imply a common brand – such as the case in Hong Kong, Singapore and London.

This suggests that aspects of an MRT concession's ability to establish its brand through use of a ticketing system (particularly the smartcard) will not to available. This is currently not the case with the BTS and BMCL concessions.

2.8 Business Rules

Detailed business rules will need to be developed based upon the decisions on:

- integrated fares;

- fare formulation; and

- common products.

These business rules will, in part cover aspects of system functionality, such as:

- refunds;

- transfer eligibility;

- product eligibility;

- fare discounts.

The business rules will also cover other business-related aspects of the system, such as:

- smartcard distribution;
- smartcard value reload.

2.9 Revenue Management

Similarly, a framework for revenue management will need to be developed, defining the accounting methods and processes to be applied the revenue streams. Of particular importance will be the management and treatment of the stored value float for the scheme.

With all fare revenues being remitted to a ticketing system agency (assuming gross cost concessions for future MRT lines), appropriate revenue reconciliation and settlement processes will be required, as well as reporting – both internal to the agency as well as to its 'contributing' operator concessions.

2.10 Regulatory Requirements

To implement integrated ticketing in Bangkok, an appropriate regulatory framework will need to be established to allow for the management of fares within the MRT system. This framework will need to cover the initial setting of fare levels (along with many of the parameters discussed above) as well as its ongoing adjustment.

Appropriate regulatory support will also be required for revenue protection activities (either undertaken directly by the agency or contracted on its behalf) – ie. interception and inspection of MRT customers' tickets and smartcards.

3. Procurement Process

A robust and transparent process should be developed for the procurement of the integrated ticketing solution for Bangkok.

The procurement process will need to cover:

- a program of activities;
- an tender evaluation process; and
- an appropriate probity framework.

3.1 Procurement Activities

The procurement activities will include as a minimum:

- the development of a solution concept – combining both system and operational services requirements;
- the development of Request for Tender (RFT) documentation based upon the concept, comprising as a minimum:
    - technical requirements;
    - implementation requirements;
    - operational services requirements; and
    - a draft contract.;
- the evaluation of the tenders received against a range of pre-defined and agreed evaluation criteria covering the scope of the required solution;
- the nomination of a preferred contractor and the subsequent negotiation of a suitable contract which would cover both the design/build of the system and on-going provision of operational services;
- the appointment of the solution contractor; and
- the administration of the resulting contract – essentially the management of the contractor in the design, development and implementation aspects of the project.

3.2 Tender Evaluation

The tender evaluation process will be based upon the RFT and will require the pre-determination of appropriate evaluation criteria.

It is also common practice to undertake the assessment within distinct streams of interest, as a minimum:

- technical criteria evaluation; and
- commercial criteria evaluation.

3.3 Probity Framework

An appropriate probity framework should be established to provide certainty to prospective tenderers that the tender processes and subsequent evaluation processes will be undertaken in a demonstrably equitable manner.

3.4 Procurement Program

Given that the new MRT lines are proposed to be commissioned during the 7 year period 2008-2014, an integrated ticketing system procurement program will need to be developed which compliments and supports these timeframes.

For example, as it is likely that the new integrated ticketing solution will be rolled out on a line-by-line basis, it may be appropriate to use the first line implementation (either the proposed Green Line – Thaksin Bridge extension or the Green Line south-eastern and/or northern extensions) to design and prove the generic system – inclusive of devices and the central system. Having provided the 'back end' systems, the 'front-end' systems would then be implemented on each new line as they are being finalized prior to commissioning.

This may suggest a contract payment structure that recognizes the design, development and implementation of the back-end systems as well as 'front-end' equipment in sufficient quantities for the first line. Subsequent contract payments could be against agreed contract unit rates – particularly as final equipment quantities may not be known until the later lines are nearing completion.

Operational services could be provided in a similar manner – with core services commencing to support the commissioning of the first line with agreed 'ramp ups' to the periodic payments based upon the scale and commissioning dates of subsequent lines.

4. Interoperability Standard

4.1 Objectives

The implementation of an appropriate open interoperability standard will allow some management of the risks associated with vendor lock-in resulting from the implementation of a new single system for Bangkok MRT.

The background to and use of these open standards is discussed in some detail in ADB 2007a and ADB 2007b.

In summary, within the context of a proposed new single system to be deployed across all future MRT lines, the implementation of an open standard will also underpin the pursuit of non-transit applications (refer to Section 6).

The adoption of an open standard may also provide part of the solution to the existing legacy BTS/BMCL issues regarding the apparent smartcard system incompatibilities.

4.2 Candidates

The likely candidates will include:

- RIS;
- ITSO;
- Calypso/IOPTA; or
- CEPAS.

TCRP 115 (2006) provides some discussion on the merits of some of the above, albeit from a US regional fare collection scheme perspective.

It may also be appropriate to assess the adequacy of the smartcard format designed and recently implemented by BTS.

4.3 Evaluation

An evaluation methodology will need to be developed to assess each of the available open standards against the specific needs of the Bangkok MRT environment.

5. Financing Requirements and Funding Strategy

The implementation of an integrated ticketing system for Bangkok will also require the identification of the financing requirements of the initiative and an appropriate funding strategy.

There are effectively two alternatives to fund the procurement of an integrated ticketing system:

- a design, build and operate and maintain (DBOM) contract with a single turnkey contractor with the government agency obtaining capital financing and paying for the delivery of on-going operational services out of fare revenues; or

- a ticketing concession (likely based upon PPP principles), with the concessionaire providing the system using their own capital and being reimbursed over time, possibly through retention of a share of fare revenues.

Under the recommended gross cost form of MRT operating concession (ADB 2007a), fare revenue will be remitted to the government agency and not retained by the concessionaire or operator.

In a DBOM arrangement the government agency would engage a consortium to provide and operate the ticketing system. It would pay for the capital cost of supplying, installing and commissioning of the ticketing system on completion and would pay for operational services (including any clearinghouse activities) on a periodic basis. The operational services payments would be based upon an appropriate service level agreement utilising a range of measurable key performance indicators.

The alternative is to adopt a similar integrated supply and operate approach but to implement it though a Public-Private Partnership (PPP) concession. In this case, private finance would be used to implement the system, with the concessionaire receiving payment either according to an agreed schedule or by retaining a share of revenue collected.

These two fundamental options will need to be analyzed using a value-for-money analysis that takes account of risk transfer to the private sector. Particular care is required in the case of payment being recovered as a share of fare revenue to ensure that a transparent and cost-effective arrangement is achieved.

Further, estimates of both capital and operational costs of the solution will need to be developed. These costs will need to include as a minimum:

- backend system development and implementation

- field device development/adaptation, installation and commissioning for each of the MRT lines

- ongoing operations and maintenance costs (the provision of operational services) for a 10 year period making allowance for the addition of MRT lines over that time-frame.

The potential for further revenues such as those relating to the management of the smartcard funds pool (float) will also need to be investigated.

6. Solution Management

Once implemented the integrated ticketing solution (comprising the developed system and its supporting operational services) will need to be managed. The two organizational options are:

- the agency undertake day-to-day management the system directly; or
- the agency have the system managed on its behalf by a commercial organisation.

Solution management will comprise a minimum of:

- card management;
- maintenance management;
- operator/concession technical support;
- asset management;
- training – both initial and onoing;
- marketing;
- system management and monitoring;
- configuration management;
- financial reconciliation and settlement; and
- reporting.

6.1 Direct Management

If the system is to be managed directly by the agency, then a significant scope and depth of specialist technical expertise will need to be developed and maintained over time. This expertise can be difficult to attract initially and can be expensive to develop in-house – particularly given the invariably bespoke nature of a number of aspects of the technology solution deployed. Further, retaining this investment in niche industry expertise may prove difficult over time.

6.2 Outsourced Management

The alternative assumes that this expertise is ‘outsourced’ under some form of service level agreement. In this case, the agency will only need to develop and maintain expertise in the management of service level-style contracts. This approach will require the development of a suite of key

performance indicators (KPIs) which will enable the appropriate service levels to be achieved.

It should be noted that establishment of system and services KPIs should also be undertaken even if the system is managed directly by the agency. However, in the case of an outsourced arrangement, the KPIs become essential parameters within the Service Level Agreement (SLA) itself.

7. Non-Transit

The solution developed will need to be cognizant of possible future non-transit applications.

Whilst undue focus on these potential opportunities can become a distraction from the solution's primary objective as an MRT fare collection system, it is important that suitable technical and commercial frameworks be established which will not preclude the exploitation of non-transit opportunities as they arise.

7.1 Convergence

A number of opportunities for expansion of the system into the non-transit space will likely come from convergence – either technologically or commercially.

Technological convergence is currently being evidenced in two areas:

- with telecommunications companies through the development of Near Field Communication (NFC) devices and applications; and
- with banks through the trialing of contactless credit card products such as Visa's Wave and Mastercard's Paypass.

These emerging trends will need to be recognized in the development of both the technical and commercial aspects of the solution.

7.2 Micropayments

The use of the smartcard stored value purse for other small retail payments will also need to be considered during the solution development.

7.3 Co-Branding

The commercial aspects of the solution will also need to be cognizant of any opportunities to combine the smartcard brand with another.

8. Institutional Considerations

Based upon the scope suggested by the foregoing activities, and building upon the previous recommendations in ADB 2007a and ADB 2007b, an appropriate government agency will be necessary to ensure the implementation of Bangkok's integrated ticketing solution.

8.1 Agency Functions

The agency will need to provide the following functions:

- fares and financial policy – development and on-going maintenance;
- procurement of the integrated ticketing solution;
- management of the system – either directly or management of the service contract; and
- coordination of all parties involved – government agencies, operators and concessions, etc.

The agency will also need to develop appropriate competencies in each of these functions.

8.2 Regulatory Issues

The agency will also need to be provided with the requisite regulatory powers to achieve as a minimum:

- centralized fares policy formulation, implementation and management activities;
- system implementation and coordination activities across multiple concessions;
- management of the development of the integrated ticketing system – particularly involving the implementation of an open standard;
- compulsory participation – particularly of the existing two concessions;
- integration testing – both of the system as it is initially developed and as operators are added;
- ongoing operations and management of the integrated ticketing system, particularly in terms of its performance and reliability; and
- clear definition of system device ownership and thus consequent responsibilities when deployed to each concession.

References

ADB (2006a), “Integrating Mass Rapid Transit in Bangkok: Options Report”, Asian Development Bank TA 4676-THA, February.

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