

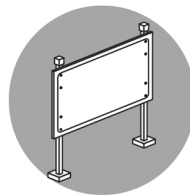
A Study of Systematic Train Operation Planning for Mass Rapid Transit Service Enhancement



Set key performance indicators (KPIs)



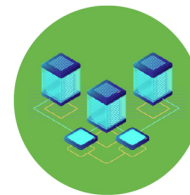
Technology development for train operations system planning



Set criteria for naming and coding stations



Develop mobile application for systematic planning in metro operations



Develop digital standards for monitoring and controlling the operations



Suggestion for roles and responsibilities of the rail transport regulator

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Importance and problem statement

There are many factors that cause problems in using the mass transit system at present, such as: travel information services, inconvenience in entering and using a station, density of users during the peak hours, confusing station names, variety of tickets available, time wasted in buying tickets, etc.



All of these problems have multiple causes, where one of them is the existence of several metro operators and project owners with different practices and standards each. Also, lack of the use of digital data for continuous planning and development.

Objectives and method of the study



The Faculty of Engineering, Mahidol University has jointly worked on the project with the Office of Transport and Traffic Policy and Planning (OTP) to study systematic train operations planning for mass rapid transit service enhancement and list achievable recommendations for the public benefit.

The objectives of the study of systematic train operations planning for mass rapid transit service enhancement are to analyze and provide recommendations for enhancing mass rapid transit service efficiency using technology development for the metro planning as well as setting standards for monitoring and controlling the operations digitally.

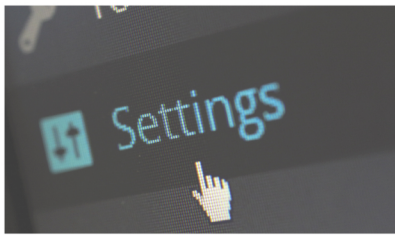


The aim is to support the large volume of people on the system to move more efficiently, conveniently and faster.

Findings from this study can be concluded as follows:

Set key performance indicators (KPIs) for metro operations

1



A set of key performance indicators (KPIs) for metro operations has been recommended for performance measurement as well as efficiency and quality enhancement.

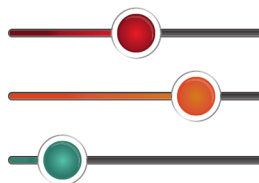
The KPIs will be used as a mechanism to raise operators and stakeholders' awareness of their performance.

It is expected that the results from performance comparison will encourage improvements, developments and acceptance among operators and policy makers.

Overall, the 6 dimensions and 9 KPIs are as follows:

DIMENSION 1 TRANSPORT VOLUME

KPIs 1
NUMBER OF PASSENGER
JOURNEYS
Freq. Monthly



DIMENSION 2 PUNCTUALITY

KPIs 2
TRAIN SERVICE
PUNCTUALITY
Freq. Monthly



6 DIMENSIONS AND 9 KPIS

DIMENSION 3 RELIABILITY



- KPIs 3 Hours of train delay/train hours operated
- KPIs 4 Number of more than 30 minute delay
- KPIs 5 Mean distance between delays more than 5 minutes

Freq. Monthly

DIMENSION 4 AVAILABILITY



- KPIs 6 Train service availability

Freq. Monthly

DIMENSION 5 RESOURCE UTILIZATION

PEAK HOUR



- KPIs 7 Percent car used in peak hour
- KPIs 8 Passenger journeys/staff hours

Freq. Monthly



DIMENSION 6 CUSTOMER SATISFACTION



UNIVERSAL DESIGN

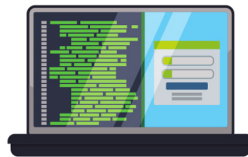
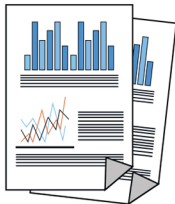


- KPIs 9 Customer satisfaction

2

Technology development for train operations system planning

Several metro lines have been operated for quite some time. Some of them may consider a revision of their operations planning in order to be in line with the current situation which is different from the study and forecast period in the past. An obvious case in Thailand is the Airport Rail Link case which altered from the Express Line and City Line services in the past to the sole City Line service. This is because the number of passengers who use the Airport Rail Link service on a daily basis to commute between their houses and their offices is increasing dramatically.



The operations planning adjustment is complicated as it involves several factors including signaling system, travelling time, turning system, starting time, number of trains, headways, etc. The suggested simulation models including detailed station infrastructure will help to oversee the impact of the adjusted plan without the real testing which may affect the service.

In order to develop the simulation models, data involving train movement, station points, signaling points, etc. are needed. Such data are kept separately in the contract document. It is suggested that the data about basic infrastructure should be kept in Excel format referencing each position in kilometers and indicating the slopes and curves of the tracks. This will help to simulate the operations and the result of the simulation will be close to the practical situation.



Findings from the simulation showed that the headway for the Suvarnabhumi - Phayathai line could be adjusted from 10 minutes to 7.5 minutes for 8 train service. The suggested headway shall be implemented without any change in the stop time at stations and the turning pattern.

Set criteria for naming and coding stations and interchanges in the Bangkok and suburban areas based on international standards

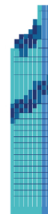
3

Data from metro operators combined with public surveys were analysed together with general principle and factors for naming metro stations.

This study recommends the process for naming and coding stations.

Priority in reference to the name of the train station

- Name after a famous place or a landmark of that area
- Name after a specific and well-known area
- Name after a nearby building or an infrastructure
- Name after a road
- Name after an organization or a government agency
- Name after a popular person



Principles of naming and assigning public transit stations

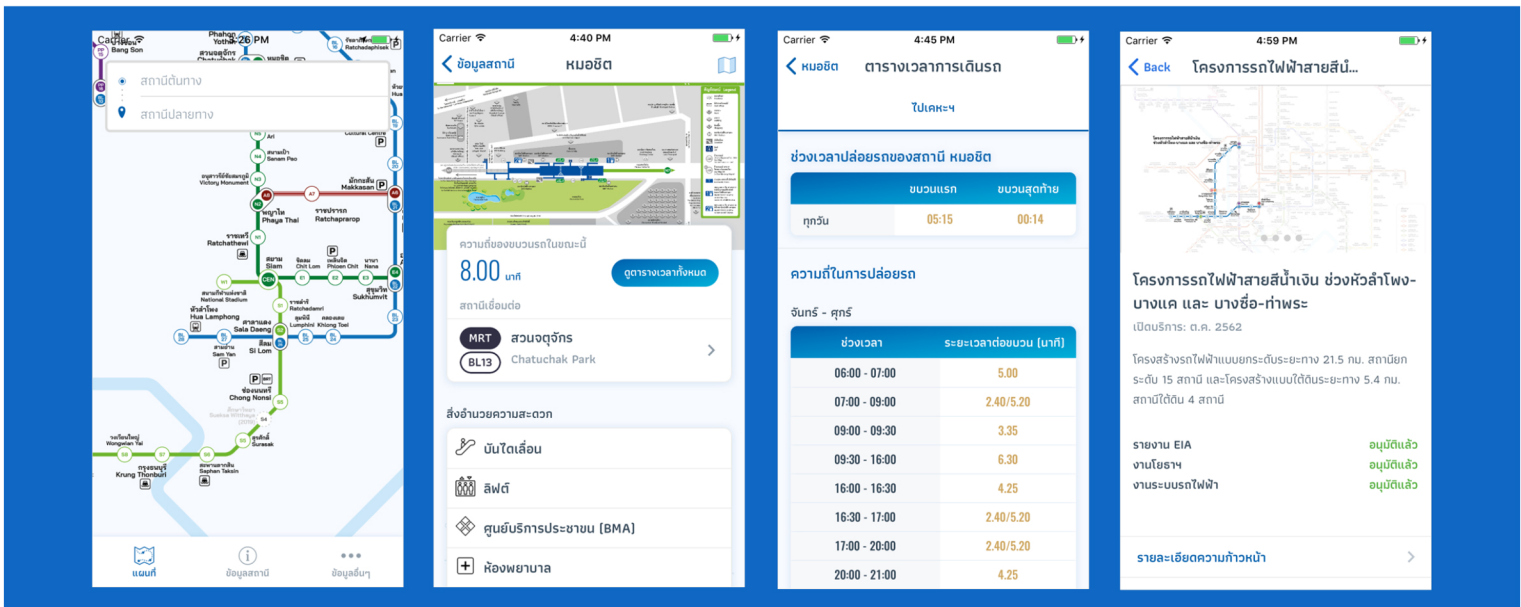
- **Easy:** The station name must be a simple name, which can be easily recognized
- **Compact:** The name of the station should be a short name.
- **Sustainability:** The station name should be used throughout the time that the station is still open.
- **Specify the location clearly:** The name of the station must be made available to the traveler to clearly identify the position.
- **Specific:** The station name must be unique or not confusing to users.
- **Interchange station:** Should use the same name in both Thai and English and specify different routes by location codes.

Develop mobile application for systematic planning in metro operations

4

The 'BKKRail' mobile application has been developed. The application includes completed information about the current services of all metro lines. It is the first application in Thailand which integrates information of all metro operators and their services which can be searched by:

- The fastest trip
- The least numbers of stations
- The cheapest cost



Moreover, the application can show the current status of future metro projects and their progress. The information provided is trustable, correct, and up-to-date.



5

Develop digital standards for monitoring and controlling the operations

Preparation of measures to supervise digital operations with the objective to help smooth the operation in the same direction. Coordination of work between departments is needed to be more effective. There are clear algorithms in operation and problem solving, and standardization of digital data management is also needed. That will facilitate effective management of digital operations. The important elements for the preparation of the digital operation supervision measures consist of 6 measures as follows:



Determination of duties and agencies responsible for the supervision of digital operation



Establishment of the Digital Bus Information Management and Supervision Center Under the Department of Rail Transport to analyze data from indicators via the digital bus information center



Establishing a framework for supervising digital operations for the supervision of rail transportation systems



Data integration and standardization of data for digital operation supervision



Determination of measures for digital data storage where useful information can be applied to plan and improve services to achieve a better quality



Monitoring of results via digital data center

6

Suggestion for roles and responsibilities of the rail transport regulator

1 To establish an organization to act as a policy maker and controller. Currently several organizations are in charge of monitoring the metro operators. As they have their own interests, the control of metro operators is different in many aspects. In order to establish a standard of operations and practices, it is recommended that the government should establish an organization dedicated for setting policy and procedures to oversee all metro operators, especially in terms of: public safety, value for government and public, service quality, common fare, common ticket, and promotion campaigns to increase the volume of passengers and to address their concerns regarding the ability to pay and others.

To establish a unit responsible for naming and coding of metro stations and interchange stations. The unit should set the stations' and interchange stations' names in line with the standards in order to avoid confusion. The stations' names might be after private organizations which are willing to pay for their names to appear publicly.

2

3 To establish a unit in charge of network planning, tracks and facilities sharing among metro lines, high speed lines, and regular train lines. For passengers' convenience, the unit should design the interchange stations for all railway lines located in the same infrastructure. Station access fees might be applied. The design of the station should consider the transit oriented development (TOD) principle connecting with other modes of transportation and stimulating local economic value. The design should also follow the universal design and barrier free and provide all necessary facilities for all, especially for the elders and disable people.

4

To establish a unit responsible for rail data center. The major responsibilities of the unit include data gathering and sharing on web service. Data from all operators and other organizations should be available in order to plan for future network, i.e., origin-destination (OD) data. The main duties of the unit is to set standards for data exchange among all stakeholders, to ensure the correctness of the data, and to provide quick access to data.

To establish a unit to determine standards and detailed procedures for metro operators, i.e., output specification, safety procedure, consumer protection, and customer satisfaction. Rewards should be set in case the metro operators perform well. At the same time, penalty should be enforced in case of inability to achieve as per target or contract agreement.

5

6

To establish a dedicated unit to monitor the services and ensure interoperability of all metro systems and intercity as well as high speed trains. In general, the railway investment is in form of public-private-partnership (PPP), but the government must have a solid policy for interoperability of all systems. This will help to maximize resources utilization and value of spare parts. The lifecycle costing concept should be considered in the long run, instead of considering only the concession period. Therefore, investment can be made in different forms if it creates value for the government in the long term. The interoperability concept should be enforced, especially for the newly-developed projects starting from design framework, and system design for interoperability of all lines including the ongoing high speed projects.

As the technology and system used for mass rapid transit in Thailand is different, standard concepts and investment plan should be considered to promote technology transfer and support local industries for sustainable development and human resources development. In addition, it is recommended to offer a portfolio of projects in collaboration with government officers, academia and industry and/or operators for practical learning and transfer of technology.

7

Bangkok Mass Transit



เส้นทาง LINE		สถานีร่วม/เชื่อมต่อ Interchange Station		ท่าเรือ Port	
	สายสีเขียวอ่อน (สายสุขุมวิท) Light Green Line (Sukhumvit Line)		ทางเดินเชื่อมต่อ Skywalk		สถานีรถไฟ Train Station
	สายสีเขียวเข้ม (สายสีลม) Dark Green Line (Sila Line)		ที่จอดรถ Parking		สนามบิน Airport
	สายสีน้ำเงิน (สายเฉลิมรัชมงคล) Blue Line (Chulalongkornrajavidyalaya University Line)		รถประจำทางด่วนพิเศษ Bus Rapid Transit		แม่น้ำ River
	สายสีม่วง (สายฉลองรัชธรรม) Purple Line (Sala Daeng Line)		สายสีแดงเข้ม Dark Red Line		สายสีเทา Grey Line
	สายสีชมพู Pink Line		สายสีแดงอ่อน Light Red Line		สายสีทอง Gold Line
	สายสีส้ม Orange Line		สายท่าอากาศยาน Airport Rail Link		สายสีน้ำตาล Brown Line