

# An Evaluation Framework of Transportation Responsiveness: Case of Pattaya City

Wuttigrai Ngamsirijit, Yodmanee Tepanon

**Abstract**—Transportation is one of the main activities related to creating value for the tourists. Transport management in tourism mainly focuses on managing transfer points and vehicle capacity. However, transport service level must also be ensured as it now relates to tourist's experiences. This paper emphasizes on the responsiveness as one of key service performance measures. An evaluation framework is developed and illustrated by using the case of small bus service in Pattaya city. It can be seen as a great potential for the city to utilize the small bus transportation in order to meet the needs of more diverse group of passengers and to support the expansion of tourist areas. The framework integrates with service operations management, logistics, and tourism behavior perspectives. The findings from the investigation of existing small bus service are presented and preliminarily validate the usability of the framework.

**Keywords**—Responsiveness, Demand responsive transportation, Tourism, Logistics

## I. INTRODUCTION

LOGISTICS currently involves in the development of the tourism industry in more concrete ways. Tourism logistics can be considered in the context of logistics management in general in which they require product quality. The design of such flow as goods, people, information, and knowledge must link to the city's characteristics so that tourism product quality and performance can be attained. The traditional transportation system such as buses and shuttles is fixed both in terms of time and route. It is typically that this transit system is only effective during tourist season. In terms of economics, Prideaux [1] states that if the transport is limited or ineffective, visitors will have the opportunity to greatly change their destination to travel to other locations. In consequences, this affects the ability to compete in the macro-level.

Tourism logistics has not yet been widely used to develop the economic potential in Thailand due to limitations in communication and coordination between organizations involved in the tourism industry from upstream to downstream. Also, there is lack of support in enhancing tourism infrastructure and, instead, paying greater attention on marketing. This is one of the reasons for lower growth rate of tourism industry. In order to support the growth of the tourism industry on the basis of value and experience creation to the tourists, transportation system must be improved and developed in attempts to response to the transportation needs of tourists.

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Pattaya is a city that has the potential in terms of growing numbers of tourists, more diverse types of tourists, and geographical advantages. Nevertheless, the city's public transportation system in the present has no regular bus services but only small buses and motorcycles services. Improving small bus services could provide greater possibility for the city due to the city's expansion plan to expand tourist attraction areas and to enhance capability of existing infrastructures including roads and establishments.

## II. LITERATURE REVIEW

### A. Responsiveness in Supply Chain and Transportation

Responsiveness has currently been much concerned in supply chain and logistics fields. It is the ability to meet customer needs and to act to market changes within a reasonable time for establishing competitive advantages [2]. It evolves from focusing on efficiency aspects of supply chain and logistics to building system capabilities to respond on the situations of the industry or organization [3, 4]. Holweg [5] identified responsiveness into three dimensions; product; process; and volume. In terms of product dimension, degree of responsiveness is associated with the structure of the product, variety of product, and product life cycle. Process dimension of responsiveness encompasses the abilities to meet requirements of supply chain members, and the abilities to customize the products and services by utilizing decoupling point concept. Volume dimension of responsiveness involves understanding the nature of demand, volatility of demand, customer expectation on customer service delivery and product diversification.

By considering transportation products offering to the passengers, transport can achieve responsiveness by having a various forms of transport in particular areas, establishing a variety of routes services, forming integrated transport networks so that customer service level can be enhanced. In addition, transportation should have flexibility to adapt to a variety of transportation purposes.

To meet the needs of passengers, especially when they change travel routes, transport modes, and travel schedule, the relevant processes include estimating travel demand of different types of tourists, receiving travel requirements from the passengers, scheduling the vehicles in more dynamic ways, applying postponement strategy, buffering the vehicles for unexpected events, and centralizing transit/transfer points, as well as building collaboration among parties.

Thus, planners must mainly consider passengers the time spending for traveling by each type of transportation modes, determine how to adjust travel routes and transport volume within transportation networks and consider a point or position in which the form of transportation changes from one format to another.

To develop and design the transportation system in response to various passenger requirements, information has to be accurate and precise. Particularly, demand information must be well captured. Regarding to Janelle and Beuthe [6], they describes the nature of the change in the nature of the demand for transport.

- Longer and more customized transport linkages
- Greater sensitivity to the timing of connections, arrivals, and departures
- Expanded reliance on communication and computer networks
- Speed of movements and transactions
- Standard equipment and procedures

It can be seen that system responsiveness requires comprehensive understanding on supply and demand sides. Product and process dimension can point out the importance of supply side. Meanwhile, volume dimension provides viewpoints on demand side.

### B. Demand Responsive Transportation (DRT)

Demand responsive transportation has been developed aiming at responding to passenger needs [7, 8]. It reduces waiting time problem occurring from various transportation system constraints and limitations. Figure 1 presents key characteristics of demand responsive transportation.

Route	Fixed months in advance	→	Fixed 1 hour before trip
Vehicle	Limited period of availability	→	Long periods of availability
	1 type	→	Many types
Operator	Commercial	→	Competitive tender
Passenger	Special transport services	→	General public only
	Pay on vehicle	→	Season ticket
Payment		→	Smart card
		→	
Low demand responsiveness		→	High demand responsiveness

Fig. 1 Key characteristics of Demand Responsive Transportation

In management aspects, DRT combines main techniques of capacity management and dynamic scheduling. The vehicles are allocated by considering available service capabilities at specific time and scheduling the travel based upon the request of an individual passenger. This transportation system is suitable for areas with specific requirements such as areas with diverse tourists and areas with frequent and disperse tourism demand [9]. In addition, tourism areas with low density of tourists can also be advantageous from the DRT when travel demand is low and the requests are upon an interval period of time [10].

The operating costs of traditional public transportation are high comparing to DRT when travel demand is not high. Fixed route buses have to pass every stop regardless of passenger onboard. Meanwhile, costs of operating DRT are relatively high due to higher cost of ownership, i.e. a number of vehicles to respond passenger demand and services required. Various degree of responsiveness for each type of transport is classified [11] and shown in Table I.

TABLE I  
TYPES OF TRANSPORT CLASSIFIED BY DEGREE OF RESPONSIVENESS

Registered bus options	Non-registered bus options	Taxi Options	Car Options
Post bus	Restricted user education transport*	Single operator shared ride taxi	Wheels to work
Non restricted user education transport	Shoppers' bus	Multi operator shared ride taxi	Social car scheme
Fixed route*	Car services		Car pool
Semi fixed DRT	Patient transport service*		Car club
Flexible area DRT	Community transport	Single ride taxi*	Private car*

In Thailand context, only few responsive transport are provided including private car, single ride taxi, restricted user education transport, and patient transport service as highlighted in the table. Traditional transport of fixed route bus is only bus options. Thus, transportation responsiveness in Thailand is mainly caused by taxi and car options. This results in traffic congestion in capital and tourism city.

### C. Travel Behavior and Decision Making

Key input information for responsive transportation planning is travel behavior of tourists. It is the fact that travel behavior of tourists in each city is different. In order to design the responsive transportation system, it requires clear understanding of tourist behavior in travelling around the city. The studies on travel behavior are constantly conducted since new tourism areas and cities are developed from time to time. The models used in the research include residential location choice, auto availability choice, and trip-making behavior. They provide understanding on relationships between such issues as travel distances, household characteristics, and number of vehicles in travelling.

Travel behavior can be affected by passenger's decision-making. It is typically that, in tourism, passengers rather make such short-term decisions as selecting destinations and transportation modes, and deciding the extent of travel frequency than making medium-term decisions. The influencing factors for short-term decisions include distance of destination, service level of transportation, and attraction of the places and so on. Instead, medium-term decisions by which residents are mostly made are influenced by such factor as the vehicle ownership. Long-term decisions consist of selection of workplace, types of residences, residential location. When considering in the context of tourism city, tourists are not only travel but also tend to stay longer or even become residences.

Thus, a common set of decision making factors, which can be summarized here.

- Residential location includes number of attractions, tourist density, number of establishments, accommodation rates, type of accommodation, and vehicle accessibility.

- Tourist characteristics include travel objectives, lifestyles, travel companion, and time for travel.

- Travel characteristics include travel distances, type of transport vehicles, number of places visited, frequency to visit

the same places, departure time to travel, arrival time to accommodation, travel time spent, and travel plan changes.

*D. Capacity Flexibility*

To assess the ability of the transportation system from the supply perspectives, Morlock and Chang [12] conducted a study to measure the ability of the transportation system to adapt to fluctuations in demand. Base capacity flexibility is obtained by calculating carrying capacity of the containers within the networks with minimum operational costs. Routing options is served as means to provide flexibility to the system. When travel demand changes, it is necessary for the transportation system to adjust and response to it. One way to respond is to select alternative travel routes in which vehicle capacities is higher.

The routing options for capacity flexibility include as follows:

- The shortest path (there may be connection points between the beginning and end).
- The shortest path and path with no connection points.
- A path that meets the service requirements.

The findings of Morlock and Chang [12] show that routing options can add flexibility to the transport networks. Furthermore, transportation planners should examine demand over period of time and select the appropriate paths so that transportation can be efficient and responsive to passengers.

III. THE PROPOSED FRAMEWORK

Based on the literature review, the integrated framework for evaluating transportation responsiveness is developed and presented in Figure 2.

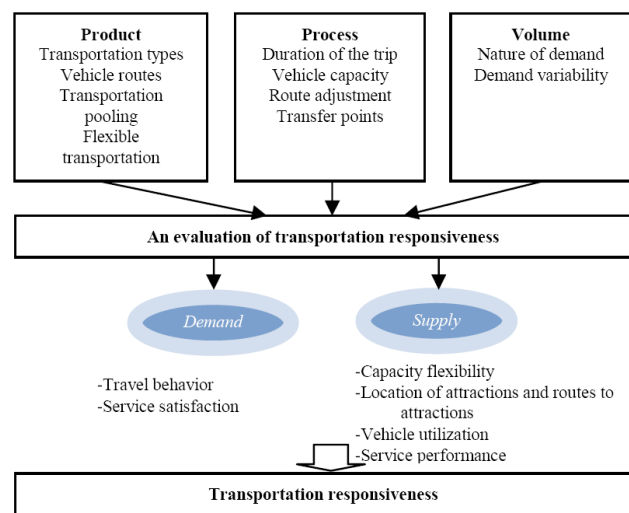


Fig. 2 A framework for evaluating transportation responsiveness

Managing tourism transportation needs requires an emphasis on both changing demand and supply. It is hard to invest in new transportation infrastructure for responsiveness purposed. Instead, the uses of planning and management of transportation resources and networks is more feasible.

Existing transportation system characteristics must be clearly understood by firstly examining input of the evaluation framework includes information regarding product dimension, process dimension and volume dimension of responsiveness. This provides understandings on which extent current transportation can be responsive, how transportation is currently performed, and by which passengers' needs can be satisfied. Nevertheless, this input is fragmented and has not yet been integrated.

To provide more insights of responsiveness in transportation system, it requires additional analysis of demand and supply aspects of transportation. The proposed models of travel behavior, service satisfaction and capacity flexibility are included so that the above set of questions becomes even clearer.

The following section presents the case of Pattaya city. It briefly describes economic and social overview of the city and is presented in accordance with the proposed framework.

IV. PATTAYA TOURISM AND TRANSPORTATION

Pattaya city is a tourist destination. Most of communities have been transformed to the commercial community for providing tourism services and facilities as the results of successful tourism development. Currently, there are 31 local communities in the city. It has been facing with the evacuation of the population migration from both all regions of the country and foreign countries to work and live in the city. Consequently, the social conditions are complex and varied.

Basic information concerning the size, number and density of population in the city during 2000-2010 are shown in Table II.

TABLE II  
POPULATION IN PATTAYA CITY DURING 2000-2010

Year	Total population	Male	Female	Total household
2000	82,133	40,127	42,006	14,192
2001	85,533	41,606	43,927	14,827
2002	89,413	43,123	46,290	15,445
2003	92,878	44,716	48,162	16,088
2004	91,855	43,812	48,043	16,992
2005	96,654	45,799	50,855	17,963
2006	98,992	46,828	52,164	18,436
2007	102,612	48,438	54,174	18,948
2008	104,797	49,241	55,556	19,326
2009	106,214	49,589	56,625	19,702
2010	107,406	50,075	57,331	19,900

Source: Pattaya Information Center

The majority of population about 87 percent is traders and tourism service providers. The revenues are approximately 270,000 baht per person a year. The travel industry is the most important economic activities of the city. Ninety percentage of total labor market have occupation in the tourism industry. There are 38 tourist attractions within the Pattaya city and 12 places around the city (Table III).

The initial development of guidelines for sustainable tourism development in Pattaya city starts with the vision for new city image as "New Pattaya: The World Class Greenovative Tourism City" and apply 3Rs bringing the vision into action consists of (1) Rebrand (2) Revitalize and Develop

Facilities and (3) Raising Capacity and Capability. To promote tourism development based on such plan, four development zone has been set as follows:

1. The eco-tourism: to preserve marine nature area with beautiful coral reefs around the island from beach area of Pattaya City and Jomtien Beach to the Koh Larn and surrounding islands.

2. The wide range of tourism: All areas of Pattaya municipality and partial areas of Jomtien municipality (from urban areas of South Pattaya to Jomtien and railroad east) is planned to organize and improve tourism capacities.

3. The culture and tourism in the area of special interest include the city's east side. From eastern boundary of the railway line to National Highway No. 7, to southern stretch of Highway 36 and Na-Jomtien area. To promote various cultural tourism activities. The city center is linked to this area by developing four routes of bus transportation network covering Huai Yai, Pattaya, and Jomtien.

4. The natural resources and tourism in the rest areas for preserving such natural resources as water and forest, promoting local agricultural products, and developing areas with low density and large plots of land.

linking three cities.

- Highway connection of Pattaya and Mabatput.

In despite of the strong focus of government on an efficient public transport system to connect to the city, there also are the needs to improve transport system within the city. The routes and road network in the city has a limit. In addition, it cannot be increased due to limitation of city space. In this sense, the problems of tourism have still not yet resolved. It is imperative that the city must be resolved by providing, for instances, a city's central transportation center bringing together all transport networks to facilitate travel, the city park buildings and related services, monorail transportation system to link the network to the destination for the convenience and benefits of tourists in the future.

One of the measures towards effective transportation system is responsiveness. It is also important to build responsiveness capabilities for inbound logistics, i.e. network within city. The following section presents the results from the analysis of primary data and secondary data from relevant agencies based on the proposed framework (Figure 2). They reflect the nature of supply and demand of transport in Pattaya city.

## V.RESULTS

The findings from investigation of the existing transportation system and tourism in Pattaya city based on the proposed framework are presented here.

### A. Transportation types

The types of public transport vehicles used by tourists are bus is non-fixed route types including small bus, van, and taxi. Small bus mode is typical and cheap for travelling in the city. Referring to transport regulation, it requires small buses operating on designate routes from 8.30 to 16.30 at least. However, due to high number of tourists and independently operating of the small buses, drivers can freely drive and pick up passengers. As a result, vehicle routes are overlapping and vehicles are overcrowded on the main route. This shows that small bus service is responsive only to passenger volumes, not actual travel needs. It is operated by not clearly defining passenger needs and then allocating the vehicles.

### B. Vehicle routes

Currently, the city has a total of 5 small bus lines; Chareonrat Pattana villege-Na Jomtien line; City Circle line; Na Klua - Siam Country Club line; North Pattaya - Central Pattaya; and Bali Hai Pier - Banglamung District Office.

To add or adjust small bus lines, it must be permitted by Ministry of Transport. The committee will conduct a meeting to discuss and consider the appropriateness of the new proposed route. The latest route n the city, the latest additional line is Bali Hai Pier - Banglamung District Office.

### C. Pooling

To deal with changes in travel demand and limitation of supply of transport, pooling should be formed. Integration of transport modes will increase the capacity of the transportation

TABLE III  
LIST OF TOURIST ATTRACTIONS IN AND AROUND PATTAYA CITY

Tourist attractions in city			Tourist attractions outside city		
1	Pattaya water park	20	Pattaya Pirom Submarine	39	Khao Cheechan Buddha Image
2	Bottle museum	21	Wongphrachan beach	40	Wat Yan Sang Wararam
3	The Sanctuary of Truth	22	Elephant Garden	41	Nong Nooch Garden and Resort
4	Mini Siam	23	Super Kart Racing	42	The Million Years Stone Park and Pattaya Crocodile Farm
5	Pattaya beach	24	Monster World	43	Elephant Village Pattaya
6	Wongamat beach	25	Tuxedo Magic Castle	44	Three Kingdoms Park
7	Jomtien beach	26	Siriphon Orchid Farm	45	The Horseshoe Point Resort Pattaya
8	Koh Lan	27	Paintball Park and Bungee Jump	46	Sriracha Tiger Zoo
9	Mabprachan reservoir	28	Snake Show	47	Khao Kheow Open Zoo
10	Point of View Pattaya	29	NS P Snake Show	48	Bira International Circuit
11	Suan Chaloemphrakiat	30	Pattaya Airpark	49	Pattaya Flying Club
12	Pattaya Kart Speedway	31	Lakeland Water and Cable Ski	50	Silver Lake Vineyard
13	Wang Sam Sien	32	S K Pattaya Ranch		
14	Khomluang Chumpon Khet Udomsak Monument	33	Chang Siam		
15	Viharnra Sien	34	Elephants Trekking		
16	Underwater World	35	Wonderland Pattaya		
17	Ripley's Believe It or Not! museum	36	Easy Kart		
18	Sukhawa dee	37	Pattaya Floating Market		
19	Khao Phratamnak	38	Pattaya Circus		

The Master Plan for the development of transportation regarding the development of sustainable transport systems has included various transportation projects associated with Pattaya city.

- Development of a transportation system directly linked the airport and the city.
- High Speed Rail line along Bangkok, Pattaya, and Rayong with the speed of 250 km /hr and express train

system in overall together with an efficient use of resources. Transportation in the city has no pooling forms, i.e. each mode is operated separately. Only integration now exists is the bus station connecting buses from other provinces. It is potentially to increase the system capacity through better planning and sharing of such information as travel demand estimation and vehicle status between carriers.

#### D. Flexible transportation

It is the fact that, non-fixed route buses are more flexible in terms of changes to passenger demand. Although there is a new route formed to meet the passenger needs, old routes are still operated. In other words, a number of vehicles is still high and can cause traffic congestion unless the allocation and planning is made.

Responding to the needs of passengers and increased flexibility to the current route is currently done by:

- Allocating high proportion of vehicles for areas with high density of tourists and attractions. Only a minority of vehicle operates around the city.
- Picking up passengers and charging a fare as a group.

#### E. Transportation capacity

In Table IV, vehicle capacities five small bus lines are shown.

TABLE IV  
VEHICLE CAPACITY OF 5 SMALL BUS LINES

Line no.	Name	Distance (Km.)	Quantity (Vehicle)
5	Chareonrat Pattana villege-Na Jomtien	29	187-340
6	City Circle	16	187-340
6079	Na Klua - Siam Country Club	19.3	10-12
7	North Pattaya - Central Pattaya	23	14-20
4	Bali Hai Pier - Banglamung District Office	10	10-12

#### F. Route adjustment

Currently, an adjustment of vehicle routes is informally taken place within the route. Drivers adjust the routes when they consider there are too many vehicles on the routes and there are unoccupied seats on the vehicle. Another reason for adjusting route is that cooperative has been concerned about service level on certain areas that a number of passengers are recently increased. Some route is temporarily established to serve passengers.

#### G. Transfer points

A majority of small buses is operated around the beach due to a number of tourists with high travel demand. In order to receive the fares and serve passengers among vehicles, transfer points are located around intersection of major roads. In doing so, drivers can change directions to others when current route has few or no passengers. Transfer points can reduce risk from demand uncertainty. However, it is argued that this approach can cause traffic congestion on the main street, especially on peak period.

## VI. DISCUSSION

Small bus service can be considered potential transport

mode for enhancing inbound tourism logistics within Pattaya city. It is commonly used by residences and tourists for all travel purposes. It can generally respond passenger' needs only in terms of volumes. Informal and temporarily approaches such as establishing transfer points, ad hoc vehicle route adjustment, and group passenger pick-up are employed. However, travel needs in terms of coverage and vehicle utilization has not met.

To permanently resolve the problems, it requires considering the following key points.

- Effective demand management: It is the attempts to enhance vehicle utilization, route coverage and service satisfaction level. It mainly involves estimating and forecasting demand and understanding travel behavior of the tourists.
- Capacity allocation and vehicle routing: To avoid overlapping routes and low vehicle utilization, the solutions may include establishing centralized transfer points for being able to assign vehicles to required locations responsively, and considering a formation of new small bus lines which can provide capacity flexibility to cope with travel demand uncertainty.

Regarding to above findings, it shows that the framework with key issues extracted from the literatures can be served as starting point or guidelines for evaluating transportation responsiveness, i.e. of small bus services in Pattaya city. Nevertheless, the next phase of an evaluation must integrate those data and information to further analyze travel behavior, service satisfaction of passenger, and capacity flexibility. Consequently, transportation responsiveness can be quantitatively examined.

## VII. CONCLUSION

The studies of tourism logistics in Thailand is considered new and requires comprehensive frameworks. The responsiveness is one of them. The framework extracts key issues of responsive transportation based on three perspectives of product, process and volume. This can be served as starting point or guidelines for evaluating transportation responsiveness. Based on findings and evidences, it can be seen as a great potential for Pattaya city to utilize the small bus transportation in order to meet the needs of more diverse group of passengers and to support the expansion of tourist areas. The existing small bus service is examined by employing the proposed framework. Many insights on responsiveness of small bus service are obtained. It preliminary proves that the framework is helpful. However, further efforts on the framework are still required such as understanding travel behavior, evaluating small bus service satisfaction, and examining capacity flexibility taken into account of demand and supply conditions. Consequently, transportation responsiveness can be fully examined.

## ACKNOWLEDGMENT

This research is fully supported by The National Research

Council of Thailand and The Thailand Research Fund. The authors would like to thank Chonburi Transportation Authority Office for valuable information and cooperation during the first phase of this research, especially to Miss Nantaya Faimetta for her enthusiasm and strong support since the beginning of the research.

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