

STUDY ON ROLE OF PARATRANSIT AS A FEEDER MODE IN URBAN TRANSPORTATION IN DEVELOPING COUNTRIES *

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1. Introduction

Most of paratransits plying the streets of developing cities are privately operated small to medium sized vehicles, ranging from human powered rickshaws to minibus, that serve short to intermediate service lengths²⁾. They provide variety of services from door-to-door collectors (taxi-like) to main line service (bus-like). According to advantages of vehicle size and unrestrained operation, paratransit services can response fluctuate demand, and fill voids of poor areas left by conventional public transports at relatively low fare that tailored for low income group's mobility. Around 20 percent to more than 50 percent of travel demand from captive riders and car dependent users are handled by motorized paratransit services in many developing countries¹⁾⁻³⁾⁻⁶⁾. Although paratransit services enhance urban mobility and compensate public transit unfilled areas, their operations pose wide range of problems to the cities - traffic congestion, accidents and air pollution. According to the nature of profit driven and uncontrolled services, they can easily abandon the unprofitable areas, leaving problems to both passengers and public sectors. In last two decades, many countries performed various actions to regulate and even eliminate paratransit services²⁾.

Currently, paratransit plays important role in urban transportation in developing countries. Paratransit operations both taxi-like feeders (Ojek in Jakarta; Motorcycle-taxi, Song thaew in Bangkok; Motorcycle-taxi in Rio de Janeiro etc.) and intermediate line-haul (Minibus in Jakarta; Vans in Bangkok and Rio de Janeiro etc.) serve variety of travelers. Their services seem to satisfy captive rider's needs in terms of mobility especially for the feeder services. It is because their natures of service that connect residential area to main streets with public transit. However, their quality of services are only acceptable but not satisfy user's needs. This dissatisfaction causes from poorly maintained vehicles and profit-driven excessive competition. However, users are still willing to use paratransits because of their ease in accessibility and low cost services. Most of future urban transportation plans, collaborated with international consultants, recommend public mass transit operations and study mainly on user's behavior on mass transportation. Not surprisingly, to achieve that goal is very difficult considering many obstructions especially limited budget and political constraints. Accordingly, paratransit service performance should not be overlooked on the way to urban transportation planning goal. Advantages on accessibility, mass transit feeding system and low cost service must be promoted, and disadvantages on unreliable services, improper operator behaviors and other externalities must be minimized.

Many studies considering paratransit operations evidently revealed their operation characteristics and effects on their users. Loo⁴⁾ studied on potential impacts of residents' coach paratransit on people modal choice and residential choice. Moreover, future of paratransit operation in Indonesia based on paratransit users' perception on quality of service³⁾ and application for BRT feeding system⁵⁾ are very interesting. Nevertheless, past researches studied on paratransit's user perception, but haven't mentioned how total travelers perceive and affect to their modal choice. Moreover, paratransit have potential to be a feeder mode that enhance public transit system performance in the future. Therefore, this study considers on how travelers perceive on feeder-type paratransit and their attitudes on present operation of feeder paratransit services. Then, problems of service that impact user patronages can be revealed and improvement actions can be performed in order to encourage people to use more public transits and enhance urban transportation performance.

2. Study Approach

Future of public transits based on their performances as well as how the people perceive their service quality. Not only operation performance outcome but also measurement of public perceptions can helpfully assess quality of service and reveal problems that need to be considered. As mentioned above, paratransit has a potential to link residential areas to main streets, and can be complementary mode by carrying people to public transit services. But, existing paratransit systems are considered informal, not well-organized and people still dissatisfy their service quality. Therefore, public

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perceptions are required to study on opportunity for paratransit application as feeding system to enhance public transport use. It is important to know how public become aware of existing paratransit operation and their willingness to use paratransit feeding systems. Service attributes assessed by travelers such as fare, comfort of accessibility, reliability, information and safety must be captured and evaluated. Moreover, perceptions should be classified for each user group in order to understand traveler's attitude on service attributes. From perception evaluation, potential strength and weakness of paratransit services can be identified and benefit for managing their operations.

3. Role of paratransit in urban transportation

(1) Paratransit feeder and urban transportation

Rapid growth of urban population, increase travel demand and inadequate public transport in developing countries rise popularity of paratransit. Paratransit operation is well-tailored for the poor and short to intermediate travels in term of fare and flexibility. Taxi-like motorized and non-motorized modes serve for short to medium trip, for example pedicabs in Manila; becak, ojek and mikrolet in Jakarta; motorcycle-taxi and song thaew in Bangkok. Bus-like services serve for medium to long travel distance such as jeepney and vans in Manila; minibus in Jakarta; passenger vans in Bangkok. Many developing cities, paratransit operations serve up to 70% of travel demand²⁾⁻⁵⁾. In present, non-motorized paratransit modes are not allowed or even prohibited in urban area due to slow moving that block traffic and easily cause accidents. Moreover, they are dominated by motorized modes due to advantage of higher speed. Although, paratransit is an efficient road utilized mode and handle many passengers, the excessive numbers and undisciplined driving create more congestion and traffic accidents. Paratransit's nature of service that carry people from residential and poor areas to main streets with public transits reflects its potential as feeding mode especially the taxi-like short haul service, for example motorcycle-taxis and song thaew in Bangkok; ojek and mikrolet in Jakarta. This type of service has advantages to penetrate into poor narrow road from small-sized vehicle. Moreover, higher speed and more numbers can cover large areas with high-frequent services that provide valuable mobility and accessibility.

(2) Paratransit's user perception and satisfaction

Future of paratransit in competition with motorization was performed by using user satisfaction in Bandung, Indonesia. This study considered user perceptions on factors and attributes of *Angkutan Kota* service, which cover approximately 50% of road-based public transports in Bandung, using onboard questionnaire survey. User satisfactions were determined by statistical data, and user perceptions were explored using Structural Equation Model, SEM. The results showed that 15.4% satisfied and very satisfied, 50.7% neutral, 33.8% dissatisfied and very dissatisfied. Joewono and Kubota concluded that operator should concern on 84.6% of their risky passengers because they have potential to move to other more beneficial services³⁾. From SEM analysis, the results showed that (1) loyalty for future use of paratransit service and overall satisfaction significantly depend on quality of service, and (2) financial consideration has significantly negative impact on service quality and loyalty for future use.

(3) Paratransit effect on user's modal choice

In Hong Kong, new town programme increased vastly population decentralization, but economic activities did not. As a result, commuting trip increased rapidly and wide spread that public transit could not cover all. Therefore, private housing estates introduced resident's coach systems ranging from short-medium-long haul, considered as paratransit service, to move their residents to mass transit station (short and medium-haul) and down town (long-haul). Loo studied on people modal choice, attitudes and residential choice from users of three services⁴⁾. The study found that short and medium-haul significantly serve passengers to public transits, buses and rails, and long-haul service can reduce approximately 3150 private vehicle during morning peak. The reasons for using these services rather than driving are cheaper and saving parking fee; however, they would not use resident's coach service if fare is increased and frequency is dropped. Also, Loo explored that 25% of resident's coach users have potential to shift to car and taxi in case that resident's coach services be unavailable⁴⁾. Besides, higher income and car available people, medium and long-haul users, tend to use their car rather than public transits. This study recommended that replacing resident's coach service may not inevitably relief traffic congestion especially during morning peak.

(4) Potential of paratransit application in urban transportation system

In many Asian developing cities, Bus Rapid Transit (BRT) has become an attractive solution for urban transportation because of its cost-effectiveness, environmental friendliness and advanced image. However, many issues such as poor land use planning, traffic congestion and lack of BRT knowledge pose difficulties for making BRT efficiently successful. Satiennam introduced many supporting strategies that are providing well-organized paratransit feeders and parking

facilities, managing parallel local buses and high land use density along BRT corridors, and applied to case study of Bangkok BRT north corridor⁵). According to spread demand, this study mentioned that well-designed feeder connection, motorcycle-taxi and song thaew, with connector facilities can improve accessibility and increase BRT capability. The results of operational performance showed that proposed strategies enhanced BRT system with better traffic network and low emission rate.

4. Discussion

Paratransit operations has higher share in urban transportation of many developing cities due to their flexibility and door-to-door service. Paratransit users seem to get used to with its services both access mode and intermediate line-haul mode, and still want to use it in the future, although they not satisfy in quality of service. It should be noted that paratransit operators should consider on dissatisfied passengers because they tend to easily move to other beneficial modes. Moreover, paratransit has a potential to enhance public transit system by operating as feeder mode. Thus, to implement paratransit feeder system as an integration with mass transit, it is important to understand how travelers perceive its services including traveler's willingness to use. Therefore, this study intend to explore traveler's perceptions and their attitudes of present paratransit feeder services including differences of each traveler income group and experiences with mass transits. In addition, issues on paratransit services can be revealed and considered for priority of improvement planning. This study will use Bangkok Metropolitan Area as case study because it is a developing megacity which has variety of travelers and paratransit feeders, motorcycle-taxi, micro-bus (silor-lek) and pick-up truck (song thaew). In addition, mass transits, elevated rail system (BTS) and subway (MRT), are already implemented in central area of Bangkok and have been planned for the future expansion.

Bangkok Metropolitan Area (BMA) is one of Asian developing megacity with population more than 8 million in habitants and very terrible congestion. According to its lack of good road hierarchy and substandard bus services, this make varieties of paratransit vehicles on the street of Bangkok which are passenger vans, pick-up trucks (song thaew), micro-buses (silor-lek), three-wheelers (tuktuk), motorcycle-taxis and pedicabs (samlor-tep)²). Among those paratransit vehicles, they can be divided into two types of services - (1) route-based bus-like service and (2) taxi-like door-to-door service. Passenger vans are mostly considered as the first type – intermediate to long haul service, and others are considered in the second type – short to intermediate haul service. The taxi-like short haul modes often served as feeder connecting people to main roads with public transits as can be seen that they are available at soi entrances, intermodal transfer points and major activity centers. Non-motorized pedicab is restricted to the suburban areas of Bangkok, then, available feeder modes in BMA are motorcycle-taxi, pick-up trucks (song thaew) and micro-buses (silor-lek). Among these feeder modes, motorcycle-taxi has lion share in the market because it is low investment mode and has ability to maneuver in the narrow roadways. On the other hands, song thaew and silor-lek still have advantages on cheaper cost per distance and safer than travelling by motorcycle-taxi. But most of travelers prefer to use motorcycle-taxi by considering high service frequency. Past study²) revealed that around 50% of people use motorcycle-taxi to transfer to bus and public transports, and more than 70% of observed passengers stated that motorcycle-taxi service is very important and should be continue. However, users concerned for safety issues and unregulated industry. 43% of users mentioned on reckless driving and 80% stated for unsafe service. As a result, people concern paratransit feeder service mainly on frequency of service, fare, unregulated operation and safety. Therefore, integration of paratransit as feeder system with future mass transit must carefully consider how users perceive the services and their attitudes. Then, problems of service that impact user patronages can be revealed and improvement actions can be performed in order to encourage people to use more public transits and enhance urban transportation performance.

5. Conclusion

In many developing countries, unplanned land use and inadequate public transit services have created informal public transit service called paratransit. Paratransit plays an important role serving poor areas that public transits can not penetrate. Moreover, paratransit modes, taxi-like and route-based bus-like services, are popularity and enjoy most share in public transportation due to their low cost, flexible and door-to-door services. Their operations as feeder system of public transits are dominant and users still need paratransit services, although most of users have dissatisfied in quality of service. In the future, many developing megacities such as Bangkok, Jakarta and Manila plan to implement mass transit system to relief traffic congestion. As have been reviewed, potential of paratransit as a feeder mode that has a capability to enhance mass transit system performance should not be neglected. Traveler's perception in paratransit operation are very important to improve paratransit service and encourage people to use public transportation. Therefore, transportation planning sector must carefully considered to introduce integration of paratransit with mass transit system that hopefully enhance urban transportation.

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