REPORT OF RESEARCH RESULTS

(a) Title: An Experiment of Safe and Affordable Senior Citizen Shuttle Service System in Bangkok Suburb

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(c) Summary

Safe, convenient and affordable transportation system is crucial for older persons to ensure access to necessary services such as community engagement, medical care and grocery shopping. The availability of adequate transportation enables older persons to live independently in their communities, helps to prevent isolation and possible depression. In Thailand, older persons nowadays live independently without their offspring and this has become a more serious social problem since many parts of Thailand have no safe, convenient and affordable transportation system for them. Even in many suburb Bangkok metropolitan areas, without cars, their only means of transportation are dangerous motorcycle taxis or quite expensive and limited regular taxi services.

This research focuses on piloting a safe and affordable transportation system in a suburb village near Bangkok by evaluating demand for a new transportation system, possibly in a form of a mini-shuttle (or a golf cart) taxi, that was specifically modified to accommodate up to 4 older persons, who might have limited mobility to accommodate their needs to join community engagement. This system will transport elderly persons from their homes to community center and transport hub in the distance of 1-3 kms.

This study picked two elderly communities in Wangthonglang and Bungyitho district where each has its own senior citizen center and tries to facilitate transportation service for elderly persons in its community to join their services. The study has two survey steps. First, pilot survey of elderly persons' travel demand and characteristics were collected along with the in-depth interview of center officers. The data from this survey were used to create the questionnaire for simulating of transport system selection in the community from the broader sample of 400 elderly persons totally. It was found that two communities require similar transport service with a fixed schedule, lowest possible fare; however, the preferred vehicle types are different. Elderly persons in Wangthonglang, located in the urban area have low income prefer a small-sized bus. While ones in Bungyitho community with lower income, located in suburb, prefer a golf car. The results of the survey were analyzed with linear regression model to determine the transportation demand for each transport system. The result shows that factors significantly affecting their travel decision are: gender, income, route type, vehicle type and fare (for urban community) and gender, age, income, distance, route type, vehicle type and fare (for suburb community). The findings can be further used to estimate fare revenue and expected cost if the systems were implemented and finding optimal transport system for the elderly persons, which are beneficial to relevant organizations for service planning and budget preparation. Finally, this research will be used as a model for other communities in surveying elderly transport demand and planning transport system as well.

(d) Aim of Research

1) Create a safe, convenient and affordable transportation system for senior citizens in a specific area
2) Providing recommendations to authorities how to create a user-friendly and affordable public transport system for senior citizens.

(e) Method of Research & Progression

Literature Review and Research Gap

Like many other countries around the world, Thailand's population has continually been aging. Thai government predicts that the proportion of persons aged over 60 years in 2017 accounts for 13 percent of the total population and it is expected to account for 25 percent of population in 2037. Several relevant government agencies are working together in promoting physical and mental health among senior citizens, who are recognized as valuable resources. However, safe, convenient and affordable public transportation system for senior citizens has not been widely discussed in both Thai government and research community.

Although there have been some attempts by local governments (esp. Bangkok Metropolitan Authority) to provide safe public transport specifically to senior citizens. Lacks of understanding senior citizens' demand along with area-specific characteristics cause the past system failed and unsustainable due to too few ridership and huge financial burden for the authority.

Research Methodology and Progression

This research focuses on piloting a safe and affordable transportation system in a suburb village near Bangkok by providing a new transportation system, possibly in a form of a mini-shuttle (or a golf cart) taxi, that was specifically modified to accommodate up to 4 older persons, who might have limited mobility to accommodate their needs. This system will transport elderly persons from their homes to major transport hubs or shopping/medical areas in the distance of 3-5 kms along with an online advanced reservation system. To these end, we started by finding the appropriate area/villages that might be suitable in the experiment and did survey questionnaire for demand analysis through the use of linear regression model. Then, a system (vehicle type, reservation system, fare, etc) will be designed according to user demand. Furthermore, we do financial feasibility and help the community plan in implementation the system.

This study picked two elderly communities in Wangthonglang and Bungyitho district (Figure 1) where each has its own senior citizen center and tries to facilitate transportation service for elderly persons in its community to join their services. The study has two survey steps. First, pilot survey of elderly persons' travel demand and characteristics were collected along with the in-depth interview of center officers. The data from this survey were used to create the questionnaire for simulating transport system selection in each community from the total sample of 400 elderly persons.

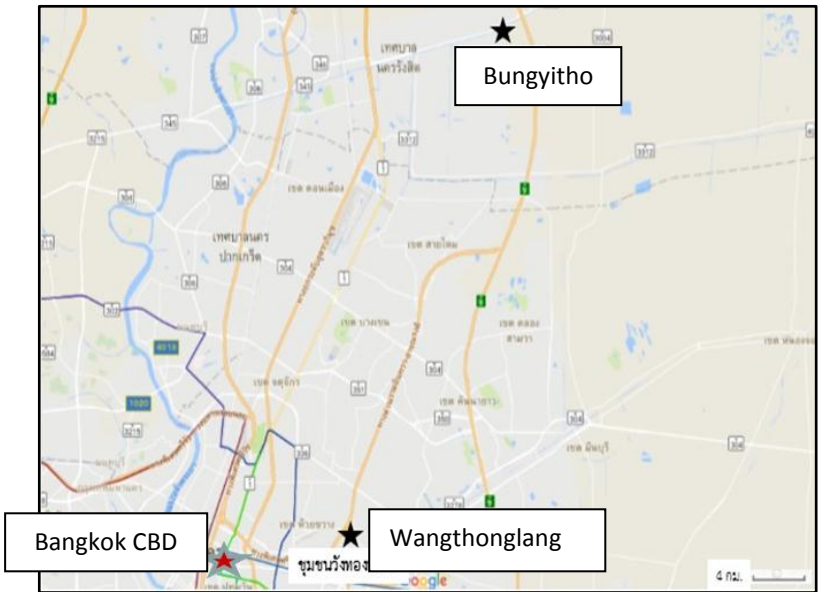

Fig. 1 Two elderly communities in this study (Modified from *Google Map, 2018*)

(f) Results of Research

Elderly Persons Demand for Transportation

Based on the two-stage survey of elderly persons in both community, we found the following information:

- Wangthonglang Most of elderly persons are female, at the ages of 60-69, average income is lower than 5,000 THB/month, living in the radius of 1.5-km from the community center, has no vehicle. Most travel to the center and the market once a week. The preferred service is small van type, fixed-route service, 5 THB fare.
- Bungyitho Most of elderly persons are female, at the ages of 60-69, average income is lower than 5000THB/month, living in the radius of 4-km from the community center, has no vehicle. Most travel to the center and the market 2-3 times a week. The preferred service is golf cart type, on-call service, 7-12 THB fare.

Transportation Service Design

Based on questionnaire simulation and regression analysis model, we found the optimal transportation system along with optimal fare as follows:

- Wangthonglang we expect there are up to 118 riderships per week depending on fare (0-15TBH/ride). The optimal fare that can maximize system revenue is 6THB, which will generate the revenue of 5,200-7,700 THB per month. The service type would be on-demand every one hour during the community activity time.

  The appropriate vehicle type serving this community would be either a small three-wheel car or a small four-wheel van with 5 THB fixed fare. The driver could be hired from a capable elderly person in the community. The subsidization cost per month is approximately 4,000-6,000 THB per month.

- Bungyitho we expect there are up to 354 riderships per week depending on fare (0-15TBH/ride). The optimal fare that can maximize system revenue is 5THB, which will generate the revenue of 10,000-14,700 THB per month. The service type would be fixed route every one hour during the community activity time.

  The appropriate vehicle type serving this community would be either a small three-wheel car or a golf cart with 5 THB fixed fare. The driver could be hired from a capable elderly person in the community. The subsidization cost per month is approximately 0-10,000 THB per month for an electric golf cart and 2,000-12,000 THB per month for a small three-wheel car.

Overall Recommendations for Elderly Transport System Design

Based on the findings, each type of transport service for elderly persons have pros and cons in terms of service capacity, convenience, safety and cost. However, to develop a sustainable transport system, it requires that the government (either local or national) must partly subsidize the system due to the following reasons:

1. Elderly persons usually travel less than other age group. We found that ones living in an urban area are travelling for community engagement less than ones in a suburb area. The community center would be the center of transport system with the requirement of parking space and management.
2. It requires the initial budget as a capital cost to purchase a vehicle. This initial fund could be polled from the community through association or got a donation from the government or corporation. Type and size of the vehicle would depend on the demand. However, the operating cost could be compensated from the fare revenue. To create job and community engagement, the driver might be elderly ones from the community.
3. The service route would be limited in the community only, without going to arterial roads for safety requirement. For urban area, small four-wheel car or three-wheel car

are appropriate. However, for suburb area, small four-wheel car, three-wheel car and golf car would be used depending on the coverage area.

Lastly, development of a new transport system in the community requires close collaboration from several organizations, especially for local government, local community and Department of Land Transport. To be successful, local community and local government would work together with strong support from the citizens in the area.

The successful transportation system in the community would lead to more participations of local citizens in utilizing the community center, create more jobs and save transport costs.

(g) Future Area to Take Note of, and Going Forward

This research finding can be applied to other communities with insufficient transportation system for elderly persons. It is noted that strong local community with adequate support from local government is crucial to develop and manage the transport system to serve the need of local users. This research can be a guideline for study in other areas to identify the significant factors affecting the demand of elderly transport, types of transport services and required operation budget. In addition, for transport academicians, we will understand more on the need of elderly persons on transport services within their community.

We expect that the findings from this proposed research would lead to significant contributions to the senior citizen welfare and their public transportation safety. This study would lead to policy recommendations to relevant organizations (Ministry of Transport, Bangkok Metropolitan Administration, provincial Municipals, etc.) to actually provide safe, convenient and affordable transportation system for senior citizens. The authorities would use the research findings and lessons to create a system that is suitable for their area.

(h) Means of Official Announcement of Research Results

We will submit our research to gather comments in reputable transportation conferences; both domestic and international. For domestic conference, now we already submitted the full paper in the 23rd National Convention in Civil Engineering (NCCE23) that was held in July 2018. Also, we plan to submit the research paper to the 13rd Eastern Asia Society for Transportation Study (EASTS Conference) that will be held in Colombo, Sri Lanka in September 2019. We expect the publication in the Journal of EASTS, following the conference