

学位論文の要旨 (論文の内容の要旨)  
Summary of the Dissertation (Summary of Dissertation Contents)

論 文 題 目

Dissertation title

Optimization of Paratransit System Operation by Considering Driver's Quality of Life

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Sustainable development has been highlighted as a guiding principle for addressing issues associated with rapid urbanization and environmental problems (Joo, 2008). Unfortunately, The path for a transition toward sustainability could not be charted in advance (Nrc Nas, 1999). Therefore, before establishing sustainable development in transportation, the government needs to figure out how to move the current position to the desired future state. In order to achieve that objective it involves the transition sustainability process, which in this process it is believed that the role of paratransit is very important. However, due to the complicated mix of positive and negative impacts of paratransit, it is still understudies whether this informal public transport would still be needed in the future or else whether actually paratransit is much more important in order to support the sustainable development of public transportation. Study of paratransit seizes researcher's attentions in developed and developing countries. The aim of this study is to develop a comprehensive study in order to provide policy suggestions to improve the paratransit service. The policy deliberation is based between evaluations on the optimized paratransit level of service and paratransit drivers' quality of life.

This research is divided into two groups of evaluations, which are subjective and objective evaluations. The research begins by collecting background (in the first chapter) and based on the literature reviews (in the second chapter) the author find problems that were essential to be solved. Although there are so many researchers conducted related to paratransit, there are still some limitations concerning stakeholder's point of views. The evaluations are discussed from chapter 3 to chapter 6 and concluded in the last chapter. The subjective evaluation is the evaluation of paratransit services from the perspective of environmental impacts and drivers' quality of life (QOL) as well as work performance, while the objective evaluation is the sensitivity analysis of paratransit network optimization. The objective analysis is conducted based on a multi objective optimization model to decide the optimal frequencies, where the objective function is to minimize the generalized cost of paratransit users and the operational cost for paratransit drivers. Then both analyses are combined together, using a jointly ordered-response probit model (ORP) model that can explicitly link the LOS variables with drivers QOL indicators. In the optimization framework, both operators' and users' behaviours are reflected; however the direct service providers are drivers of paratransit vehicles. If paratransit drivers could not provide satisfactory and reliable services, benefits for both operators and users would not be realized. If paratransit service provision could not improve drivers' QOL, drivers would not make efforts to provide satisfactory and reliable services. With the above consideration, this study suggests introducing drivers' QOL indicators to optimize the paratransit service. Finally, this study conducted sensitivity analysis in order to deliberate the policy suggestion to decide the paratransit future.

Chapter 3 Studies of the Link Performance Function (LiP), which is suitable for the traffic situations in developing countries where on-street occupancy influence is prevalent, are extremely limited. It is expected that the LiP might vary over local characteristics (i.e. Number of paratransit volume and stopping behaviour). The results confirm that the link performance in developing cities highly depends on not only the volume/capacity

ratio, but also the driving contexts such as road link variations, time variations, and/or the influence of on-street occupancy.

Chapter 4 This chapter aims to evaluate paratransit services from the perspective of environmental impacts and drivers' quality of life (QOL) as well as work performance. Paratransit drivers can be categorized as low-income people, where they are more likely to emphasize on achieving basic level of QOL involving wealth, employment, residence and health before enjoying other life aspects (higher level of QOL). For this purpose, the study implemented a questionnaire survey in September 2011 and collected the questionnaire sheets from 152 drivers from Bandung city. Using the data, a structural equation model with latent variables is built to investigate cause-effect relationships between work performance and driver's life satisfaction (as a proxy variable to indicate QOL) and environmental impacts while at the same time to measure the relationship between work performance and gap revenue and indirectly to work satisfaction. It is found that the existing condition for paratransit system are neither socially nor environmentally sustainable.

Chapter 5 This chapter presents a sensitivity analysis of paratransit network optimization for transportation planning in developing cities. The analysis is conducted based on a multi objective optimization model to decide the optimal frequencies, where the objective function is to minimize the generalized cost of paratransit users and the operational cost for paratransit drivers. Several scenarios are assumed to represent the behavioral features specific to paratransit users and drivers, as follows: scenario 1 changing the scale and shape parameters in the Bureau of Public Road (BPR) function, scenario 2 changing the flexibility of stopping places and scenario 3 combining scenarios 1 and 2 in order to derive practically feasible optimization solutions of paratransit services. The paratransit network in an area located within 1.5 km radius from the central station in Bandung city is used as a case study network. It is found that the influence of updated BPR Function which is analyzed in Chapter 3 is imperative while changing the flexibility of stopping place might not be the best solutions. The latter result is still arguable, therefore we improve the model.

Chapter 6 Our previous chapter showed that the current paratransit systems are not socially sustainable. In this study, it is aimed to clarify how the improvement of paratransit service affects drivers' quality of life (QOL). This was done by integrating the optimization results of a paratransit system (i.e., angkot) from the optimization model (Chapter 5) and the QOL evaluation results (Chapter 4) from a simultaneous-equation ordered probit model by using data collected in Bandung, Indonesia. As a result, it is found that minimizing the total cost of paratransit operation and users does not necessarily increase the operation frequency and total distance traveled for all routes, and the level of paratransit service surely affects drivers' QOL; however, improved paratransit services do not always improve drivers' QOL. It is concluded that driver's QOL needs to be reflected in decisions on paratransit operation

Chapter 7 This chapter provides the conclusions of the whole research by bringing out important findings obtained from the research and deliberate policy recommendation to be applied in the developing countries. This chapter also postulates the development possibility of the research in the future which will enrich the research findings and give more contributions.

備考 論文の要旨はA4判用紙を使用し、4,000字以内とする。ただし、英文の場合は1,500語以内とする。

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