A Study on Design and Implementation of a Community Rideshare Model on Regular Mobility Needs in Emerging Countries

アベディィン, ヌレン

出版情報：Kyushu University, 2021, 博士（情報科学）, 課程博士
バージョン：
権利関係：

（別紙様式２）

氏　　名　：　　アベディン ヌレン (ABEDIN Nuren)

論文題名　：　　A Study on Design and Implementation of a Community Rideshare Model on Regular Mobility Needs in Emerging Countries (新興国での定常的移動要求に基づくコミュニティ相乗りモデルの設計と実装に関する研究)

区　　分　：　　甲

論　文　内　容　の　要　旨

A travel behavior is determined by four major factors i.e., travel safety, travel duration, cost performance, and comfort. Besides the traditional public and private transport, a semi-private mode like ride-hailing services cover individuals' demands like ride-hailing services. Ridesharing in form of car-pool, school bus, staff bus etc. has existed from the past. A new transport concept called Mobility as a Service (MaaS), mostly popular in European countries integrates several transports and offers a one-point service platform to book a tour for a group or individual for long distance travels. This research focuses on mobility within a community where the trips are regular and short distanced. Community buses exist in Japan to cover rural areas, but these are highly subsidized. An emerging country cannot afford that. A community has different types of mobility needs and requires multiple services. Private car use by individual to meet these requirements is not financially viable, nor environmentally suitable. The public or semi-public transport cannot meet the specific community mobility needs.

It is observed that there are fundamental differences in transportation service development process in advanced and emerging countries. Policy and infrastructure come first and then the application to make efficient use of the infrastructure in advanced countries. On the other hand, in emerging countries, the sequence is completely the opposite. Applications comes first and then it drives the infrastructure development in an organic way. In Bangladesh, rideshare applications were first installed, affordable users switched their travel options to rideshare. New demand for new vehicles, roads, and policy have been created. Road safety, congestion in urban areas, ultimate regular commuting expenses are common concerns which motivated us to design a community rideshare model to maximize community benefits. No solutions or studies on such community rideshare model has been introduced before.

This research introduces a new concept of "community rideshare" and proposes a model, called SSW (Social Services on Wheels). Two communities (one urban and one rural with different demographics) in Bangladesh are studied, their travel behavior as well as the performance of SSW are presented.

First, this research carried out two separate surveys in two different communities to understand their daily mobility needs and their current travel behavior. The communities are: (1) Urban Small and Medium Enterprise (SME) (n=314) and (2) a rural community (n=83 households). Some of the findings of the survey are previously known but the study lists the consequences and root causes which become

important element for designing the proposed SSW model. The common characteristics are: (a) Short distance but long travel duration due to multiple transfers, longer route, waiting time and congestion; (b) No timetable of public transportation causes uncertainty of transport availability and failing to arrive destination on time with consequences of less productivity and bad impression; (c) Unsafe and insecure transports cause accidents, occurrence of incidents like theft, sexual harassment etc. The unsafe route and transport facilities ultimately cause problems like dropouts of high school girls in villages. Bad transport system also negatively impact SME employees work performance by causing lateness in arrival and irritating mental status.

Second, this study proposes an SSW model to meet the travel needs (guaranteed transport, on-time arrival, safe and comfortable ride, door-to-door service ensuring minimum hops and walking). The model also considers value-added services like in-vehicle office facilities including Wi-Fi and printing services. The model was configured for two studied communities to collect experiment data.

Third, two social experiments were conducted in two communities (a) SME community (2 months, 20 SMEs in one complex, two 10-seated-vans with 18 selected employees on two routes) and (b) rural community (2 months, 83 households, one 10-seated-van). Experimental data e.g., pickup time, drop off time, pick up and drop off points, vehicle movement and pause duration were collected by using our own developed software system and Google APIs. The collected data were analyzed to understand both qualitative and quantitative travel behavior e.g., increased travel safety, reduced travel duration, increased cost performance and increased comfort.

As SSW offers door to door service, number of hops become zero, the waiting time in the road can ideally be saved 100%. The benefits of SSW for urban SME community are reduced number of hops and reduced waiting time, and increased safety and comfort; the cost performance was satisfactory. SSW for rural high school girls reduced walking distance almost 10 times (from 5km to 0.5km) and 70-110 minutes of walking, provided safer and comfortable travel environment, reduces risk of sexual harassment and eve-teasing during school commute. In rural areas, apart from school bus service, more services (e.g., healthcare, goods delivery, emergency car, internet service etc.) were required to designed for financial sustainability.

Future work of this research would be identifying the criteria of potential users of SSW service in different communities. An extension of SSW service for Urban family mobility is also in consideration. This model can also be applied in rural areas of developed countries where transportation system slacking due to depopulation. Studying its application in such areas would also create valuable knowledge.