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Use of Stated Preference Survey to Determine Design Parameters of a Rideshare System: A Case Study from Sri Lanka

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1. Introduction

With nearly one million registrations at present, three-wheelers are the second-most popular vehicles on Sri Lankan roads, in terms of vehicle number. Promoting three-wheeler based taxi sharing could be one way of increasing high-occupancy vehicles on roads to cater to the existing trip purposes of road users while disincentivising the introduction of still-more three-wheelers to the existing fleet.

A short corridor of 1.4km length between the University of Moratuwa (UOM) and Katubadde junction in Sri Lanka was considered as the case location for this research as shown in Figure1. Available modes of travel for users in this corridor are bus, car and three-wheeler (TW). During morning and evening peak times, the share of road users from UOM is considerable. Students of UOM being a population of nearly 8,000 account for a larger share (90%) of all commuters. In the case of the corridor concerned, bus and TW are the most common modes of transport among students. The research objectives were to identify: (1) barriers in implementing ridesharing, (2) suitable approach to initiate taxi share and (3) realistic design parameters for ridesharing for decision makers.

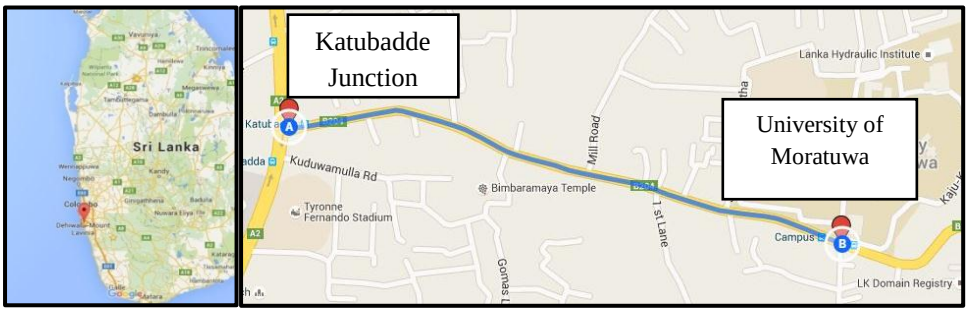

Figure 1: Location of the study area (Source: http://goo.gl/maps/QvPEd)

2. Methodology and Analysis

A group of 50 students were considered as a convenient sample while the population of interest was the cohort of undergraduate students of UOM. Face-to-face interviews were conducted along with structured questionnaires to collect data such as socio demographic, trip-related information including mode of travel to UOM and data such as opinion on ridesharing using TW.

According to preliminary analysis, students expressed a higher level of satisfaction (8.6 out of 10 point Likert scale) arising from TW use while being neutral about buses (5.5 out of 10). In addition, the analysis indicated that 24% of respondents have tried self-initiated TW ridesharing. Both the above findings strengthened the case in favour of TW as a mode for ridesharing. However, 56% of respondents openly expressed that the main problem in ridesharing is negotiation. While respondents were reluctant to initiate pooling, interestingly, 94% of respondents expressed their willingness to take part in ridesharing when pooling was initiated by others. Jayasinghe and Sivakumar [1] identified it as a social and cultural issue in developing countries in general.

In order to overcome the problem of negotiation, the study proposed an infrastructure modification by dedicated halt (Share-Point) for gathering of TW users would be planned adjacent to existing bus stops to invite all users who are willing to make a rideshare while accommodating 56% of people who believe negotiation as the main problem towards ride sharing.

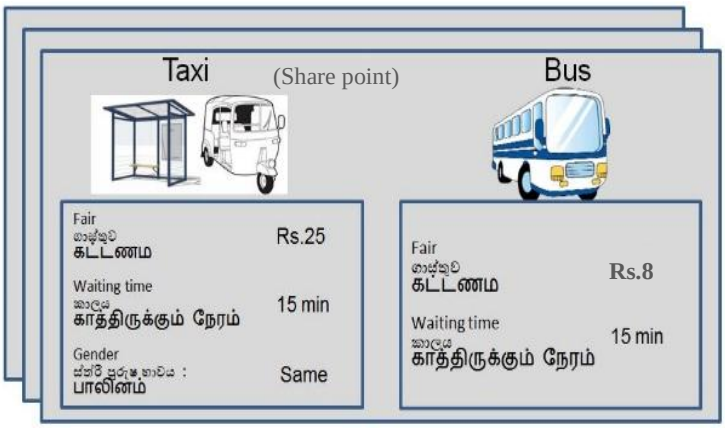

Figure 2: A sample card with SP survey question

A stated preference (SP) survey was designed to predict the future ridesharing market share based on this new share-point concept. Bus and TW were the only two modes considered as alternatives. Based on SP cards presented to respondents, the choice between two alternatives were recorded and analysed. In SP survey, bus fare

and average waiting time were fixed at LKR 8 and 15 minutes respectively while TW mode is attributed with different levels as follows: (i) fare in LKR [15, 25, 35, 45], (ii) Waiting time in minutes [5, 10, 15] and (iii) Gender [Same, Opposite]. The same 50 students were responded for SP survey with maximum of 24 cards (4×3×2) per respondent.

Based on responses collected, the probability of students waiting for ridesharing was identified as shown below in Table1.

Table1: Probability of TW being chosen over bus by a student

			TW fare per person/ (LKR)			
			15	25	35	45
Waiting time for TW/ (min)	5	Same Gender	0.98	0.62	0.48	0.26
		Opposite Gender	0.86	0.52	0.36	0.14
	10	Same Gender	0.90	0.54	0.38	0.20
		Opposite Gender	0.78	0.42	0.18	0.10
	15	Same Gender	0.76	0.34	0.34	0.08
		Opposite Gender	0.66	0.16	0.02	0.02

Though ridesharing was proven as win-win solution for riders and operators [1], ridesharing is still critical as the operators are motivated only by higher fares to make operators receptive to this system [2]. While the current fare per trip of the stretch is Rs. 70 and the maximum carrying capacity per TW is three riders as per regulation, ridesharing is possible with two or three riders. Therefore, realistic fare per rider to motivate operators would be LKR. 35 and LKR. 25 respectively, as shown in Table2.

Table 2: Willingness to share a TW against various design parameters

No of people to share	Most realistic fare per person/(Rs.)		Waiting time		
			5min	10min	15min
2 (minimum; for sharing)	35 (= 70/2)	Same Gender	0.48	0.38	0.34
		Opposite Gender	0.36	0.18	0.02
3 (maximum; as per TW capacity)	25 (≅ 70/3)	Same Gender	0.62	0.54	0.34
		Opposite Gender	0.52	0.42	0.16

3. Conclusion

This study identified volunteer reluctance to initiate a ridesharing negotiation as one of the major barriers among the people. Unlike in developing countries where various agents fill this gap through ridesharing clubs in Sri Lanka such clubs are not very common yet. Since TWs are generally waiting at informal stands closer to bus halts, this study proposed a share-point through a new infrastructure as a solution to overcome this barrier of negotiation. The proposal was tested using stated preference survey and ridesharing found to be feasible.

The SP survey also identified willingness to wait at share-point for TW along with various design parameters which could be used as initial estimators for decision makers. Willingness to go for rideshare from same gender was identified as being always higher than that of opposite gender which reflects local culture.

Gender category of same-gender and opposite gender can be further studied by considering all possibilities of gender mix (namely MMM, FFF, MM, FF, MMF, MFF, MF, where M and F stand for male and F respectively) for better clarity as gender would be a sensitive parameter in developing countries.

Reference:

[1] Jayasinghe R.M.T.T.B., Sivakumar. T. (2014), "Applicability of Ridesharing Using Paratransits: A Case Study From A University Community In Sri Lanka", Asia Pacific Conference on Transportation and The Environment

[2] Redmiles, E. (2014). Human factors and requirements for a successful mobile platform dynamic taxi-share system in the USA.

Keywords: *Ridesharing, Stated Preference, Para-transit*