IMPACT OF RIDE-SHARING ON PUBLIC TRANSPORT IN DHAKA CITY: AN EXPLORATORY STUDY

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ABSTRACT

The rapidly growing ride-sharing, an on-demand mode of transportation, is becoming more common amongst the daily commuters of Dhaka city, the capital of Bangladesh in recent years. This paper focuses on evaluating the impact of ride-sharing on Dhaka's existing transportation system; hence estimating the modal shift due to the introduction of ride-sharing transport.

In total 1007 ride-sharing app users of Dhaka city were interrogated in person with a well-structured questionnaire survey to assess their perception regarding this new mode of transportation. Respondents' basic demographics, trip purpose, trip origin and destination were also documented for comprehensive analysis. The effect of different aspects associated with travel behavior on modal shifting and induced travel was explored through analysis.

From socio demographic aspect of respondents it was observed that, high percentage of users are from middle income class who showed interest to pay extra charge in exchange of better service. The study perceives that around 28% of the respondents shifted from public transport to ride-sharing. Poor accessibility, lacking of reliability and comfortability are substantially decreasing the public transport demand day by day. Furthermore with the integration of a new facility, 'carpooling', to the ride sharing service, a significant percentage of the commuters who prefer public transport will avail this new provision due to its attractive fare schedule. This induced travel due to 'carpooling' has shaped the existing transportation system to a balanced one.

The research will provide a synopsis of the public perceptions to the concerned authorities to ameliorate the services of this promising transportation mode, along with the public transport, towards building a better sustainable transportation system.

Keywords: *Ride-sharing, Public transport, Modal shifting, Carpooling, Sustainable transportation system.*

1. INTRODUCTION

Rapidly growing ridesharing services have significantly influenced in transforming existing transportation system in Bangladesh. In recent years Bangladesh has been experiencing strong economic growth and simultaneously has an increasing internet penetration rate (Kamal and Ahsan, 2018). These have paved the way to ridesharing to be flourished conspicuously. Ridesharing in Bangladesh is no more a new emergence. E-hailing transport services have been spearheading in this sector since 2015. Now the impact of this service to the existing situation is needed to be assessed.

Though the country is experiencing rapid economic growth, it lacks in quality of public transport to satisfy people's demand. Poor quality services, unsustainable trend of development, proper integration problem are some of the reasons why public transportation in Bangladesh is still lagging behind whereas ridesharing, an on demand travel mode, has changed the travel behavior of city people (Palma, 2019). It provides door to door service and in no time it has become the most convenient and available mode of transportation of Dhaka city. Ridesharing is also expanding in other large cities like Chittagong and Sylhet. Thus a significant modal shift from public transport has been observed due to the influencing effects of ridesharing.

This study focuses on the results of public opinion to assess the impact of ridesharing. A constructive questionnaire survey was conducted for evaluating public opinion. The collected data include respondents' demographic, socioeconomic and trip related information. Besides existing scenario of ridesharing in Dhaka city has been developed assessing public opinion. A new terminology 'carpooling' has been introduced to the participants. And the response towards 'carpooling' was noteworthy. The probability of induced percentage to ridesharing from public transport has been identified by analyzing the effect of ridesharing on modal shift. The result of this significant modal shift highlights the lacking of public transport and other modes apart from ridesharing available in Bangladesh to attract commuter.

People's modal choice is shaped by various factors and among these- comfortability, trip completion, responsiveness (Rahman, Das, Hadiuzzaman & Hossain, 2016) and such other factors were taken as the influencing ones in this study. Based on their experience respondents rated the services provided by ridesharing. Thus a distinct idea about overall service quality provided by ridesharing has been developed.

The aim of the study is to provide information about this fast growing mode of transportation which can be used as supplement of public transport in Bangladesh. Transport is the key infrastructure of a city and the economic expansion depend on public transit option. Thus integration of ridesharing and quality public transport can lead towards a sustainable transportation system.

2. LITERATURE REVIEW

Shared transport is an on-demand vehicle-sharing arrangement, where travelers share a vehicle along with the cost of the journey, thereby creating a fusion between private vehicle and public transit. (Shared Transport, 2019; Agatz, Erera, Savelsbergh & Wang, 2012). Ridesharing is no more a new emergence. At present it is one of the most common means for commuting. For better understanding the impact of ridesharing on existing transportation system, researchers have begun to analyze the perception of commuters towards ridesharing (Amey, Attanucci & Mishalani, 2011).

Mahmoudifard, Kermanshah, Shabanpour & Mohammadian (2017) comprehend the characteristics, preferences and behavior of people who use ridesharing to assess it as a new mode of transportation. This paper aimed at studying the travel behavior associated with Uber riders by conducting an online survey in Chicago area. Another study (Azudin, Norhashim & Nachiappan, 2018) developed SERVQUAL model for evaluating consumers' perception of service quality provided by Uber. The findings of the paper provide that the Uber business model is viable in small city like Ipoh. Again the

perception of commuters and operators in Metro Manila of Uber and GrabCar was determined by another study (Paronda, Regidor & Gaabucayan-Napalang, 2017). This study assessed that Uber or GrabCar could be a convenient substitute of private cars and safety and reliability were the two top most reasons for using ridesharing. Limpin (2018) investigated the factors which positively influenced users attitude towards ridesharing in Philippines. Several studies analyze the service qualities that act behind the overwhelming popularity of ridesharing. Sharma and Das (2017) identified particular service qualities that affect customers' satisfaction in India. They explored that the appearance of physical facilities personnel and printed and visual materials were the significant factors for overall user satisfaction derived from online cab service.

Some studies make a comparison between ridesharing and existing transportation system like taxis or public transport (Sun & Edara, 2015). Rayle, Shaheen, Chan, Dai & Cervero (2014) made a comparison between taxi and ridesourcing trips in their paper. The results indicated the differences between taxi and ridesourcing in context to users and user experience. According to the paper shorter waiting time and consistent mode of travelling have made ridesourcing popular than taxis. Hoffmann, Ipeirotis & Sundararajan (2016) investigated the effects of ridesharing on public transit systems. Their study employed that an increase in ridesharing could counteract the declination in public transportation use, at least in response to subway system shocks in the U.S.

Ridesharing has invaded over the existing transportation system in Bangladesh also. Kumar, Jafarinaimi & Morshed (2018) examined the amendment of Dhaka's existing transportation system with introduction of Uber by practices and infrastructure of mobility across the city. Still there is a lack of comprehensive study about the impact of ridesharing on public transport in Dhaka city and riders' perception about it.

The current study aims at considering different aspects of ridesharing as a new alternative mode of transport in Dhaka city. Here the demographic of the respondents and existing scenario of ridesharing have been presented. This paper also attempts to identify the fact which have the potential to encourage users to switch from public transport to ridesharing. 'Carpooling' a new terminology for Bangladesh was being introduced among the respondents and induced travel to ridesharing was observed due to its shared travel cost.

3. METHODOLOGY

To assess users' perception regarding ridesharing, a well-structured questionnaire survey was conducted in Dhaka city. The selection of an appropriate questionnaire survey outline for this study was based on Mahmoudifard et al. (2017) and changes were made to fit with context in Bangladesh background. The survey was conducted in potential locations expecting high concentration of ridesharing users from January 2019 to April 2019. For easy access of data online based survey was carried through Google Forms whereas field based survey was adopted for collecting data along with real time passenger feedback. Bashundhara City Shopping Complex, general offices and banks, university areas and key locations of street with high concentration of ridesharing users (figure 1) were identified for survey purpose.

The questionnaire, comprising of 25 questions regarding basic demographics, trip origin and destination, trip purpose, car ownership and alternative modal choice, took an average of 5 minutes to complete. A total of 1041 questionnaires were distributed and a convenience sample of 1007 were accepted after excluding 34 respondents for their incomplete responses. Correlation between demographic characteristics of respondents and induced traffic along with modal shift were explored through analysis of the received data.
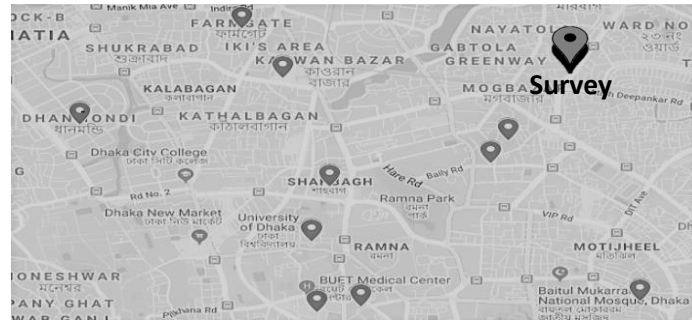
Figure 1: Survey Area

4. DATA ANALYSIS

In this section the key findings from the survey including respondents' demographics, existing scenario of ridesharing in Dhaka city, modal shifting to ridesharing and induced travel have been discussed.

4.1 Respondents' Demographics

Among 1007 respondents 65% of the total respondents were male and rest 35% were female. Though the percentage is male dominating, women participation in ride sharing service is increasing rapidly due to the poor existing transportation system of Bangladesh. The present safety and security condition in public transport for women in Bangladesh is alarming.

Among the respondents 52% were student that is 526 in number. This presences sampling bias. Again it also indicates that the rate of embracing and using new technologies among young generation is much higher. As ride sharing services are comparatively expensive than public transport, percentage of unemployed using ridesharing is the least that is only 45 in number.
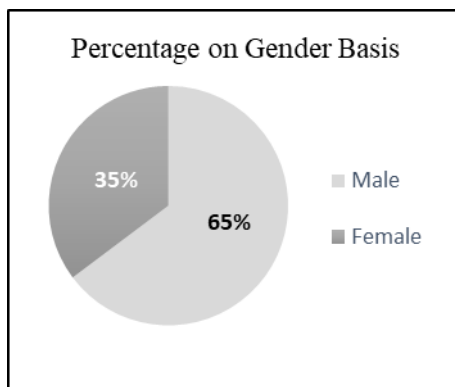

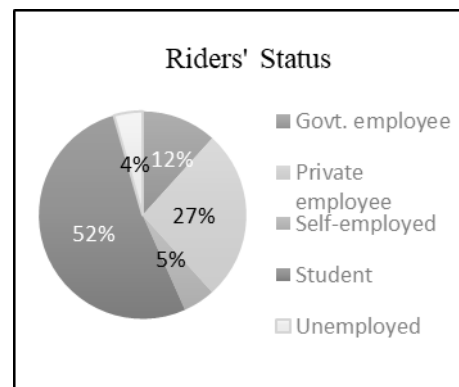Figure 2: Relative Percentage of Respondents on Gender Basis

Figure 3: Percentage of Riders' Status

Based on riders' response, information about car ownership was collected. And it is noteworthy that 19% people use ride sharing services inspite of having at least one car. This is due to the parking problem in Dhaka city and also expenses of using private cars. This indicates decreasing dependence on personal vehicle. This is also an indication of mode shifting to ridesharing and reduction of idle time for vehicles.

In Bangladesh modes available for ridesharing are car, motorcycle and CNG. Among the modes car is the most popular. As highest percentage of ridesharing users are students, they prefer to make their

trip in group. So the car user percentage (44%) is higher than motorcycle (35%). 21% people use both car and motorcycle.
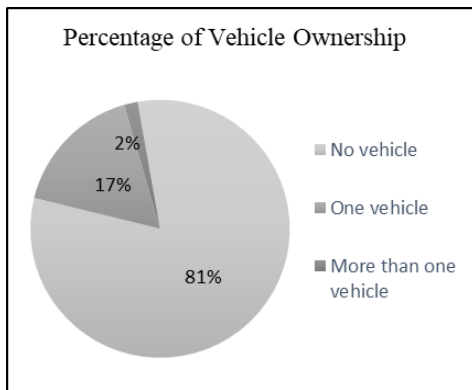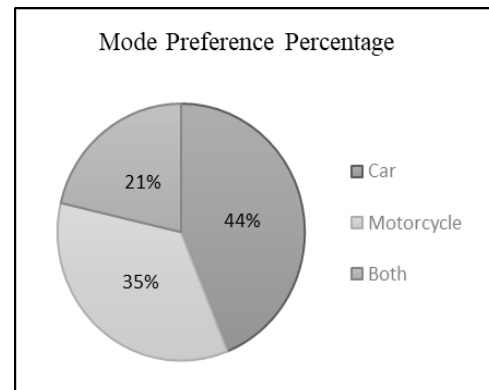

Figure 4: Vehicle Ownership Percentage

Figure 5: Percentage of Mode Preference

The questionnaire survey conducted among the 1007 app-based ride sharing service users shows that 44% users prefer international app (e.g.-Uber), 33% prefer national app (e.g.-Pathao, Obhai, Shohoz) and 19% use both national and international app. Uber service is slightly more popular than national services among people inspite of being launched later on national services (Pathao (2015), Shohoj (2014), Uber (2016)). Figure 6 illustrates the results.

Respondents were asked about their general purpose of using ridesharing. From figure 7 it is seen that work trip encompasses larger portion which is 35% of the total respondents. From respondents feedback it is known that students use ridesharing for variety of purposes like- going to school/colleges, shopping, outing with friends, going for restaurants and other social activities. For that, although highest percentage of ridesharing users are students, going for school/university is only 21% which is 271 of 1007 respondents.
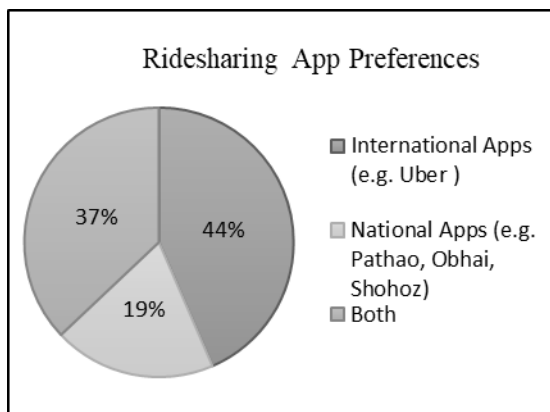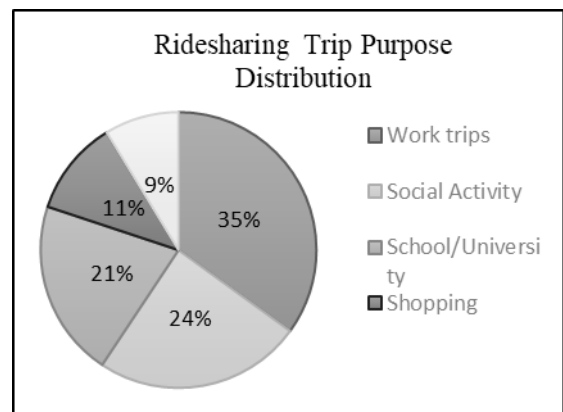

Figure 6: Percentage of Ridesharing App Preferences

Figure 7: Percentage of Trip Purposes

4.2 Existing Scenario of Ridesharing

Respondents were also asked about their necessity of having a car when ridesharing is available. Among 1007 respondents 189 people have at least one vehicle. From these 189 people 22 replied that they don't need a vehicle now. From figure 8, it is seen that 13% of car owner don't feel the necessity of having personal vehicle anymore. This indicates mode shifting from personal vehicle to ridesharing. The idle time of ridesharing is less than personal vehicle as the vehicles need not to be parked.
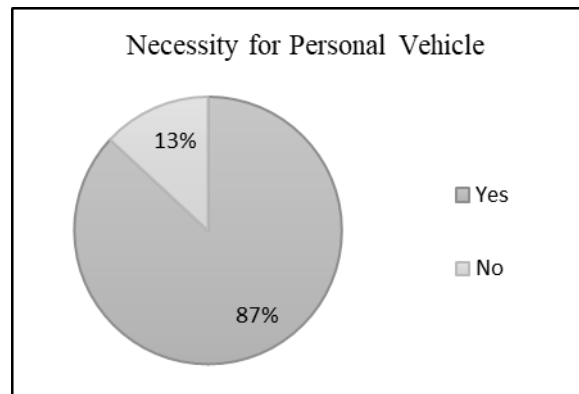
Figure 8: Necessity of Personal Vehicle Ownership

4.3 Modal Shift to Ridesharing

From analysis it is observed that, income range for most frequent ridesharing users are from 75-150 (in thousand). A systematic pattern is seen in frequency of using ridesharing with income range. Ridesharing user frequency increases with higher income but after a certain point, frequency starts decreasing with increase in income (figure 9). People with low income (0-25 thousand) prefer public transport for daily trip. Where people with income range 25-75 thousand and 75-150 thousand mostly prefer ridesharing for daily ride. In contrast people with high income (ranges from 150-300 thousand and greater than 300 thousand) use their personal vehicle for outing.
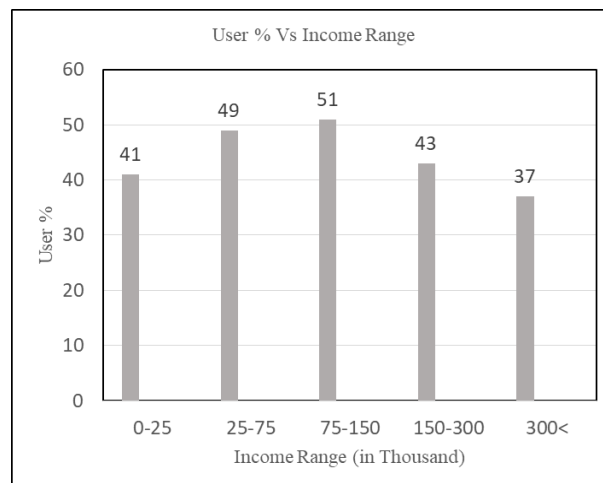

Figure 9: Ridesharing User Frequency with Different Income Level

Many factors can influence users' mode preference. Respondents were asked when there was no ridesharing service available what their preference for daily trip was. This result is presented as a comparison of mode preference between before and after launching ridesharing. 72% of 1007 riders replied they used public transport before launching ridesharing. Figure 10 shows that among the same respondents only 44% use public transport for daily trip now after launching ridesharing. Thus 28% public transport users have been shifted due to ridesharing. Similarly, percentage of other modes of transport (CNG/Auto rickshaw) users have been fallen from 13% to 8%. This huge shift from public transport definitely indicates the lacking of the Govt. to attract people by providing contemporary facilities. This will result in more vehicles on the road.
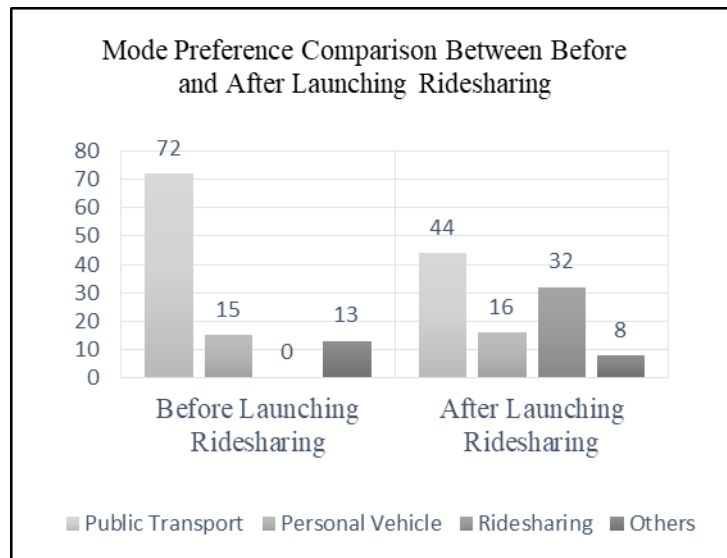
Figure 10: Mode Preference Before and After Launching Ridesharing

4.4 Carpooling and Induced Travel

A new feature carpooling (shared ride service) was introduced among the respondents which is currently not available in Bangladesh. 44% people of the total respondents prefer public transport for their daily trip. From respondents' feedback it is known that cost is their main reason behind not using ridesharing. But after introducing carpooling a significant change has been noticed in their response. Among these 44% people, 69% responded positive towards using ridesharing after knowing about carpooling which gives the opportunity of sharing ride as well as cost. Thus, induced percentage to ridesharing is around 30%. As a consequence, this 32% ridesharing users (Figure 10) will jump to 62%. Nonetheless this substantial percentage can affect on the existing transportation system.

Based on ridesharing users' feedback the following features were found which directed them to ridesharing-

- o Quality of the Vehicle- About quality of vehicle 64% riders feel satisfied with the quality of the vehicle. Riders termed it as one of the major influencing characteristics for choosing ridesharing. A few user experienced low-quality vehicles specially car.
- o Cleanliness of the Vehicle- About overall cleanliness of the used vehicle with ridesharing 59% responded as satisfactory or very satisfied. And another 16.5% people are dissatisfied with the cleanliness. About cleanliness issue motorcycle users mentioned about the problems of using same helmet.
- o Riding Safety- About safety issue car users feel safer than motorcycle users. Among the car users 72% responded satisfied or highly satisfied whereas among motorcycle users 57% responded satisfied. A few riders face hijacking during a ride.
- o Female Security- Riders were asked to comment on female security in ridesharing according to their perspective. 43.6% riders were satisfied about female security issue. They termed it far better than Dhaka's existing public transport. Due to this percentage women are focusing on ridesharing rather public transport. Another 25.1% riders think that ridesharing is not women friendly. The environment of ridesharing should be improved.
- o Upgradation of Ridesharing Applications- For giving improved services ridesharing applications are upgraded. 56.2% riders were satisfied with upgradation. But 14.3% riders responded negative towards existing upgraded version.
- o Charges of Ridesharing- In case of the charges of ridesharing service, 32.1% riders had no comments. However, they said the charges are within their affordable range. This percentage is willing to pay even extra charges but be comfortable on their trip. But 32.2% riders termed the charges 'too high' whereas 35.9% people are satisfied with the charge. They use ridesharing on a regular basis.

5. CONCLUSIONS

This paper represents the results based on current research to analyse the impact of ridesharing on Dhaka's existing transportation system as a new mode of mobilization. This new mode has shifted consumption habits of commuters and induced travel due to carpooling. To identify the impact of this new mode, a questionnaire survey was conducted in Dhaka city.

From the analysis, it is found that the maximum number of ridesharing users are from middle income commuters. Lower income groups are prone to be more sensitive to the expense and thus they are reluctant to pay high value for commuting. Besides, the higher income group have more flexibility on mode choice because of their car ownership (Lane, 2005; Katzev, 2003). Therefore, the percentage of ridesharing user is much affected by middle income commuters as they have less flexible work schedule and willing to pay high value for commuting (Shaheen, 2012). These results match with the real scenario quite fairly.

Moreover, the study shows a statistically significant decline in percentage of public transport users. Pojani and Stead (2015) stated that minimum cost and high quality got the maximum preferences among the commuters for trip purpose. Here 'cost' denotes to expense for travelling and fast speed associated with safety, comfortability, punctuality and reliability are the criteria for specifying 'high quality' (Chen, 2018). Though ridesharing is expensive compared with public transport, but high quality of ridesharing has seized out the commuters (Furuhata et al., 2013). The declining percentage of public transport users captured from the analysis reflects the above-mentioned scenario.
The findings in response to 'carpooling' among the public transport users have been found to be positive towards ridesharing. On account of carpooling, a major percentage of public transport users will be induced to ridesharing as carpooling not only reduces fare of travelling but also saves time, interest and energy. This induced percentage will undoubtedly impart effect on Dhaka's existing transportation system. Further investigation on this induced travel is required for an overall development of existing transportation system of Dhaka city.

This study focuses on assessing impact of ridesharing on existing transportation system based on users' perspective. It is recommended that future studies should explore this impact using more representative data from both users' and drivers' perspective. Future studies could also investigate to obtain detailed information regarding the falling rate of public transport users so that this could be a potent solution to several transportation issues. Comparing the effect of other modes of transportation with ridesharing will enhance this research as well as ameliorate towards building a sustainable transportation system.

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