

**ASSESSMENT OF SERVICE QUALITY, SAFETY AND SECURITY OF RIDESHARING
SERVICES FROM PASSENGER'S PERSPECTIVE IN DHAKA CITY**

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PROJECT REPORT APPROVAL

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DEDICATION

We would like to dedicate this research to our respected parents and siblings.

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First and foremost we would like to thank our supervisor Dr. Shakil Mohammad Rifaat. We are very grateful to him for his continuous support, patient guidance and valuable advice. Without his help it would never be possible to complete this thesis work. His availability and encouragement throughout our thesis have helped us increase our productivity.

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ABSTRACT

The introduction of ride sharing companies has brought a vast impact on the Transportation field since the start of last decade. It is a form of shared mobility that provides on demand vehicles for hire services. In this system passengers can take rides through a cell phone based app. Likewise cities in developed countries, the ride sharing companies are gradually gaining popularity in the cities of developing countries as well , for example, in Dhaka , the capital of Bangladesh . Though these ride-sharing services are offering many benefits to the commuters in Dhaka City, their service quality and safety issues are often criticized and neglected. However, no visible study, if any, is observed which has assessed the service quality as well as safety and security from the passengers' perspective of ride-sharing services in Dhaka city.

Thus, the main objective of this study is to analyze the service quality and security of ridesharing from user's perspective in Dhaka city. For this purpose this study tries to identify the customer's satisfaction level by assessing the service quality of the ridesharing companies where the service quality incorporates availability, reliability, assurance, responsiveness, comfort, empathy, price fairness, drivers' behavior & attitude, etc. of the offered services. Moreover, as the mechanism of ride-sharing facility is fully app based, the service quality of apps (i.e., user friendly or not, whether the app provides real-time GPS location through efficient network availability, adequate information about the driver and the vehicle etc.) will also be evaluated from the user's perspective. With the increase of ride sharing services, the matter of personal safety and road safety of the passengers has now gained attention. Many incidents of various types of harassment and assaults of passengers along with the inflicted injuries from road crashes are reported from those rides. Thus the safety scenario would be assessed from two perspectives, firstly, personal safety of the passengers and secondly, road safety. Satisfaction level on personal security (i.e., easy availability of driver's identity, vehicle registration number, helpline number etc.) and road safety issues (i.e., speeding, overtaking, illegal lane changing, seat-belt and helmet usage etc.) will be evaluated from ridesharing users' point of view.

To assess the service quality, safety and security, 153 people have been surveyed by means of questionnaire forms. Through this questionnaire survey information on

respondents' socio-economic, demographic, trip characteristics etc. have been collected along with their satisfaction level on service quality and safety provided by ride sharing services. Linear Regression model will be used to establish a relationship between respondents' characteristics and their satisfaction level on service quality, safety and security. The results of this study will reveal that the satisfaction level on the provided service and security greatly varies among the respondents based on their socio-economic, demographic and travel characteristics. Through this study the actual scenario of service quality and safety provided by various ride-sharing companies will be unveiled. The findings of this study would be beneficial to the policy makers as well as authorities of the ride sharing companies for taking necessary measures to improve the existing provided services and security offered to the passengers.

Keywords: Ride-sharing, Service Quality, Safety, Security, Linear Regression Model.

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List of Abbreviations

CNG	Compressed Natural Gas (Three wheelerCNG driven vehicle)
DUI	Driving Under Influence
DWI	Driving While Intoxicated
GPS	Global Positioning System
IRT	Incident Response Team
OLS	Ordinary Least Square
RSS	Ride-sharing Services

Chapter 1: INTRODUCTION

1.1 Background

The popularity of ride-sharing services is increasing among the commuters across the globe at a fast pace. Compared to flag down taxis, customers are happy to pay for convenience and a lesser fee. As the satisfaction of customers leads to repetition of purchase, brand loyalty and positive reviews, customer satisfaction becomes the foundation for the success of any business. (Angelova and Zekiri, 2011) Outside the USA, de Souza Silva et al. (2018) found based on an online survey that a half replacement of taxicabs, 30% public vehicle replacement and 18% vehicle trips replacement have been implemented in different cities of Brazil. On the other hand, Tang et al. (2019) found that there was a 35.1% substitution of taxicabs, 37.4% substitution of public vehicle and a 17.3% private vehicle trips substitution which was reviewed in ten Chinese urban communities. In the range of 5% to 12% pace, the ride-hailing trips in the United States have been accounted. (Alemi et al., 2018; Gehrke et al., 2019) So, the use of the ride-hailing services in the world especially in the developed countries is immensely important. But from a site, Investopedia, in its first report as a public company, from the Uber companies it is said that more than \$1 billion on \$3.1 billion in revenue have been lost in the 1st quarter of 2019. So, there exist discrepancies on the way these ridesharing services are designed and used in the world. Customers faced problem with price, safety, pickup points, driver's attitude, response of complains, car interior etc. According to a report of 'The Guardian', in 2017, 2,936 reported sexual assaults have been counted during 1 billion US trips. As per the US Safety report, in 2017, in over 8.2 billion miles, there were 49 "Uber-related" fatalities and over 1.3 billion miles there were 58 "Uber related" fatalities.

The developing countries like Kenya, Nigeria, Egypt etc. have very poor public transportation system as such on demand transportation system provided by the ridesharing services have given great service to the customers and thus the ridesharing services have expanded in the developing countries as well. But despite the benefits of ride hailing, it is not the perfect solution to the

transportation problems the developing countries face with huge population. Thus it is a complex concept to grasp. In a research paper for Pune city of India, (Mahapatra and Telukoti, 2018) cab services are used by 13% of the consumers on a daily basis. Uber cab services are preferred by only 2% where there is no city transport. The reason behind might be the lack of centralized IT infrastructure. As such, driver's history cannot easily be determined and the lack of proper information causes a security issue both for the passenger and driver. According to WHO, through surveying, 17% of women responded that lack of women driver is the reason behind not using the Uber app that often and when travelling alone or at night, 40 percent women prefer woman driver. According to World Economic Forum, in India, four major cities are estimated to be losing \$22 billion annually to traffic congestion. And economic downfall occurs due to road deaths and high traffic congestion causes these road deaths.

One of the key indicators for economic development in the developing countries like Bangladesh is the advancement of transportation and communication system. Considerable efficiency, safety and reliability are important for the commuters of the Dhaka city as the city is mostly densely populated and one of the congested cities in the world. In this city, one of the most popular modes of public transportation is the three-wheeler auto-rickshaws or CNGs because of the fare-pricing and availability. But by refusing to charge by the metering system and not taking trips which doesn't generate higher prices has caused CNGs demand to decrease significantly. On the other hand the charge taken by taxi cab was way too high for the general people. Thus the use of taxi cabs also came down. According to the World Bank report in the Dhaka city, 3.2 working hours per day is taken up by traffic congestion which causes addition of 600 million working hours per year. The introduction of app-based ridesharing services became a blessing as it provides commuters with door to door pickup, ease of finding transport and app-based fare estimation. On 21st November, 2016, Uber launched its ride-sharing services in Dhaka. And then Pathao was introduced in Bangladesh for personal users followed by other companies such as Jobike, Obhai, Obon, Amarbike, Texiwala, Gariwala, Shohoz-ride, Chalu, and others. With the rapid growth of ride-hailing industries, much investigation on service quality becomes essential. Now better quality with utmost professional approach is seek by the consumers. And the business can mostly be successful when the demands of customers are met properly. From the paper, Hanif et.al, (2010), 37.8% satisfaction of customers depends on the fairness of price and services of customers and rest of 62.6% depends on the other variables which have not been

taken into consideration in the research study. This service quality includes availability of ridesharing vehicles, comfort inside the car, reliability etc. Technical issues are also there like network availability, inefficient GPS navigation system, issues with drivers like driver's misbehavior towards passengers, not willing to accept digital payment system, cancelling trips etc. (Showkat and Chowdhury, 2019)

With the passage of time many people in Bangladesh started to avoid ride-sharing services because of the security issues. Especially women feel unsafe due to various reasons during the night time. 21% people avoid using ridesharing services as real time information needs to be provided. (Islam et al., 2019) From the report of "The Business Standard" in the early 2020, a complaint was filed by two women as they were physically assaulted by an Uber driver. Likewise, all things considered, a portion of these are just not all that enthusiastic about taking care of issues concerning drivers' evil conduct, not getting travelers subsequent to tolerating a call, consistently getting some information about the objective, and mentioning the client to go on a disconnected outing. Additionally, respondents likewise recognized maltreatment of individual data (9%), missing helmet of passengers (8%) and accident risk (6%) as the issues of this assistance. (Islam et al., 2019) From a report of Asian Age Online, Bangladesh, 215 charges about sexual assault or other accusation was uncovered by two inspections. The complaints included discrimination, sexual harassment, bullying, unprofessional behavior, retaliation, physical security and wrongful dismissal. And there have been many cases of sexual harassment recently. (Meyliana et al, 2019). In (Cynthia et. al, 2019) it was found that at night 46% participants prefer bus over Uber services as they don't feel safe enough. So it is necessary to analyze from both personal safety and road safety. From personal safety consideration of whether the driver's id is correctly known, whether the passenger checks the vehicle registration number, stays online while travelling, knows the different help-lines etc. And from road safety, violation of traffic rules, accidents, time of the day etc. As a result, the necessity of these safety features from user's perspective needs to be explored.

Different people have different demographics, socio economic conditions, travel characteristics, consumer preferences from the ridesharing services. Profit can be earned and revenue of the ridesharing companies would increase if these factors are known and a relationship is created between the satisfaction of customers and service quality and safety of the system. So the

vehicular crashes, fatalities, injuries and safety related externalities are investigated in this study. In a wider sense this would eventually help the consumers to get better facilities from the ridesharing services and there will be fewer accidents & crimes committed from this, thus safer ride would prevail. There are researches on the ridesharing service quality in Bangladesh but not many researches has been done on the assessment of safety and security of ridesharing services from passenger's perspective particularly in Dhaka city. As such a study on the assessment of service quality and safety of ridesharing services from user's perspective have been prepared so that a relation can be made with the customer satisfaction and the service quality and safety. A wide range of factors from socioeconomic and demographic characteristics, travel characteristics, location etc. in Dhaka city are explored in this context. Dhaka is chosen as the study area because it's the capital city of Bangladesh; its population is rapidly increasing as such it has the maximum use of ridesharing app in Bangladesh.

1.2 Problem Statement

The success of a service depends on a lot of things. For ride sharing services, service quality, safety and security of the users, defines whether the service is successful or not. Personal security of the users is the most important issue of any transportation system. Passenger harassment is one of the major problems in the aspect of ride sharing services. Passengers often face unexpected behavior from the drivers. As these ride sharing services are app based, and sometimes users need to provide their personal numbers to use these apps some occurrences like unwanted phone calls from the drivers are reported from the users. This is specially happening in case of female users.

Another problem, which is pretty common, is that the drivers are charging more than the predetermined amount. That is more like typical contract riding than the actual ride sharing service. Though there are system of giving drivers feedback and reporting, these are not always effective.

Inexperienced drivers often cause riders dissatisfaction. The whole ride sharing system greatly depends on using modern technology. A driver need to know how to use maps, how to find a

location, how to use the app correctly. But because of poor surveillance, these matters often remain out of knowledge. That causes great problems for the passengers. There are a lot of cases reported as the driver could not get to the location of the passenger because of his lack of knowledge of using maps or other technology. Passengers are often asked to come to some point near the driver. But this is totally unexpected. Time maintenance becomes difficult for the users for these reasons the system is a mobile smart phone app based system, so there a question arises if the system is user friendly, and can people of all types use them properly. That affects the service quality of the system.

Driving unsafely, breaking the law is also causing problems. Not only inexperienced drivers, old and poorly maintained vehicles can also pose dangerous. Most of the ridesharing services do not perform regular inspection of vehicles. Some services do review photos of vehicles before rideshare driver applicant is approved. But this is not always effective. Unfit vehicles sometimes get approval that can cause accidents.

As most of the ride-sharing services are provided 24hours, night time safety is very important for the passengers. In our country where people's safety and security is always questioned, a night time trip is actually challenging and risky. People are not actually comfortable using transports after midnight. It is important to find if ride sharing services are safer than the other transport systems during night time

1.3 Objective of the study

The objectives of this study are as follows,

- To determine the factors that affects the service quality and safety of the ride-sharing services from the perspective of the passenger.
- To determine the impact of these factors upon the experience of the passenger using ride-sharing services.
- To provide possible measures that has to be implemented in order to improve the service quality and security of the ride-sharing services.

1.4 Significance of the study:

1.4.1 Contribution to Literature

- It will emphasize upon the factors that control the service quality and safety of the passengers in ride-sharing, in Dhaka city which has been given little attention.
- New factors that affect passengers experience can be found out with this study. In the developed countries previous studies like this was also done. (Hanif et al.,2010). But, since Bangladesh is a developing country and the road infrastructure is very poor so the factors that are to be considered while ensuring the security of the passengers will be different from the other studies that has been done in foreign countries because the road infrastructure of Bangladesh is different from that of the developed countries.
- It will develop a linear regression model which will show how the factors vary the experience of the passengers using ride-sharing.
- This study will also show how the change in factors enhances the experience of the passenger using ride-sharing service.

1.4.2 Contribution to Policy making

- This study will provide evidence based recommendations to the ride-sharing companies to improve the safety and security of the passengers based on the road conditions of Dhaka city.
- This research will also help the ride-sharing companies to make the users more aware of the policy of the apps that are being used.
- Although there were many complaints regarding unwanted occurrences in the ride-sharing services, the companies are unable to put a halt because the policy has some flaws. This research will contribute in the improvement of the policy in order to reduce the amount of crime and provide better service quality to the passengers.

1.5 Scope of Research

This study will analyze and examine the present conditions of ride sharing services. Data will be collected from the passenger's perspective. Different factors working behind will be analyzed. The key focus of the research is the service quality and safety of ride sharing services from passenger's perspective. Dhaka city will be used as study area. Data will be collected from the users of ride sharing services inside Dhaka city. The study will unveil the significant factors working behind.

There will be two case studies. In each of the case studies, linear regression model will be used to analyze the collected data. The 1st model will study different factors like socio- economic, demographic and travel characteristics affecting the overall service quality. Similarly the 2nd model will study these different factors affecting the overall safety of ridesharing services.

1.6 Outline of Thesis

The thesis is organized into six chapters. After the introduction in first chapter, the other five chapters will cover the following topics:

1.6.1 Literature Review

In this chapter, factors associated with service quality and safety of ridesharing services which were explored in previous studies has been reviewed. Important information and finding from these studies are also documented.

1.6.2 Data and Methodology

Chapter three describes the sources of the database used in this study as well as methodology followed in statistical analysis. This chapter also discusses the different socioeconomic and demographic data, fatalities scenario in Dhaka city and detailed procedure of the linear regression analysis.

1.6.3 Analysis and Model Development

In this study, two models were developed. As the process of analysing the data are incorporated in this chapter, the two models that were developed are discussed here as well as.

1.6.4 Results and Interpretation

Two different models (service quality and safety) are presented in this chapter to address the objective of this research. From the analysis, obtained results are stated here. Explanation of the results is discussed rigorously in this chapter.

1.6.5 Conclusions and Recommendations

In this chapter, to draw the final conclusion, whether the variables are consistent in the finding have been explored based on the findings of survey based on different factors effecting service quality and safety. Some directions for future exploration of research in this area are also mentioned.

Chapter 2: LITERATURE REVIEW

Mobile app based transportation services like Uber, Pathao, Shohoz and Obhai has made Bangladesh to experience tremendous change in the transportation sector in the recent years. It has become easier for users to travel using the application-based ride-sharing services that are available in Bangladesh. Because of its comfort and availability it has become very popular. But with such increase in services, the safety of passengers is still a big issue. CNN found that 103 Uber drivers have been charged with molestation or mistreatment and indecent assault to rape has been caused by no less than thirty one drivers. There is not enough law in the country which can be maintained to punish the culprits. Not much research has been done on the safety and security of the passengers. It is an important field of research at the moment. (Cynthia et al., 2019) Besides safety and security, the service quality of ride-sharing is also decreasing. There are many complaints about the bad experiences in ride sharing services. As a result, the ride sharing companies are losing their customers. Service quality is a big factor in order to hold customers. From the previous researches it has been found out that the customer satisfaction plays an important role in building long and profitable relationship between the brands and their customers. (Eshghi et al., 2007) Thus in this chapter, different components that can be used to assess the service quality and safety will be discussed and findings of previous research will be summarized so that the readers can gain knowledge about the effects of these factors. These discussions will help build context for the result of our study.

2.1 Service Quality

The difference between the expectations and perceptions of the service is the function of service quality. (Parasuraman et al, 1985) Very few researches have been done on service quality of ridesharing services in Bangladesh. From the research paper, Man et al (2019), SERVQUAL created by Parasuraman and Zethami (1985) five main dimensions: tangibility, reliability, assurance, responsiveness and empathy have been adapted by most of the researchers while studying service quality. But here we have considered many more factors that need to be included in service quality to meet the customer satisfaction. Thus ridesharing services like Uber

and Pathao must excel in their service quality so that they can meet rider's demand and help in building company's image. Thus the factors that are included in the service quality are discussed below:

2.1.1 Tangibility

Tangibility refers to the physical environment of an organization. It refers to person's appearance, physical facilities like settings, decorations; displays. Besides tangibles are like the safety and convenience of the customers and its representative as company's image and quality. (Zeithaml et al., 2006) From the research paper, (Man et al., 2019), tangibility has been found to have positive correlation with customer satisfaction in Kuala Lumpur. Tangibility includes whether driver's attire is clean or not, the interior of the vehicle is clean or not, vehicles used is older than 7 years or not etc. Based on these factors users might have different expectations from the ridesharing services. Thus this study analyzes whether there is positive or negative relation with the tangibility from user's perspective in Dhaka city.

2.1.2 Reliability

Reliability is the ability of the organization to serve the customers accurately and it was found that it significantly affects the satisfaction of the customers. In the previous research (Siew et al., 2011; Zhengwei, 2012; Saghier and Nathan, 2013; Hassan et al., 2013; Al-Azzam, 2015; Minh et al., 2015; Wahid et al., 2017) Horsu and Yeboah (2015) it has been shown that in Ghana reliability has both positive and significant effect on customer satisfaction in minicab taxi services. Similarly, Khuong and Dai (2016) and Mudenda and Guga (2017) identified the relation between reliability and customer satisfaction of the ridesharing services. Reliability includes proper display of notifications of delays, vehicles arriving on time, waiting time etc. People tend to use the services more which have better reliability.

2.1.3 Availability

Availability is the probability that the vehicles will be at committable state and operable at anytime and it is defined as uptime divided by the total time. Dhaka city is one of the most

overpopulated cities in the world. As such even with the advent of the improved transport sector, it still becomes difficult to provide sufficient transportation to the large population. Andaleeb, Haq, and Ahmed (2007) in their study identified that the people of Dhaka city faces problems for not having a personal car as the public transportation system lacks standard facilities. But at present with the advent of improved technology, the market of transportation system is expanding with the introduction of improved ridesharing services. (Teubner and Flath, 2015)As per 2018 investigation of Policy Research Institute, the ride-sharing industry in Bangladesh merits an expected Tk. 22000 million and records for about 23% of the vehicle area in the country. With year-on-year development outperforming 40%, motorbike deals have kept on developing. A Reuters report says that under Pathao around 200,000 drivers have now been enrolled. In a research, (Islam, Huda and Nasrin, 2019), 60% is the availability of ridesharing services Bangladesh. In this study we will consider the availability of the ridesharing apps from user's perspective. Generally with the increase in availability of ridesharing services, the service quality also increases.

2.1.4 Assurance

“Assurance concerns knowledge, politeness, courtesy, trustworthiness and honesty of employees.”(Keshavarz et al., 2009)To assess a company or a driver for a trip, assurance is an important dimension. There is a positive relationship between the customers and assurance. (Khurshid et al., 2012)This includes that the passengers travelling will feel safe while using the ride-sharing service. The passenger will be assured that the driver will reach the destination properly using proper route. Assurance plays an important role because whether the passenger will again chose the ride-sharing service again depends on this factor.

2.1.5 Empathy

Empathy is the ability of the employees to show their care and concern for the problems users might be facing.(Naik et al., 2010)This means that to understand that whether the passenger is comfortable or not. The driver makes a good chat with the passenger and thus a good bonding is formed. The driver tries to under the need of the passenger, for instance, whether the passenger is in a hurry or not. Empathy has an immense positive impact upon the satisfaction of the passenger

with the serviceability of the ride-sharing service. Due to great empathy the passenger might again chose the same ride-sharing service later. Empathy is the caring attitude shown towards the passengers and the observed and emotional experience would have significantly positive relation with the customer satisfaction. (Hassan et al., 2013)

2.1.6 Responsiveness

The willingness to help the customers and provide prompt service is known as responsiveness (Zeithaml et al., 2006). Responsiveness is positively related to customers as well. (Siew et al., 2011; Saghier and Nathan, 2013; Hong and Marimuthu, 2014; Al-Azzam, 2015; Minh et al., 2015)It is concerned about dealing with the customer’s complaints, requests and questions quickly and attentively. When the company answers the quarries of the customers that’s when the company is said to be responsive. Some of the companies of ride hailing services are not efficient in making the hotlines operational. As such riders cannot get response immediately. As stated in a report of ‘The Business Standard’, it is often seen that these companies have a tendency not to reply to the queries received from the media. But some of the users in Bangladesh have found the Uber companies to be a bit more responsive than the other companies. So overall it is considered that responsiveness has a positive relation with the customer satisfaction.

2.1.7 Comfort

Comfort plays a very important role in gaining passenger satisfaction. Comfort has significant influence on customer satisfaction. (Budiono, 2009) Comfort includes proper leg spacing, smooth journey, proper seats, air conditioning etc.(Litman, 2008) People tend to prefer taking expensive rides for the comfort and specially people prefers comfort when taking long rides. So an important purpose of making trips with the ridesharing services can be comfort.

2.1.7.1 Air Conditioner

Air-conditioner (AC) plays a major role in providing comfort to the passenger during travelling. The presence of AC inside the vehicle keeps the environment inside the vehicle cool and

soothing. Especially during the summer season, the presence of AC in the vehicle is a must. Besides, even during the winter season, during the hot and humid days there is need for AC. During the summer, one can decrease the temperature in the car without the need of opening the windows which might have let dust particles to come inside the car. Traffic jams are very common in Bangladesh. Sitting idly in traffic jam will also be comfortable if there is AC in the vehicle. The presence of AC is important to the people with dust allergy. AC circulates and filters the air inside the vehicle. This can be an indicator of service quality and passenger's satisfaction level might increase with its presence.

2.1.7.2 Comfortable seat

The car seat plays a great role in providing comfort to the passenger. The seats of the car should be comfortably soft so that the passenger can have a comfortable journey. There should be Headrests in the seats. If the seats are not comfortable then the entire trip of the passenger will be ruined. And car seats should be such that the passengers are able to comfortably lean on their back rather than sitting at an angle of 90 degrees. This will cause huge discomfort to the passenger which may result in back-pain. The leg-spacing within the car is very important. Because if there is not enough leg-spacing in the car, passengers won't be able to seat comfortably. There will a huge discomfort for the passenger.

2.1.7.3 Odor

Bad odor inside the car can cause huge discomfort for the passenger. Due to the pungent smell it may be very hard for the passenger to breathe. For pleasant smell the driver may use air-fresheners. This will produce a good smell within the car and thus will make the ride comfortable for the passenger. The driver should keep the interior of the car neat and clean in order to avoid pungent smell inside the car. Besides, smoking inside the car can produce an unpleasant smell for the passengers. Smoking inside the car should be strictly avoided.

2.1.8 Socio Economic and Demographic Impact

Socio economic and demographic conditions of people have significant effect on the service quality of ridesharing services. Income of a person effects the number of trips a person takes as well as the car availability is also related. And the higher the cars are available the more likely the better the service quality.

2.1.8.1 Gender, Education and Occupation

Many countries have done extensive research on effect of service quality of ridesharing services. In most of these studies, gender, education and occupation are the most common factors that affect these ridesharing services. Male have been found to be using the ridesharing services more than the female. (Jahan, 2019) In the research work of (Lee et al., 2017) education has been considered as a significant control variable. Students are considered primary user of ridesharing services.

2.1.8.2 Trip Location

In a city, the location also plays an important role in finding the service quality satisfactory or not. In higher income, solvent residents, the transportation infrastructure is different and people living in those areas expect better services from these ridesharing companies. On the other hand people living in a bit lower income areas might be more tolerant about the services provided. In Manila and Busuanga Island in Philippines, a study shows that higher income passengers are less concerned about the fare difference while choosing any transportation mode. (Diaz, 2011)

2.1.8.3 Number of trips, travel times and distances

On average, older people travel less than younger persons in terms of trips per day, distance and travel time. The most marked decrease in trip number and travel time takes place after the age of 75. Regarding distances, there is a peak at the age of 30-39 years before the travel distances decrease more continuously until high age.

The general trend of decreasing travel activity with age is universal, but the specific parameters differ, indicating for example, differences in license renewal policies, socio-economic or other background variables.

2.1.8.4 Modal choices

According to the OECD (2001, p. 32) half of the trips made by older people in Europe is by private cars. Different countries have different modal choice with regard to public transportation. Trips on foot of middle-aged people are less than younger and older people. Depending on the country, 30-50% of trips are made on foot. Finally, cycling is of minor relevance as a transport mode for older people. Older people tend to drive car less frequently, they have a higher share in walking and public transport use compared to other adult age groups. (INFAS & DLR, 2010; OECD, 2001; TØI, 2011)

2.1.8.5 Trip purposes

The purpose of making trips play an important role on what services an individual expects from the ride-sharing services. Whenever the potential of ride-hailing services are assessed and compared with the public transport then often different trip purposes are taken in the consideration. (SUMC, 2016) In a study, when respondents were asked about the main purpose of trip, they responded leisure. (Tirachini & Río, 2019) Fewer numbers of the trips are made by the old age people for daily supply purpose and most trips are made for shopping or private arrangement. (INFAS & DLR, 2010; TØI, 2011) The attitudinal effects of older people explain the raised mobility, life style improvement, fitness and health conditions etc. (INFAS & DLR, 2010).

2.1.9 Price Fairness and Lack of Accountability

Mburu, Van and Cullen (2013) found that in Kenya price in banking industry influences customer satisfaction and price relationship and value are closely related with each other. According to user's perspective of many countries from many researches, it is found that the because of the comfort and conditions provided by the ridesharing apps, price charged is fair in comparison to

other public transportation. That's why service quality is important as the purchasing increases with satisfied customers. (Murray & Howat, 2002) But with that according to the research paper, (Showkat and Chowdhury, 2019), there are different issues that have been stated about the price system of specifically Pathao,

- i. Pathao pay doesn't work: Pathao clients dealt with issues with Pathao's advanced installment framework. By and large, clients couldn't make installments with the framework.
- ii. Discount and promotion code issues: Users couldn't benefit much from the discounts and drivers couldn't profit from the passengers as such drivers don't really want to take those rides. Passengers were mostly disappointed from these promotion codes.
- iii. Expensive and over charged: It has been discovered that numerous clients have grumbled about the cost getting higher. Numerous clients back in 2016 guaranteed the cost to be lower than auto rickshaws, but at this point it is no longer the scenario. Also, Pathao vehicles apply a pointless measure of holding up charge. Others have contrasted the cost and said Uber was less expensive. Numerous clients have been requesting to decrease the fare.

Subsequently from this it tends to be perceived that cost gigantically affect the workers of ridesharing application clients. Thus, as per the client's point of view the value decency factor should be investigated for the zone of Dhaka city.

2.2 Safety and Security

The effectiveness and security threats of the ridesharing companies are overlooked because of its increased popularity. It has been investigated that if the riders doesn't feel secured in Uber services then they are likely to not take rides in the future. (Rahafrooz) Many people responded about the decrease in sustainability of ridesharing services because of the lack of security. As per the result from (Gargiulo et al., 2015; Cici et al., 2013) security have been identified as a major boundary for the dynamics of ridesharing services. So it becomes a necessity to ensure safety and security to the commuters.

As indicated by the Road Safety Foundation, 83 percent ladies face misuse, physical and mental badgering, from public vehicle staff in the city. The women who were surveyed reported that they don't feel safe when using the public transportation. Consequently this is the place where the ridesharing application can help overcome any barrier with these requirements and genuine arrangements. Especially in the case of women, there are distinct requirements that need to be met in terms of transportation design, security and comfort. So if these safety measures are provided in the service then both the user will be benefitted as well as the company. This will create safer ride and lesser accidents on roads. Thus to evaluate the safety of passenger it's important to consider personal safety and road safety separately. And if the factors under the two safety sides are explored and analyzed from user's perspective then it would be easy to improve the quality of company and help improve the share economy. The safety incident reported in comparison to the number of rides taken is not so significant. Still it is necessary for the ridesharing companies to ensure proper passenger safety applying different methods as the customer safety and security and behavior of drivers towards passengers will ultimately define the success of ridesharing services. (Chaudhry et al., 2018)

2.2.1 Ride-sharing Policy

Certain policies are being made by Bangladesh Road Transport Authority (BRTA) for the betterment of the people who use ride-sharing services. The policies are made for the welfare of the country and that the ride-sharing services abide by the rules and regulations of the transportation sector of the country. This service policy, 2017 contains **eight broad sections.**

Section-A Bangladesh Road Transport Authority (BRTA), the conditions for operating these services including obtaining a 'Ridesharing Service Provider Enlistment Certificate'. But this section didn't mention the maximum number of vehicles that can be kept in its fleet, only the minimum number of vehicles the service can provide has been mentioned. So this might create congestion in the city due to too many vehicles on roads.

Section-B contains the responsibilities and obligations of the policy of the ridesharing services which are based on 12 exhaustive conditions.

Section-C layouts the technique for authorizing selection certificate to the organizations that provides this service. In comparison to the huge business this sector conducts, the enlistment fee which is Taka 100 thousand for a year is too inadequate. Taka 10 thousand is the renewal fee which is also very low.

Section-D harps on the method for authorizing selection testaments to the ridesharing motor vehicles, including the reports to be submitted for the reason. For a certificate that remains valid for 3 years, the fees of Taka 500 for bikes and Taka 1,000 for different vehicles are too low.

Section-E mentions the fare policy of ridesharing cars that these cannot exceed a certain amount which has been mentioned in ‘Taxicab Service Guideline’, 2010. But the fare policy of motorcycles has not been mentioned in this section.

2.2.2 Socioeconomic and demographic impacts

2.2.2.1 Gender

The gender of the person plays a major role in case of personal safety of a person while using the ride sharing services. The safety of female is more concerning than that of the male. According to a report on December 2, 2020 there have been over 3000 sexual assaults reported in one year where it numerous unreported cases were expected to be present. Moreover, the weekend nights are more vulnerable times for sexual assault by using the ride sharing services. An organization called the Taxicab, Limousine & Para-transit Association (TLPA), being very much concerned about the safety and security of the passengers, found approximately 324 alleged sexual assaults related to Uber drivers themselves, along with 24 physical assaults (TLPA, 2017)

2.2.2.2 Occupation

Occupation is a major reason why a person has to use the ride sharing services on a regular basis. But the personal safety is at stake. Because sometimes due to work people have to travel late at night and using the ride sharing services at those times increases the chances of crime. There have been many occurrences of hijacking and robbery in the rider sharing services at late night.

2.2.2.3 Age

Age is a big factor in case of ride-sharing services. Because the older people rarely tend to drive. They mostly prefer to use the ride sharing services to fulfill their mobility needs. As a result, the probability of road accidents reduces to a large extent. In some rural areas of USA where there is scarce of transportation, the adults are affected by driving cessation (Rosenbloom,2003; Strogatz et al., 2019).

2.2.2.4 Route to Destination

Sometimes the drivers take a different route to reach the destination other than that shown on the app. In some cases the routes are risky for the passengers and several cases of robbery have been found due to use of different route. Sometimes the drivers are also involved in such cases.

2.2.2.5 Time of the day

Time of the day for travelling plays a major role in using the ride-sharing services. Females are very much concerned about their safety in ride-sharing services both during day and night time. But the concern is more during the night time. Although from a survey it has been seen that people prefer rider-sharing services over the public transportation system during the night time in case of safety (Cynthia et al., 2019).

2.2.3 Personal Safety

2.2.3.1 Safety features on ridesharing app

GPS tracked trips–Real- time GPS tracking can be maintained through sharing trip details using ‘Share Status’ during the trip.

Share Status - Share real-time GPS tracking of the trip and details like vehicle information, driver name and average rating with 5 trusted contacts, your family and friends, for safety and tracking."

National Helpline 999—This line helps in reaching the government’s control room where fire services, police, ambulances and government agents are included.

VoIP phone call - VoIP feature in the Uber app option helps the riders and drivers by making free anonymous call to each other.

This includes an internet connection to make voice call and details of the driver and the vehicle are displayed in the app through this feature. Driver’s rating and feedback are also included in this.

24-hour in-app support—Any issue with the driver or to get some guidance, one can directly get the help from the Uber app.

Uber has put resources into a day in and day out Incident Response Team (IRT) to react to any episode that is accounted for to Uber. It additionally has a police contact group that incorporates previous law requirement staff who work straightforwardly with the nearby police to aid their examinations.

Ratings and feedback—It makes two ways rating system with mutual respect and good behavior between riders and drivers following Uber's Community Guidelines.

In this study the questionnaires would contain these elements whether the passengers uses these safety features and if they do so whether these have helped them or not.

2.2.3.2 Checking registration number of the vehicle before getting on the ride

There have been reports of scammers who pose as rideshare drivers, so it is very important that the license plate and the name of the driver before getting in, and check their appearance against the photo in the app. And, if one is getting picked up in a popular area, like an airport, this will also avoid accidentally taking someone else’s ride. In the intense congestion of Dhaka city, these safety issues are very important to ensure by the passengers.

2.2.3.3 Drivers not knowing the way to the destination

Sometimes in these ridesharing services it is found that drivers from different districts of Bangladesh drive Uber in Dhaka city. As such most of these drivers don't know the locations of the destinations they are to drive the passengers. So, this creates a tension among the commuters. Even though the GPS shows the destination but sometimes as of not knowing the destination properly they take the long turns as shown in the map. Those routes might be unsafe and there creates a probability of occurrence of any mishaps or unwanted incident with the passenger. Lack of usability of maps of ridesharing services in India have been found out in the prior works by(Zade and O'Neill, 2016; Ahmed et al., 2016)

2.2.3.4 Misuse of Personal Information

Similarly as with numerous other online platforms, ridesharing network face issues of client protection. Concerns encompass the applications incorporate the security of monetary subtleties (which are regularly needed to pay for the assistance), and protection of individual subtleties and area. These applications request client data, for example, telephone number, email, and profile picture, all highlights which can be utilized to follow back to the client's character. When this data is in the application's data set, it can access by the application just as in a roundabout way by any accomplices of the application.

From a research paper, (Cynthia et al., 2019) in a graph, it shows 10% participants have faced actual problems after sharing their personal information. However, majority of the participants have felt that their personal information can be compromised.

2.2.3.5 Potential Misuse of App

Some drivers start the trip before the passengers aboard the car. Sometimes drivers give people call and instruct the riders to walk to the location preferred by the drivers for their convenience. Riders often find that the drivers have already started the trip. This causes a little back and forth between the passenger and the driver. There are drivers who try to defend themselves and some without any vivid explanation. For example, R8 said, "I asked him why he did it. He was not answering me at all. At one point, he told me to get down from the car" (Kumar et al., 2018).

2.2.3.6 Offline Trips

A huge security threats for the commuters are often posed on the passengers because of the offline ride hailing services. From the report of 'The Business Standard', the recent murder of a bike rider Milon on Mouchak-Malibagh flyover on August 26, while on an offline trip, gives basis to the rising concern. It is because when the passengers are riding on the service offline then the GPS cannot track the passenger as there is no surveillance in the whole process. According to the report of 'Daily Sun', it is mentioned that now, to make a trip most drivers are interested in running the service off-line. Various harassment and security risks might be increased when such contract based ridesharing takes place. So, it is an important analysis to know the no of passenger who takes offline trips. This will thus even help the government to mark the problem and the companies to come up with new solutions to ensure safety to the passengers.

2.2.3.7 Cancelling trips after wasting the users' time

To use ride sharing services one has to set his pick up location from where the driver is to pick him and a destination location where he wants to go. When a driver accepts request, one can see their estimated time of arrival and current location on the screen. Also driver's name, photo, vehicle make, color and license plate number can be seen. Then the user needs to wait till the vehicle comes to his location. It is reported that some drivers cancel trips after they accept requests from the users. User's time is wasted because of that.

2.2.3.8 Misbehaving with passengers

Unprofessional behavior, inappropriate physical contact or verbal aggressions from drivers make users uncomfortable. A number of such cases are reported against the drivers. Though most of the ride sharing services have rating facility for the users (based on how good or bad the trip was one can rate a driver) this problem is not solved. Sometimes proper actions are not been taken against the drivers. Thus misbehavior with the passengers makes them feel unsafe as such this is also an important criterion to assess the safety of ridesharing services.

2.2.3.9 Refusing to go to a certain destination

Drivers often prefer longer trips over shorter trips because the profit margin is larger for big trips. They may also dislike trips to certain neighborhoods, trips that might require expensive (toll-ridden) return trips, or trips that involve traffic congestions. There are many reasons they'll want to say no a ride, and this policy prevents that. Every ignored or declined request causes a delay and increases the wait time for the passenger. To use ride sharing services one has to set his pick up location from where the driver is to pick him and a destination location where he wants to go. When a driver accepts request, one can see their estimated time of arrival and current location on the screen. Also driver's name, photo, vehicle make, color and license plate number can be seen. Then the user needs to wait till the vehicle comes to his location. It is reported that some drivers cancel trips after they accept requests from the users. User's time is wasted because of that.

2.2.4 Road Safety

The road infrastructure of Bangladesh is poor. The traffic rules are not maintained at all. The govt. is also unable to maintain proper traffic rules and hence the drivers drive recklessly on the roads resulting in traffic jams and accidents. The amount of roads in Bangladesh is very less compared to the amount of roads required; even then everyday large number of vehicles is being introduced on the road. The drivers that are driving the vehicles are unaware of the traffic rules and regulations. However, a reduction of fatal crashes and DWI offences occurred after the launch of Uber after some months of operation. (Dills and Mulholland, 2018) On the other hand, with ride sourcing use, road fatalities (pedestrian and non-vehicle occupants) increase and these trends remains over time. (Barrios et al., 2019)

2.2.4.1 Reckless driving

Reckless driving is a significant issue in Bangladesh. A large portion of the drivers are unconscious of the traffic rules and guidelines since most people of the country are ignorant. The legitimate methods of driving are barely known to the drivers. The drivers are driving out and about as per their desire as opposed to maintaining the traffic rules and regulations. Fast driving

is one of the serious issues. They often exceed the speed limit. This causes a colossal security issue for the travelers in the vehicle. Also, the drivers change the lanes all the time which makes the other drivers irritated and causes sudden accidents. The drivers even don't utilize indicators appropriately while changing the lanes. Panic is caused when the drivers suddenly applies hard break. Reckless driving of the drivers is very common. (Cynthia et al., 2019) From a report of 'The Independent', Tahsina Ferdous Rinia, in a Pathao ride, a student of Dhaka University (DU) faced accident due to its reckless driving.

2.2.4.2 Violation of traffic rules

The drivers of Bangladesh hardly know any traffic rules. And as a result they often violate the traffic rules while driving vehicles. Violation of the traffic rules increases the chances of accident highly. Due to the violation of traffic rules the passengers get panicked as there more possibilities of causing an accident. The drivers are often found driving without seat belts. It is very dangerous for the driver. Again, often it is seen in Bangladesh that the drivers ignore the traffic symbols. Moreover, the drivers break signals, which is truly very risky.

2.2.4.3 Alcohol involved road crashes

As alcohol consumption is the reason behind the increased crime counts so association between crime and alcohol includes both DUI rate (Greenwood and Wattal, 2015; Brazil and Kirk, 2016; Jackson and Owens, 2011) and violent crimes (Bouchery et al., 2006; Cook and Moore, 1993; Markowitz, 2005) The road crashes due to intoxication is less comparatively in Bangladesh. Drivers are rarely seen intoxicated. So this factor is not so important.

2.2.4.4 Time of Trip

Time of the trip influences the possibility of road accident. During the night time, the possibility of road accident increases and so the drivers are required to drive more cautiously. But this is hardly the case. The drivers drive recklessly even during the night time. Although there are some exceptions where the drivers drive very cautiously and the passengers remain relaxed about the safety. After dark an inordinate number of fatal injuries occur. (Plainis et al., 2006)

2.2.4.5 Fatigue of the driver

Tiredness of the driver may also cause road accidents. Due to fatigue the driver won't be able to concentrate on the road and cause an accident. Hence the fatigue of the driver is a safety concern issue. This usually happens when a driver has not slept enough or did not get enough rest. Falling asleep at the wheel is clearly dangerous. 72,000 crashes, 44,000 injuries and 800 deaths were caused due to drowsy driving in 2013 estimated by the National Highway Traffic Safety Administration but still the numbers are not properly estimated and drowsy driving causes 6000 fatal crashes every year. (Tefft, 2014)

Chapter 3: DATA AND METHODOLOGY

In this chapter procedure of data collection, analysis of data, formulation of data and the methodology used in data analysis are described. Linear regression model will be used to identify different factors. Before describing the mathematical formulation of the model, assumptions and estimation and the sources of data used in this study are discussed.

3.1 Main steps in methodology

To gain the objective of the study, suitable statistical models need to be selected. In this study Linear regression model is used to analyze the data. Questionnaire survey was done to collect suitable data. Initially offline data collection was done but due to Covid-19 situation offline survey was not possible to continue. So, the questionnaire survey was done based on online platform. Google forms were used to collect data from the passengers. Data were collected from 153 users.

The methodology can be divided into three main steps:

- Collecting data from the passengers by questionnaire survey using Google forms.
- Selection of statistical model to analyze the collected data.
- Analysis and interpretation of model findings; that is, engineering judgment of factors affecting ride sharing services.

3.2 Data collection and Description of data

3.2.1 Data collection

Questionnaire survey was done to collect suitable data. The questionnaire survey was done using Google forms so the data collection process was mainly online based. But before the COVID- 19 situation, surveying was done offline. 10% of the responses were collected online and the rest 90% were collected online. Our main focus was to collect data from the service holders mostly as they use these ride sharing services most. We also collected data from the employees of Samsung, Robi etc. Data was collected from random users. Age, educational qualification,

income etc. were not predetermined. Then categorization of the collected data was done both manually and by using software. Irrelevant data were omitted. Data was collected from 153 users.

3.2.2 Description of data

The questionnaire form can be divided into six parts.

- i. First part was based on demographic characteristics. Passengers gave information about their gender, age, profession, education, income, transport budget, car ownership, trip purpose, trip numbers, service used and the reason behind using the service.
- ii. Service quality related questions like cleanliness of vehicles, seat arrangements, comfort and other facilities. These questions were asked in a scale of 1 to 4 where the order is in increasing negative.
 - 1) Never
 - 2) Rarely
 - 3) Frequently
 - 4) Always
- iii. The third part includes driver's behavior, attire, driving skill related questionnaire.
- iv. As the ride sharing services are mainly app based, there can be some app related issues. This part of the questionnaire includes app related issues; responsiveness, GPS system, feedback system, payment system and other facilities.
- v. Personal safety related questions; misuse of personal information, using proper route, GPS tracking, female passengers' safety and security related issues.
- vi. Last part of the questionnaire includes road safety related issues; rough driving, violating traffic rules, robbery, accidents, sexual harassment etc.

Questionnaire Survey Form

Please put (√) in the appropriate option

Section-1:Socio-Economic, Demographic and Travelling Information

1. Gender-
 - a) Male
 - b) Female
2. Age
3. Education level-
 - a) Primary
 - b) SSC
 - c) HSC
 - d) Graduate
 - e) Post-Graduate
4. Occupation
 - a) Student
 - b) Service Holder(Government & Private)
 - c) Business
 - d) House Wife
 - e) Others (Please Mention)
5. Monthly income in BDT (approximately)-
6. Monthly budget for transportation in BDT (approximately)-
7. Where do you live in? (e.g. Uttara, Gulshan, Maghbazar etc.)-
8. Do you have a car?
 - a) Yes
 - b) No
9. Do you drive on your own?
 - a) Yes
 - b) No
10. What is the common purpose of the trips you make every day?
 - a) Study
 - b) Employment
 - c) Business
 - d) Shopping
11. What is the approximate number of trips you make every day?
12. Which ridesharing service do you frequently use?
 - a) Uber
 - b) Pathao
 - c) Shohoj
 - d) Others(Please Mention)
13. Major route you normally travel (your destination)?

14. How frequently do you take the services of ridesharing apps?
- a) Daily
 - b) Weekly
 - c) Monthly
 - d) Occasionally
 - e) Others(Please Mention)
15. At what time of the day do you generally make the trips?
- a) Morning Peak
 - b) Noon
 - c) Evening Peak
 - d) Night
16. What is the reason of choosing ride-sharing service over public transport?(Choose only one)
- a) Reasonable fare
 - b) Comfort
 - c) Security
 - d) Reliability

Section-2:Service Quality of Vehicle

- I. How often do you find the vehicle not clean?
- 1) Never
 - 2) Rarely
 - 3) Frequently
 - 4) Always
- II. How often do the vehicles having uncomfortable smell inside?
- 1) Never
 - 2) Rarely
 - 3) Frequently
 - 4) Always
- III. How often do you find the AC is not working properly?
- 1) Never
 - 2) Rarely
 - 3) Frequently
 - 4) Always
- IV. How often do you find the seats of the vehicle are not clean?
- 1) Never
 - 2) Rarely
 - 3) Frequently
 - 4) Always
- V. How often do the seats in the vehicle feels not comfortable
- 1) Never
 - 2) Rarely
 - 3) Frequently
 - 4) Always

- VI. Give your opinion on how often do you find the seat arrangement not (leg-spacing) appropriate-
 - 1) Never
 - 2) Rarely
 - 3) Frequently
 - 4) Always
- VII. How often do you find the vehicles provided by ridesharing services are older than 5 years?
 - 1) Never
 - 2) Rarely
 - 3) Frequently
 - 4) Always

Section-3:Assessment on Driver's Behavior and Attitude

- I. Give your opinion on how often do you find driver's attire (dress) not clean- (Man et al., 2019)
 - 1) Never
 - 2) Rarely
 - 3) Frequently
 - 4) Always
- II. How often have you found the driver talking inappropriately to you?(Keshavarz et al., 2009)
 - 1) Never
 - 2) Rarely
 - 3) Frequently
 - 4) Always
- III. How often do you feel that the driver talks too much?(Chaudhry et al., 2018)
 - 1) Never
 - 2) Rarely
 - 3) Frequently
 - 4) Always
- IV. How often do you find drivers haven't shown empathy in any difficulties such as in traffic jam or delayed due to any road hazard or closure?(Naik et al., 2010)
 - a) Never
 - b) Rarely
 - c) Frequently
 - d) Always
- V. How often do the drivers smoke in the car while driving?
 - 1) Never
 - 2) Rarely
 - 3) Frequently
 - 4) Always

- VI. How often have you faced situations where the driver doesn't know the route?
- 1) Never
 - 2) Rarely
 - 3) Frequently
 - 4) Always
- VII. How often do you face drivers cancelling the trip?
- 1) Never
 - 2) Rarely
 - 3) Frequently
 - 4) Always
- VIII. How often do the drivers start the trip before you get in the vehicle?(Parveen, Morshed and Kumar, 2018)
- 1) Never
 - 2) Rarely
 - 3) Frequently
 - 4) Always
- IX. Give your opinion on how often drivers fail to reach the schedule for arrival time-Khuong and Dai (2016) and Mudenda and Guga (2017)
- 1) Never
 - 2) Rarely
 - 3) Frequently
 - 4) Always
- X. Give your opinion on how often drivers failed to pick up at the exact location
- 1) Never
 - 2) Rarely
 - 3) Frequently
 - 4) Always
- XI. How often do the drivers ask for extra charges?
- 1) Never
 - 2) Rarely
 - 3) Frequently
 - 4) Always
- XII. How often do you have arguments with the driver regarding the fare?
- 1) Never
 - 2) Rarely
 - 3) Frequently
 - 4) Always
- XIII. How often do the drivers misbehave with you?
- 1) Never
 - 2) Rarely
 - 3) Frequently
 - 4) Always

- XIV. How often do the drivers refuse to go to exact destination?
1) Never
2) Rarely
3) Frequently
4) Always
- XV. How often do the drivers use different route other than the route showed on the map?(Khurshid et al., 2012)
1) Never
2) Rarely
3) Frequently
4) Always

Section-4:Service Quality of the App

- I. How often do you find the app not responsive?(Zeithaml et al., 2006)
1) Never
2) Rarely
3) Frequently
4) Always
- II. How often do you find the information system shown on ridesharing services about the arrival and departure time table not working properly-(Khuong and Dai,2016) and (Mudenda and Guga,2017)
1) Never
2) Rarely
3) Frequently
4) Always
- III. How often do you find vehicles not available in the ride-sharing app?(Huda and Nasrin, 2019)
1) Never
2) Rarely
3) Frequently
4) Always
- IV. Give your opinion on how often you find the feedback system in the ride-sharing app not working properly-
1) Never
2) Rarely
3) Frequently
4) Always
- V. How often do you find the GPS is not available on the app?(Zade and O'Neill, 2016; Ahmed et al., 2016)
1) Never
2) Rarely
3) Frequently
4) Always

- VI. How often do you find not shown the fair price according to the distance travelled in apps?(Mburu, Van and Cullen, 2013)
- 1) Never
 - 2) Rarely
 - 3) Frequently
 - 4) Always
- VII. How often the promo codes and discounts don't working properly? (Showkat and Chowdhury, 2020)
- 1) Never
 - 2) Rarely
 - 3) Frequently
 - 4) Always
- VIII. How often do you find driver's information was not provided on the app?
- 1) Never
 - 2) Rarely
 - 3) Frequently
 - 4) Always
- IX. How often the digital payment system does not working properly?(Showkat andChowdhury, 2020)
- 1) Never
 - 2) Rarely
 - 3) Frequently
 - 4) Always
- X. How often do you find the complaint handling system is not working properly on the app?
- 1) Never
 - 2) Rarely
 - 3) Frequently
 - 4) Always

Section-5:Personal Safety and Security

- I. Do you think not displaying the license of driver in the app beneficial to you?
- 1) Never
 - 2) Rarely
 - 3) Frequently
 - 4) Always
- XI. Do you think there is no benefit for personal safety from real time GPS tracking and share trip details?
- 1) Never
 - 2) Rarely
 - 3) Frequently
 - 4) Always

- XII. Do you think the safety feature, helpline 999 for the passengers not beneficial?
- 1) Never
 - 2) Rarely
 - 3) Frequently
 - 4) Always
- II. Do you think not checking the registration number of the vehicle is beneficial before starting the ride?
- 1) Never
 - 2) Rarely
 - 3) Frequently
 - 4) Always
- III. How often do you feel unsafe while using ride-sharing during daytime?
- 1) Never
 - 2) Rarely
 - 3) Frequently
 - 4) Always
- IV. How often do you feel unsafe while using ride-sharing during night-time?
- 1) Never
 - 2) Rarely
 - 3) Frequently
 - 4) Always
- V. How often do you feel uncertain that the driver will reach the destination properly using proper route?
- 1) Never
 - 2) Rarely
 - 3) Frequently
 - 4) Always
- VI. How often do you face your personal information being misused? (Cynthia et al., 2020)
- 1) Never
 - 2) Rarely
 - 3) Frequently
 - 4) Always
- VII. How often did you failed to catch network/off-line during travel?
- 1) Never
 - 2) Rarely
 - 3) Frequently
 - 4) Always
- VIII. Do you think safety features/information available in the app is inadequate for female passengers from safety and security perspective?
- 1) Never
 - 2) Rarely
 - 3) Frequently
 - 4) Always

Section-6:Road Safety and Security

- I. Give your opinions on how often the drivers drive roughly-
 - 1) Never
 - 2) Rarely
 - 3) Frequently
 - 4) Always
- II. Give your opinion on how often driver's violating traffic rules while driving-
 - 1) Never
 - 2) Rarely
 - 3) Frequently
 - 4) Always
- III. Give your opinion on how often the driver's seems fatigue while driving-
 - 1) Never
 - 2) Rarely
 - 3) Frequently
 - 4) Always
- IV. How often have you faced road accidents from ridesharing services?
 - 1) Never
 - 2) Rarely
 - 3) Frequently
 - 4) Always
- V. How often do you face robbery/mugging while using ridesharing services?
 - 1) Never
 - 2) Rarely
 - 3) Frequently
 - 4) Always
- VI. How often have you faced drivers taking unknown people during your ride-
 - 1) Never
 - 2) Rarely
 - 3) Frequently
 - 4) Always
- VII. Have you ever faced sexual harassment?
 - 1) Never
 - 2) Rarely
 - 3) Frequently
 - 4) Always

Please provide any suggestion to improve the service quality& security of ride-sharing service in the comment box below-

3.3 Statistical model

The principal objective of a statistical model is to identify a probabilistic system of the form

$$Y=f(X)$$

Where the dependent variable Y is a function of a set of independent variable X. The regression analysis of the above mentioned form examines:

- i. Whether the observed patterns in the data are consistent with theoretical prediction.
- ii. The relationship between a quantitative dependent variable and one or more quantitative or qualitative independent variables.

3.4 Linear Regression Model

Linear regression is one of the most widely studied and applied statistical and econometric techniques. It is a useful method for modeling the relationship between a dependent variable and one or more independent variables. A lot of reasons are behind this widespread acceptability. First, linear regression is suitable for modeling a wide variety of relationships between variables. In addition, the assumptions of linear regression models are often suitably satisfied in many practical applications. Furthermore, regression model outputs are relatively easy to interpret and communicate to others, numerical estimation of regression models is relatively easy.

3.4.1 Assumptions of the Linear Regression Model

Linear regression is used to model a linear relationship between a continuous dependent variable and one or more independent variables. There are some required assumptions of the linear regression model. If any of the requirements are not met, alternative model has to be adopted in some cases.

Here the assumptions of the linear regression model are explained by following Washington et al. (2010).

3.4.1.1 Continuous Dependent Variable Y

The assumption is that the response is continuous; that means it can take any value within a range of values. A continuous variable is measured on the interval or ratio scale. Although it is often done, regression on ordinal scale response variables is incorrect. For example, count variables (nonnegative integers) should be modeled with Poisson and negative binomial regression. Modeling nominal scale dependent variables (discrete variables that are not ordered) requires discrete outcome models.

3.4.1.2 Linear-in-Parameters Relationship between Y and X

The form of the regression model requires that the relationship between variables is inherently linear- a straight-line relationship between the dependent variable Y and the independent variables. The simple linear regression model is given by:

$$Y_i = \beta_0 + \beta_1 X_{1i} + \varepsilon_i \quad (3.2)$$

In this algebraic expression of the simple linear regression model, the dependent variable Y is a function of a constant term β_0 and a constant β_1 times the value X_1 of independent variable X for observation i, plus a disturbance term ε_i . The subscript i corresponds to the individual or observation, where $i = 1, 2, 3, \dots, n$. In most applications the response variable Y is a function of many independent variables.

3.4.1.3 Observations Independently and Randomly Sampled

An assumption that the data are randomly sampled from the population is necessary to make inferences about the population of interest. Independence requires that the probability that an observation is selected is unaffected by other observations selected into the sample. Random assignment can also be used in place of random sampling while other sampling schemes such as stratified and cluster samples can be used in the regression modeling framework with corrective measures.

3.4.1.4 Uncertain Relationship between Variables

The addition of a stochastic, disturbance, or disturbance term, ε differentiates the equation of a straight-line and a linear regression model. This term consists of several elements of the process. First, it can contain variables that were omitted from the model such as the sum of many small, individually unimportant effects, some positive and others negative. Second, it contains measurement errors in the dependent variable, or the imprecision in measuring Y, again assumed to be random. Lastly, it contains random variation inherent in the underlying data-generating process.

3.4.1.5 Disturbance Term Independent of X and Expected Value Zero

The requirements of the disturbance term ε are:

$$E[\varepsilon_i] = 0 \tag{3.3}$$

And

$$VAR[\varepsilon_i] = \sigma^2 \tag{3.4}$$

According to Equation 3.4 the variance of the disturbance term, σ^2 , is independent. This is considered as the homoscedasticity assumption which implies that the net effect of model uncertainty including unobserved effects, measurement errors, and true random variation, is not systematic across observations; instead it is random across observations and across covariates. When disturbances are heteroscedastic then alternative modeling approaches such as weighted least squares or generalized least squares may be required.

3.4.1.6 Disturbance Terms Not Auto Correlated

This requirement is written as follows:

$$\text{COV}[\varepsilon_i, \varepsilon_j] = 0 \text{ if } i \neq j \quad (3.5)$$

Equation 3.5 specifies that disturbances are independent across observations. Common violations of this assumption occur when observations are repeated on individuals, so the unobserved heterogeneity portion of the disturbance term ε is the same across repeated observations. Observations across time often possess auto correlated disturbances as well. When disturbances are correlated across observations, generalized least squares or other correction methods are required.

3.4.1.7 Regressors and Disturbances Uncorrelated

This property is known as exogeneity of the regressors. When the regressors are exogenous, they are not correlated with the disturbance term. Exogeneity means that the values of the regressors are determined by influences that are outside of the model. So Y does not directly influence the value of an exogenous regressor. In mathematical terms:

$$\text{COV}[X_i, \varepsilon_j] = 0 \text{ for all } i \text{ and } j \quad (3.6)$$

When an important variable is endogenous (depends on Y), then alternative methods are required, such as instrumental variables, two and three stage least squares, or structural equations models.

3.4.1.8 Disturbances Approximately Normally Distributed

Although not a requirement for the estimation of linear regression models, the disturbance terms are required to be approximately normally distributed in order to make inferences about the parameters from the model. In this regard the central limit theorem enables exact inference about the properties of statistical parameters.

3.4.2 Regression Fundamentals

information and properties about the parameters in the population model is provided by Regression by inspecting properties of the sample-estimated betas, how they behave, and what they can tell us about the sample and thus about the population.

For the entire population of interest the linear regression model is

$$E[Y_i | X_i] = E[\beta_0 + \beta_1 X_{1,i} + \beta_2 X_{2,i} + \dots + \beta_{p-1} X_{p-1,i}] \quad (3.7)$$

The expected value of Y_i given covariate vector X_i is a conditional expectation. The mean or expected value of Y_i is conditional on the covariate vector for observation i . In Equation 3.7 the population model represents a theoretically postulated model whose parameter values are constant, unknown and denoted with betas. As Equation 3.7 is based on all members of the population of interest, the parameters are unknown. The underlying true relationship between the independent variables X_1, X_2, \dots, X_{p-1} and dependent variable Y_i is reflected by The parameters (betas), because the population N is presumably finite at any given time. The true population model contains p parameters in the model, and there are n observations.

The unknown disturbance term for the population regression model (Equation 3.7) is given by

$$\epsilon_i = Y_i - \hat{Y}_i = Y_i - E[\beta_0 + \beta_1 X_{1,i} + \beta_2 X_{2,i} + \dots + \beta_{p-1} X_{p-1,i}] \quad (3.8)$$

Regression builds on the notion that information is learned about the unknown and constant parameters (betas) of the population by using information contained in the sample. The sample is used for estimating betas random variables that fluctuate from sample to sample and the properties of these are used to make inferences about the true population betas. There are numerous procedures to estimate the parameters of the true population model based on the sample data, including least squares and maximum likelihood. The following description is explained from Washington et al. (2010).

3.4.2.1 *Least Squares Estimation*

Least squares estimation often referred to as “ordinary least squares” or OLS is a commonly used estimation method for regression applications. It represents a method for estimating regression model parameters using the sample data.

In the algebraic expression of the OLS regression model shown in Equation 3.7, one might expect, requires a minimum (least) solution of the squared disturbances. OLS seeks a solution that minimizes the function Q:

$$\begin{aligned}
 Q_{\min} &= \sum_{i=1}^n (Y_i - \hat{Y}_i)_{\min}^2 = \sum_{i=1}^n (Y_i - (\beta_0 + \beta_1 X_i))_{\min}^2 \\
 &= \sum_{i=1}^n (Y_i - \beta_0 - \beta_1 X_i)_{\min}^2
 \end{aligned}
 \tag{3.9}$$

The values of β_0 and β_1 that minimize the function Q are the least squares estimated parameters. As β_0 and β_1 are parameters of the population and are unknown, estimators B_0 and B_1 are obtained, which are random variables that vary from sample to sample. The least squares estimated parameters B_0 and B_1 are obtained by setting the partial derivatives of Q with respect to β_0 and β_1 equal to zero:

$$\frac{\partial Q}{\partial \beta_0} = -2 \sum_{i=1}^n (Y_i - \beta_0 - \beta_1 X_i) = 0 \quad (3.10)$$

$$\frac{\partial Q}{\partial \beta_1} = -2 \sum_{i=1}^n X_i (Y_i - \beta_0 - \beta_1 X_i) = 0 \quad (3.11)$$

Solving these equations using B_0 and B_1 to denote the estimates of β_0 and β_1 , respectively, and rearranging terms yields

$$\sum_{i=1}^n Y_i = nB_0 + B_1 \sum_{i=1}^n X_i \quad (3.12)$$

$$\sum_{i=1}^n X_i Y_i = B_0 \sum_{i=1}^n X_i + B_1 \sum_{i=1}^n X_i^2 \quad (3.13)$$

Solving simultaneously for the betas in Equations 3.12 and 3.13 yields

$$B_1 = \frac{\sum_{i=1}^n (X_i - \bar{X})(Y_i - \bar{Y})}{\sum_{i=1}^n (X_i - \bar{X})^2} \quad (3.14)$$

$$B_0 = \frac{1}{n} \left(\sum_{i=1}^n Y_i - B_1 \sum_{i=1}^n X_i \right) = \bar{Y} - B_1 \bar{X} \quad (3.15)$$

3.4.2.2 Maximum Likelihood Estimation

Maximum likelihood estimation results in the maximum likelihood estimates, or MLEs. The joint density of observing the sample data from a statistical distribution with parameter vector θ , such that

$$f(x_1, x_2, \dots, x_n, \theta) = \prod_{i=1}^n f(x_i, \theta) = L(\theta | \mathbf{X}) \quad (3.16)$$

For the regression model, the likelihood function for a sample of n identically, independent and normally distributed disturbances is given by

$$\begin{aligned} L &= (2\pi\sigma^2)^{-\frac{n}{2}} \text{EXP} \left[-\frac{1}{2\sigma^2} \sum_{i=1}^n (Y_i - X_i^T \beta)^2 \right] \\ &= (2\pi\sigma^2)^{-\frac{n}{2}} \text{EXP} \left[-\frac{1}{2\sigma^2} (Y - X\beta)^T (Y - X\beta) \right] \end{aligned} \quad (3.17)$$

The logarithm of Equation 3.17, is simpler to solve than the likelihood function itself, so taking the log of L yields

$$LN(L) = LL = -\frac{n}{2}LN(2\pi) - \frac{n}{2}LN(\sigma^2) - \frac{1}{2\sigma^2}(\mathbf{Y} - \mathbf{X}\boldsymbol{\beta})^T(\mathbf{Y} - \mathbf{X}\boldsymbol{\beta}) \quad (3.18)$$

Maximizing the log likelihood with respect to $\boldsymbol{\beta}$ and σ^2 reveals a solution for the estimates of the betas that is equivalent to the OLS estimates, that is $\mathbf{B} = (\mathbf{X}^T\mathbf{X})^{-1}\mathbf{X}^T\mathbf{Y}$.

3.4.3 Regression Model Goodness-of-Fit Measures

Goodness-of-fit (GOF) statistics are useful for comparing the results across multiple studies, for providing feedback on the extent of knowledge about the uncertainty involved with the phenomenon of interest and for comparing competing models within a single study, (Washington et al. (2010)). Three measures of model GOF are discussed: R-squared, adjusted R-squared, and the generalized F test. To develop the R-squared GOF statistic, some basic notions are required. Sum of squares and mean squares are fundamental in both regression and analysis of variance. The sum of square errors is given by

$$SSE = \sum_{i=1}^n (Y_i - \hat{Y}_i)^2 \quad (3.19)$$

The regression sum of squares is given by

$$SSR = \sum_{i=1}^n (\hat{Y}_i - \bar{Y})^2 \quad (3.20)$$

And the total sum of squares is given by

$$SST = \sum_{i=1}^n (Y_i - \bar{Y})^2 \quad (3.21)$$

The SSE is the variation of the fitted regression line around the observations. The SSR is the variation of the fitted regression line around, and SST is the total variation — the variation of each observation around. Algebraically $SST = SSR + SSE$. Mean squares are just the sum of squares divided by their degrees of freedom. SST has $n-1$ degrees of freedom; because 1 degree of freedom is lost in the estimation of \bar{Y} . SSE has $n - p$ degrees of freedom, because p parameters are used to estimate the fitted regression line. SSR has $(p - 1)$ degrees of freedom. The degrees of freedom are additive such that $n - 1 = n - p + p - 1$. The mean squares, then, are $MSE = SSE/(n - p)$ and $MSR = SSR/(p - 1)$. The coefficient of determination, R-squared, is defined as

$$R^2 = \frac{[SST - SSE]}{SST} = \frac{SSR}{SST} = 1 - \frac{SSE}{SST} \quad (3.22)$$

The proportionate reduction of total variation accounted for by the independent variables (X) is the R^2 . It is the proportion of total variance explained by X. When $SSE = 0$, $R^2 = 1$, and all of the variance is explained by the model. When $SSR = 0$, $R^2 = 0$, there is no association between X and Y. Because R^2 can only increase when variables are added to the regression model (SST stays the same, and SSR can only increase even when statistically insignificant variables are added). For the degrees of freedom changes as a result of different numbers of model parameters, an adjusted measure, R^2_{adjusted} , is used to account and allows for a reduction in R^2_{adjusted} as

additional, potentially insignificant variables are added. The adjusted coefficient of multiple determinations is

$$R^2_{\text{adjusted}} = 1 - \frac{\frac{\text{SSE}}{n-p}}{\frac{\text{SST}}{n-1}} = 1 - \left(\frac{n-1}{n-p} \right) \frac{\text{SSE}}{\text{SST}} \quad (3.23)$$

The following guidelines should be applied:

- The R^2 and R^2_{adjusted} measures provide comparisons with previous models that have been estimated on the phenomenon under investigation. So, an R^2_{adjusted} of 0.40 in one study may be considered “good” only if it represents an improvement over similar studies and the model provides new insights into the underlying data-generating process. It is only the combination of a comparable R^2_{adjusted} value and a contribution to the fundamental understanding of the phenomenon that justifies the claim of improved modeling results.
- The absolute values of R^2 and R^2_{adjusted} measures are not sufficient measures to judge the quality of a model. It might represent a breakthrough in the current level of understanding by an R^2 of 0.20 from a model of a phenomenon with a high proportion of unexplained variation whereas an R^2 of 0.90 of another phenomenon might represent no new insights or contributions. Thus, it is often better to explain a little of a lot of total variance rather than a lot of a little total variance.

Due to data artifacts, large values of R^2 and R^2_{adjusted} can be caused inflated values can be caused by the small variation in the independent variables. This can cause trouble if in practice the model is needed for predictions outside the range of the independent variables. R^2 and R^2_{adjusted} values can also inflate be inflated by extreme outliers.

- The R^2 and R^2_{adjusted} assume a linear relation between the response and predictor variables. It can give misleading results if the relation is nonlinear. In some cases R^2 could be relatively large and suggest a good linear fit, when the true relationships are curvilinear. In other cases R^2 could suggest a very poor fit when the relationships are

nonlinear. This emphasizes the need to plot, examine, and become familiar with data prior to statistical modeling.

- When an intercept term is included in the regression model the R^2 and R^2_{adjusted} values are bound by 0 and 1 only. The R^2 and R^2_{adjusted} values can exceed the value 1 when the intercept is forced through zero, and more caution needs to be used when interpreting them.

Another measure for assessing model fit is the generalized F test. For testing the statistical difference between competing models this approach is a general and flexible approach. First, a full or unrestricted model is estimated. This could be a model with ten independent variables. The full model is fit using the method of least squares and SSE is obtained — the sum of square errors for the full model. For convenience, the sum of square errors for the full model is denoted as

$$SSE_F = \sum_{i=1}^n (Y_i - \hat{Y}_{Fi})^2 \quad (3.24)$$

Where the predicted value of Y is based on the full model

A reduced model is then estimated. It represents a viable competitor to the full model with fewer variables. For example, this could be a model with nine independent variables, or a model with no independent variables, leaving only the Y-intercept term B_0 . The sum of squared errors is estimated for the competing or reduced model, where

$$SSE_R = \sum_{i=1}^n (Y_i - \hat{Y}_{Ri})^2 \quad (3.25)$$

The logic of the F test is to compare the values of SSE_R and SSE_F . SSE can only be reduced by adding variables into the model, thus $SSE_R \geq SSE_F$. If these two sums of square errors are the same, then the full model has done nothing to improve the fit of the model; so the reduced model

is superior. Conversely, if SSE_F is considerably smaller than SSE_R , then the additional variables add value to the regression by adding sufficient additional explanatory power. In the generalized F test the null and alternative hypotheses are as follows:

$$H_0: \text{all } \beta_k = 0 \quad (3.26)$$

$$H_a: \text{all } \beta_k \neq 0 \quad (3.27)$$

In this test the null hypothesis is that all of the additional parameters in the full model (compared to the reduced model) β_k are equal to zero.

When the null hypothesis is true (making the F test a conditional probability), the F^* statistic is approximately F distributed, and is given by

$$F^* = \frac{\frac{SSE_R - SSE_F}{df_R - df_F}}{\frac{SSE_F}{df_F}} \approx F(1 - \alpha; df_R - df_F, df_F) \quad (3.28)$$

Where $df_F = n - p_F$ and $df_R = n - p_R$ (n is the number of observations and p is the number of parameters). To calculate this test statistic, the sum of square errors for the two models is first computed, then the F^* statistic is compared to the F distribution with appropriate numerator and denominator degrees of freedom. Specifically,

$$\begin{aligned} \text{If } F^* \leq F(1 - \alpha; df_R - df_F, df_F), \text{ then conclude } H_0 \\ \text{If } F^* \geq F(1 - \alpha; df_R - df_F, df_F), \text{ then conclude } H_a \end{aligned} \quad (3.29)$$

The generalized F test is very useful for comparing models of different sizes. The F test yields an equivalent result to the t test for that variable when the difference in size between two models is

one variable. Thus, the F test is most useful for comparing models that differ by more than one independent variable.

Following Montgomery and Runger (2003) the hypotheses of t-test are

$$H_0: \beta_1 = \beta_{1,0} \quad (3.30)$$

$$H_1: \beta_1 \neq \beta_{1,0} \quad (3.31)$$

Where we have assumed a two-sided alternative and the t-statistics is

$$T_0 = \frac{\hat{\beta}_1 - \beta_{1,0}}{\sqrt{\hat{\sigma}^2/S_{xx}}} \quad (3.32)$$

Follows the t distribution with (n-2) degrees of freedom under $H_0: \beta_1 = \beta_{1,0}$. We would reject $H_0: \beta_1 = \beta_{1,0}$ if

$$|t_0| > t_{\alpha/2, n-2} \quad (3.33)$$

Where t_0 is computed from Equation 3.33

The denominator of Equation 3.33 is the standard error of slope. So, we could write the test statistic as

$$T_0 = \frac{\hat{\beta}_1 - \beta_{1,0}}{se(\hat{\beta}_1)} \quad (3.34)$$

Chapter 4: ANALYSIS AND MODEL DEVELOPMENT

4.1. Introduction

A total of 153 samples were collected for conducting the study. There are two dimensions of the study. First is the service quality of the rider-sharing services and the second is the safety and security of the ride-sharing services. The safety and security of the ride-sharing services comprises of personal safety of the passengers and as well as the road safety such as, driving speed, obeying traffic rules etc. Two analyses will be carried out for the two aspects of the study. This is because the two aspects are totally different from one another.

For the analysis purpose, linear regression model is used. The same model is implemented for both the aspects of the study. The outcome of the analysis of the two aspects may identify the faults in the ride-sharing services and thus direct towards the measures to be taken for the betterment of the service.

4.2. Model Development

For the development of the model, suitable factors were selected. The factors were such that they were helpful to make a proper judgment and reach a conclusion for the analysis. Firstly, several other similar research papers were reviewed for determining the factors. And, secondly, on top of those factors other various factors were included based on the local context.

Table 4.1: Summary Statistics

Variable	Description of Variables	Mean	Std. Dev.
<i>Socio-economic & Demographic Characteristics</i>			
Gender	If gender is Male=1; otherwise=0	.686	.466
Occupation			
Student	If occupation is Student=1; otherwise=0	0.183	0.388
Service-holder (Government/Private)	If occupation is Service Holder(Government & Private)=1; otherwise=0	0.608	0.490
Business	If occupation is Business=1; otherwise=0	0.072	0.259
Housewife	If occupation is House Wife=1; otherwise=0	0.072	0.259
Self Employed	If occupation is Self-employed=1; otherwise=0	0.033	0.178
Other Occupation	If occupation is Other=1; otherwise=0	0.033	0.178
Monthly Income (in BDT)			
<20000	If monthly income is <20000=1; otherwise=0	0.229	0.421
20000-40000	If monthly income is ≥ 20000 but <40000=1; otherwise=0	0.268	0.444
40000-60000	If monthly income is ≥ 40000 but <60000=1; otherwise=0	0.190	0.393
>60000	If monthly income is ≥ 60000 =1; otherwise=0	0.314	0.466
Living Area of the Respondent			
Solvent Area	If living area is Solvent Area=1; otherwise=0	0.523	0.501
Average Solvent Area	If living area is Average Solvent Area=1; otherwise=0	0.359	0.481
Less Solvent Area	If living area is Less Solvent Area=1; otherwise=0	0.072	0.259
Economically Disadvantaged Area	If living area is Economically Disadvantaged Area=1; otherwise=0	0.046	0.210
Self-Driving	If respondent can drive; self-driving=1, otherwise=0	0.150	0.376
<i>Travel Characteristics</i>			
Monthly Budget for Transportation			
<2000	If budget is <2000=1; otherwise=0	0.137	0.345
2000-4000	If budget is ≥ 2000 but <4000=1; otherwise=0	0.301	0.460
4000-6000	If budget is ≥ 4000 but <6000=1; otherwise=0	0.235	0.426

>6000	If budget is $\geq 6000=1$; otherwise=0	0.327	0.471
Major choice of Ridesharing- Services			
Uber	If major service choice is Uber=1; otherwise=0	0.752	0.433
Pathao	If major service choice is Pathao=1; otherwise=0	0.150	0.359
Shohoj	If major service choice is Shohoj=1; otherwise=0	0.007	0.081
Other Services	If major service choice is Other=1; otherwise=0	0.092	0.289
No of Trips			
<1	If number of trips in a day is one=1; otherwise=0	0.124	0.331
2	If number of trips in a day is two=1; otherwise=0	0.529	0.501
3	If number of trips in a day is three=1; otherwise=0	0.118	0.323
>3	If number of trips in a day is more than three =1; otherwise=0	0.137	0.345
Major Travel Location			
Solvent area	If major travel location is Solvent Area=1; otherwise=0	0.673	0.471
Average solvent area	If major travel location is Average Solvent Area=1; otherwise=0	0.216	0.413
Less solvent area	If major travel location is Less Solvent Area=1; otherwise=0	0.059	0.236
Economically disadvantaged area	If major travel location is Economically Disadvantaged Area=1; otherwise=0	0.052	0.223
Major Travel Time of Trip			
Morning Peak	If major traveled time of trip is Morning Peak=1; otherwise=0	0.477	0.501
Evening Peak	If major traveled time of trip is Evening Peak=1; otherwise=0	0.510	0.502
Noon	If major traveled time of trip is Noon=1; otherwise=0	0.320	0.468
Night	If major traveled time of trip is Night=1; otherwise=0	0.209	0.408
Major Reason for Ridesharing			
Reasonable Fare	If reason is reasonable fare=1; otherwise=0	0.072	0.259
Comfort	If reason is Comfort=1; otherwise=0	0.562	0.498
Security	If reason is Security=1; otherwise=0	0.118	0.323
Reliability	If reason is Reliability=1; otherwise=0	0.157	0.365
Saves Time	If reason is Saves Time=1; otherwise=0	0.092	0.289

Some of the factors were recorded in individual manner while many factors were recorded in categorical manner. In case of categorical manner, the binary effects were used to record the data. There were different categories under a certain factor and the category that was chosen was denoted as 1 and the other categories were denoted as 0. For instance, under the variable living area of the respondents there were several categories, and the respondent living in solvent area then that will be denoted as 1 otherwise 0. The same method has been used for all the categories.

The categorical data are always summed up to 1 or 100% and hence one of the categories has to be omitted from the model. The omitted has to be used as the base case as to which the other categorical variables are compared to. For instance, in case of occupation, the self-employed category has been omitted.

Moreover, there are some continuous variables as well, such as, monthly income of the respondents, monthly budget for transportation and so on.

In analysis of the model results, the positivity of the estimated coefficients indicates the lower probability of using ride-sharing services because the value of the variables decreases and vice versa.

4.2.1. Model for Service Quality:

Linear regression model was used for the analysis of service quality of the ride-sharing services. Initially 64 factors were prepared to be used for the model of service quality. But after the analysis, 16 factors were retained for the service quality model. The socio-economic and demographic factors were used as the control variables.

Several factors after the analysis were omitted, for instance, age, self-employed, having car and so on. These factors were dropped because they were not significant statistically during the model development procedure. The following table consists of the factors that were significant for the model of service quality.

Table 4.2: Linear Regression Model for Service Quality

Number of obs. = 153			
F(16, 136) = 5.07			
Prob> F = 0.0000			
R-squared = 0.3738			
Adj. R-squared = 0.3002			
Root MSE = 10.743			
Variable	Co-efficient	Standard error	P-Value
Gender	5.5321	2.196	0.013
Occupation			
Student	-35.2086	5.376	0.000
Service-holder(Government/Private)	-28.9396	5.261	0.000
Business	-28.5561	6.174	0.000
Housewife	-26.6868	6.078	0.000
OtherOccupation	-26.9331	7.065	0.000
Economically Disadvantaged Area	-10.1331	4.607	0.030
Income >60000	-4.4097	2.360	0.064
Budget Category (in BDT)			
Budget 2000-4000	-6.4446	2.394	0.008
Budget 4000-6000	-5.7508	2.353	0.016
Self-Driving	5.9662	2.429	0.015
Major Travel Location			
Solvent Area	-5.0599	3.046	0.099
Average Solvent Area	-6.1469	3.436	0.076
Time of Trip			
MorningPeak	3.7754	1.963655	0.057
Noon	3.6319	2.053	0.079
Night	4.4972	2.261	0.049
Constant	95.7783	5.806	0.000

Numerous factors were recorded in categorical manner and in order to express these factors binary (0 and 1) variables are used. For instance, the type of occupation is recorded by six binary variables which include student, service-holder (government/private), business, housewife, self-employed and others. If the occupation of someone using the ride-sharing service is business then it will recorded as 1 otherwise 0. The case is similar for all other categorical factors.

Again, there are also some continuous variables, such as, age, monthly income, budget, number of trips and so on.

4.2.2. Model for Safety and Security:

The factors that are significant for the model of safety and security are enlisted below in Table 4.3. Linear regression model was also used for the analysis of the factors for safety and security. Total 12 factors were found significant during the analysis. Many factors have been eliminated as they were not significant during the analysis process.

Table 4.3: Linear Regression Model for Safety & Security

Number of obs. = 153			
F(12, 140) = 4.27			
Prob> F = 0.0000			
R-squared = 0.2680			
Adj. R-squared = 0.2052			
Root MSE = 5.9391			
Variable	Co-efficient	Standard Error	P- Value
Gender	1.8336	1.087	0.094
Occupation			
Student	-2.8964	1.373	0.037
Self-employed	4.7148	2.876	0.103
Monthly Income Category (in BDT)			
Income 20000 - 40000	-3.7453	1.260	0.003
Income >60000	-3.1991	1.261	0.012
Major Travel Location			
Solvent Area	-6.2801	2.214	0.005
Average Solvent Area	-8.6280	2.379	0.000
Less Solvent Area	-7.8134	3.010	0.010
Number of Trips			
Trips <=1	-3.6451	1.5995	0.024
Trips = 2	-2.3281	1.103	0.037
Pathao Ridesharing Service	2.5002	1.452	0.087
Reliability	-2.3026	1.355	0.092
Constant	41.2261	2.435	0.000

Chapter 5: RESULTS AND INTERPRETATIONS

5.1 Introduction

The main goal of this chapter is to understand how the socio-economic, demographic and travel characteristics in community level affect the use of ridesharing services from the passengers perspective.

In this study, two models were developed for service quality and safety. So two separate model analysis were done. In each of these models: linear regression model was used.

This chapter also describes how the model has been generated and also the description of data needed for the model development along with the elimination process of insignificant variables to get the desired model.

5.2 Analysis of Survey Data on Service Quality:

Table 5.1: Survey Data on Service Quality

Questions	Never (%)	Rarely (%)	Frequently (%)	Always (%)
<i>Service Quality of Vehicles</i>				
Vehicle not clean	11.8	62.1	22.9	3.3
Vehicle having uncomfortable smell inside	11.1	69.9	16.3	2.6
AC not working properly	17	61.4	19.6	2
Seats of the vehicle not clean	17.6	64.7	15.7	2
Seats in the vehicle not comfortable	14.4	66	17	2.6
Leg-spacing inappropriate	24.8	53.6	17.6	3.9
Vehicles are older than 5 years	4.6	28.8	49	17.6
<i>Driver's Behavior and Attitude</i>				
Driver's attire not clean	15.7	60.8	20.9	2.6
Driver talking inappropriately to passengers	16.3	68	13.7	2
Driver found to be talkative	17.6	58.2	22.2	2

Drivers haven't shown empathy in any difficulties	13.1	58.8	24.2	3.9
Drivers smoke in the car while driving	81	17.6	1.3	1.1
Driver doesn't know the route	7.8	64.1	25.5	2.6
Drivers cancelling the trip	6.5	37.9	49.7	5.9
Drivers starting the trip before you get in the vehicle	37.3	47.1	13.7	2
Drivers failing to reach the schedule for arrival time	5.9	55.6	35.3	3.3
Drivers failed to pick up at the exact location	9.2	52.9	33.3	4.6
Drivers asking for extra charges	47.1	44.4	7.2	1.3
Having arguments with the driver regarding the fare	51.6	39.9	7.2	1.3
Drivers misbehaving with passengers	34.6	59.5	5.2	0.7
Drivers refuse to go to exact destination	20.3	56.9	19.6	3.3
Drivers using different route other than the route showed on the map	9.8	51	35.3	3.9
<i>Service Quality of the App</i>				
Found the app not responsive	20.3	63.4	13.7	2.6
Arrival and departure time not showing properly on the app	11.1	52.9	28.8	7.2
Vehicles found not available in the ride-sharing app	8.5	57.5	28.1	5.9
Feedback system in the ride-sharing app not working properly	22.2	54.9	17.6	5.2
GPS is not available on the app	35.9	47.7	14.4	2
Unfair price according to the distance travelled	19.6	48.4	28.8	3.3
Promo codes and discounts don't working properly	38.6	41.2	17	3.3
Driver's information were not provided on the app	42.5	41.8	13.1	2.6
Digital payment system does not work properly	34	47.1	16.3	2.6
Complaint handling system is not working properly on the app	26.8	43.8	23.5	5.9

From the table 5.1 it can be seen that most respondents have found the vehicles unclean rarely about 62.1%. Only 3% found the vehicles always unclean. 66% respondent responded rarely when asked about whether they find the seats uncomfortable. From a study it was found comfort has significantly positive relation with the service quality of ridesharing services. (Horsu&Yeboah, 2015) The air conditioner found to be not working properly rarely (61.4%) and 17% have agreed that they never found the A.C not working properly. 69% have responded that they rarely have found drivers talking inappropriately to the respondents. So the housewives are quite satisfied with the service quality.

Respondents have found the price is unfair according to distance rarely (48.4%) and 28.8% frequently. That is probably the reason the male gender are not satisfied with the service quality. So the price allocation with distance needs to be maintained. It was found in a research in Surabaya that price has a significant on customer loyalty in ride-hailing services. (Assegaff&Pranoto, 2020)Also the vehicles are frequently found to be older than 5 years, the responses in frequently is the highest (49%). It can be said that most of the ridesharing vehicles are old. So it needs proper maintenance. This is also probably the reason male and respondents who can drive don't find the service quality satisfactory enough. Students seem to be more technologically advanced as such respondents who are students most probably responded that when asked about how often the GPS system not working properly, 35.9% responded to never. This means most respondents have never felt that the GPS system is not working properly. They are also happy with the feedback system as only 2.6% people responded to always when asked how often the digital payment system not working properly. This makes the service quality mostly satisfactory to the students.

51.6% responses were on rarely when asked whether the driver failed to reach the scheduled arrival time. Only 3.3% responses were from always. And arrival and departure time not showing properly when asked, most responses were rarely (57.5%) and 8.5% never responses. And rarely (52.9%) the drivers failed to pick up from the exact location. That is why the business men, other occupation, service holders all busy working people to save time and to take the comfort of door-door ride benefit, are mostly satisfied with the service quality of ridesharing

services. In the previous research it was found that the travel time, cost and availability dominates predictions about the use of ridesharing services. (Alesbury et al., 2017)

Then 49% respondents have found drivers frequently cancel the trip. And respondents found 35.3% frequently taking different routes than the routes shown in the map. This is a serious let down in the service quality of ridesharing vehicles. That is why during the night respondents probably are not satisfied with service quality of ridesharing vehicles. 13.7% responses were on found the app not responsive enough. At noon people are not satisfied with the service quality. During the morning peak this is also probably the reason the respondents are not satisfied with the service quality

38.6% respondents found that the promo codes and discounts never work improperly. This is probably another reason why the economically disadvantaged areas are also satisfied with the ride sharing services. 42.5% respondents responded that they had never seen the driver's information not properly displayed in the app. Drivers never seem to smoke in the car as 81% responses are in never smokes in the car. These are also the probable reasons why respondents who mostly travels to average solvent area and spends 2000 to 4000 BDT monthly on transportation uses the service and feels satisfied most of the time.

5.3 Analysis of Survey Data on Safety and Security:

Table 5.2: Survey Data on Safety & Security

Questions	Never (%)	Rarely (%)	Frequently (%)	Always (%)
<i>Personal Safety</i>				
Not displaying the license of the driver beneficial	59.5	10.3	11.1%	13.1
How often you find the real time GPS tracking and share trip details not beneficial to you?	64.7	21.6	10.5	3.3
Safety features help line 999 not beneficial	41.2	24.2	26.8	7.8
Checking the registration number not beneficial	60.1	16.3	16.3	7.2
Unsafe while using ridesharing service during day time	54.9	26.1	15	3.9
Unsafe while using ridesharing service during night time	24.8	53.6	17.6	9.8
Uncertain that the driver will reach the destination using proper route	22.2	51.6	22.9	3.3
Personal information being misused	45.1	35.9	13.1	5.9
Failed to catch network/ off-line during travel	16.3	68	13.7	2
Safety features/ information available in the app inadequate for female passengers from safety and security perspective	17.6	22.2	42.5	17.6
<i>Road Safety</i>				
Drivers drive roughly	6.5	51.6	37.3	4.6
Drivers violating traffic rules while driving	16.3	54.9	22.9	5.9
Drivers seem fatigue while driving	19	56.9	20.3	3.9
Faced road accidents from ridesharing services	58.2	34	5.9	2
Faced robbery/ mugging while using ridesharing services	77.1	12.4	9.2	1.3
Drivers taking unknown people during ride	69.3	19.6	9.2	2
Faced sexual harassment	87.6	8.5	2.6	1.3

When asked how often the respondents found that not displaying the license of the driver beneficial, most respondents responded never (59.5%) as displaying the license of the driver is always beneficial. 64.7% have never felt that GPS tracking and share trip details in the app not beneficial. Because these safety features are supposed to be helpful when any unwanted situation occur. 41.2% never felt that the safety feature helpline 999 not beneficial. That means these features are always helpful. If people know how to use it properly then the people will be able to make use of it. And 60.1% respondents think that checking the registration number is never not beneficial which means it is always beneficial to people specially people who makes trip less than 1 or equal and 2 trips in a day, these people more or less make many trips so these people are mostly accustomed to the apps services as such they probably have responded that these safety features, checking registration number etc. all are beneficial. Thus they feel safe and secured in using the ridesharing services.

Most male gender seems to face more accidents, robbery, assault etc. And thus respondents mostly had replied they have faced these problems rarely (34%). A research also mentions that there is always a concern about drivers might attack, kidnap or assault when the riders use these ridesharing services. (Mirsadikov et al., 2016)37.5% responded that they have found drivers frequently driving the car roughly as in Dhaka city the roads are not properly maintained and traffic regulation is very poor.

From our survey, 13.1% respondents frequently found their personal information is misused while using the ridesharing services. This breaks trust in the service. Self-employed people don't usually go outside. So probably they have trust issues with the ridesharing services which make them feel unsafe while using it. On the other hand, 41.5% have never faced their personal information being misused which means ridesharing services tries to keep passengers information secured. This is also probably an important reason monthly income between 20000 and 40000 (in BDT) feels safe using this service. Then from our survey we have also found that 77.1% respondents never faced robbery/mugging while using the ridesharing services. And 58.2% respondents chose never faced accidents from using ridesharing services. So ridesharing services can thus be called a safe mode of public transportation. Also most of these respondents probably use their private car, like income greater than 60000 probably uses the service less that's probably another reason why most of them have never faced such incidents.

51.6% respondents were drivers driving the vehicles rarely and 54.9% respondents responded that the drivers maintain the traffic rules and regulations. From the table 5.2 it can be found that while travelling to major travel locations like solvent area, average solvent area etc. people probably drives the vehicle properly out of the fear of police checkpoints/ proper traffic regulations in developed areas. So most of these respondents probably travels to these solvent and average solvent area for which most responses were as such and thus in the table 5.2, it shows respondents who travel to these areas feel safe and secured using ridesharing services.

17.6% always find that the safety features/ information available in the app are inadequate for female passengers. 42.5% frequently finds these safety features inadequate for female passengers. These respondents most probably are the Pathao users as the people who mostly use Pathao services don't feel safe and secured while using the ridesharing services as shown in the table 5.2.

5.4 Analysis of Survey Data on Socio-economic, Demographic and Travel characteristics:

Table 5.3: Survey Data on Socio-economic, Demographic Profile & Travel Characteristics

Variable	Category	Frequency	Percentage
Gender	Male	106	69%
	Female	47	31%
Occupation	Student	27	18%
	Service-holder(Government/ Private)	94	62%
	Businessman	11	7%
	Housewife	11	7%
	Self-employed	5	3%
	Other Occupation	5	3%
Monthly Income (in BDT)	Income<20000	41	27%
	20000<=Income<40000	33	21%
	40000<=Income<60000	26	17%
	Income>=60000	53	35%

Living Area	Solvent Area	80	67%
	Average Solvent Area	55	22%
	Less Solvent Area	11	6%
	Economically Disadvantaged Area	7	5%
Whether the respondent Drives or not	Self-Driving	20	87%
	Doesn't Drive	133	13%
Monthly Budget (in BDT) in Transportation	Budget <2000	21	14%
	2000<=Budget<4000	46	30%
	4000<=Budget<6000	36	23%
	Budget>=6000	50	33%
Frequently used Ridesharing App	Uber	115	75%
	Pathao	24	16%
	Shohoj	1	0%
	Obhai	1	1%
	Other ridesharing services	12	8%
Number of Trips	Trips<=1	22	14%
	Trips =2	80	52%
	Trips =3	19	13%
	Trips>3	32	21%
Major Travel Time of Trip	Morning Peak	73	32%
	Noon	47	20%
	Evening Peak	81	35%
	Night	30	13%
Major Travel Area	Solvent Area	103	67%
	Average Solvent Area	33	22%
	Less Solvent Area	9	6%
	Economically Disadvantaged Area	8	5%
Major Reason for using Ridesharing services	Reasonable Fare	11	7%
	Comfort	85	52%
	Security	18	12%
	Reliability	15	10%
	Saves Time	24	16%

5.4.1 Profile of the Respondent:

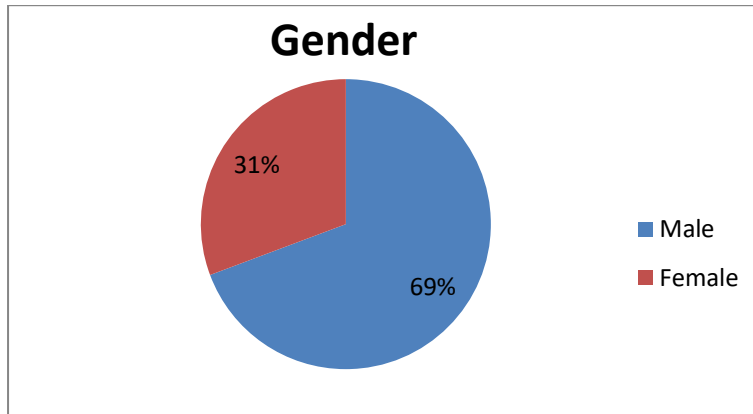


Figure 5.1: Percentage of male and female respondent

In our survey we have found that 69% respondents in the questionnaire survey were male and 31% were female which means majority of the respondents were male. So most of these ridesharing services are probably used by male and satisfaction of service quality and safety were mainly responded by the male gender. And from table 5.1 and table 5.2 we have learnt that most male respondents were not satisfied with the service quality and safety of ridesharing services.

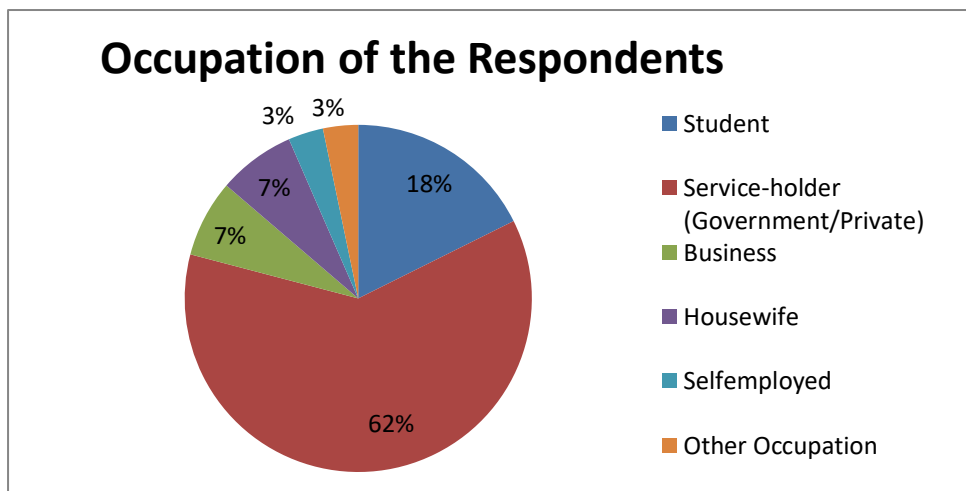


Figure 5.2: Occupation of the respondents

The main occupation of the respondent of our survey were service-holder (62%), student (18%), businessmen (7%), house wife (7%), self-employed (3%) and other occupation like army,

teacher etc. together were 3%. Most of the respondents were service-holder working either in government or private jobs. The busy people of Dhaka city have mostly answered these questions as such we can also get an idea that most ridesharing services are used by service-holders. And the graph also shows that equal number of respondent's occupation were self-employed and other occupations like army, teacher etc. And since the self-employed use the ridesharing service very less so that's probably also a reason why they don't feel safe while using this service. On the other hand student, businessman, housewife and other occupation are satisfied with the service quality of ridesharing services.

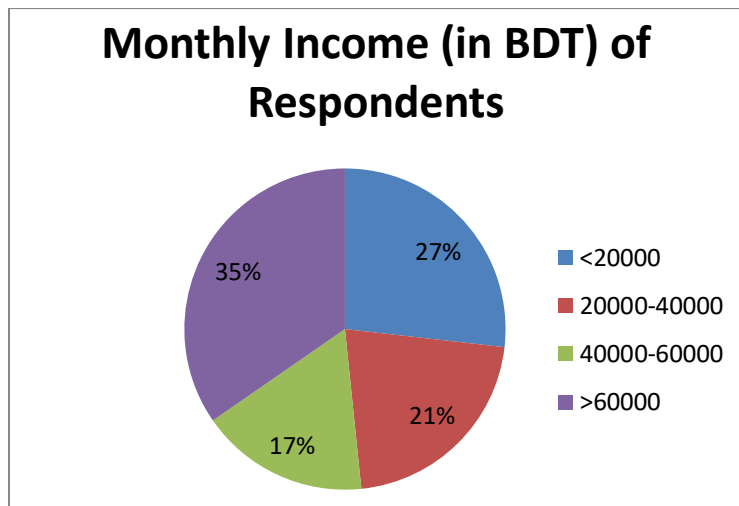


Figure 5.3: Monthly income of respondents (in BDT)

From the pie chart we can see that 35% respondent income is greater than 60000. Most of the respondents were higher income groups. In most of the studies it was found that in the higher income household and well educated respondent uses these ride-hailing services. (Alemi et al., 2018) Income between 20000 and 40000 were 17% respondents have never felt unsatisfied with the service quality and unsafe while using ridesharing services. 21% respondent monthly income was between 40000 and 60000 and respondent with income greater than 60000 also never felt unsafe using the ridesharing services.

Table 5.4: Survey Data on respondent's living area

Major Travel Location	Frequency	Percentage
Solvent Area		
Gulshan	80	52%
Dhanmondi		
Banani		
Uttara		
Baridhara		
Bangla Motor		
Farmgate		
Shahbag		
Bashundhara		
Average Solvent Area		
Mohakhali	55	36%
Mirpur		
Mohammadpur		
Basabo		
Badda		
Shamoli		
Malibagh		
Nakhali para		
Lalbag		
Rampura		
Niketon		
Shiddheshwari		
Tejgaon		
Motijheel		
Less Solvent Area		
Bosilla	11	7%
Mogda		
Kalachandpur		
Bhatara		
Aftabnagar		
Kallyanpur		
Gopibag		
Economically Disadvantaged Area		
Keraniganj	7	5%
Tongi		
Outside- Dhaka		

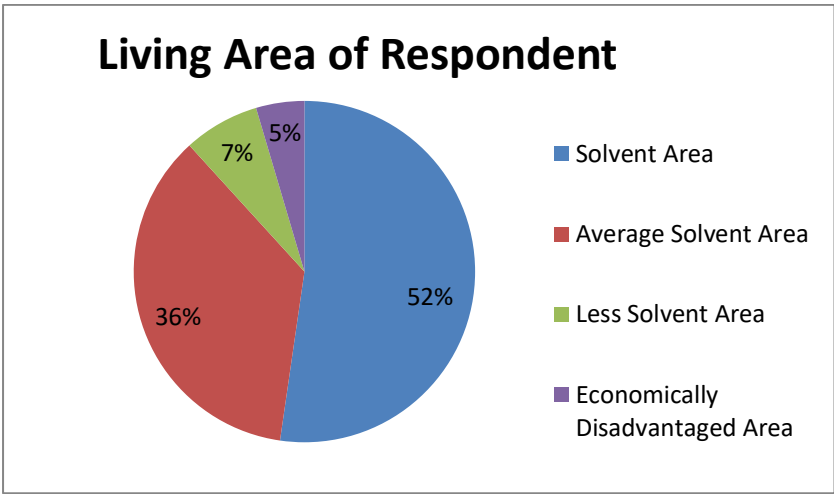


Figure 5.4: Living area of the respondents

From the above pie-chart it can be realized that about half of the respondent live in the solvent areas (52%), which includes Gulshan, Banani, Uttara, Bashundhara etc.as shown in table-5.6 and 36%% live in the average solvent area. The survey was done in the higher standard area of Dhaka city as ridesharing services are mostly popular among these people and as a result of it, they are likely to have better knowledge on the service quality and safety ridesharing services provide. Rest 6% respondent reside in less solvent area and 5% respondents live in economically disadvantaged area which includes Keraniganj, Tongi and outside of Dhaka city.The reason behind this is that the survey is based on assessing the service quality, safety and security in Dhaka city. So the surveying was done inside the Dhaka city area.

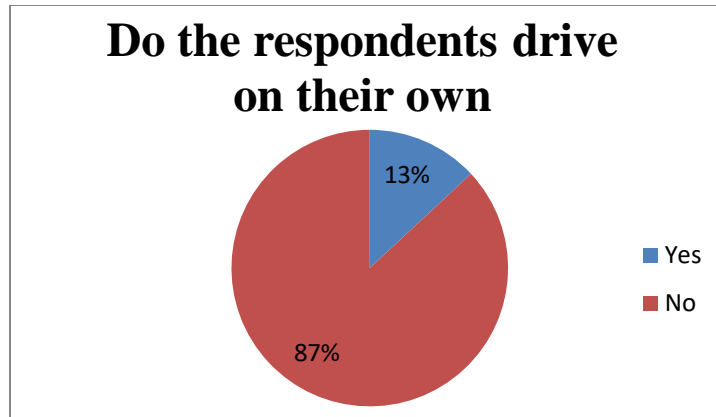


Figure 5.5: Whether the respondent drive their private cars on their own

From our questionnaire surveying we can say a significant number of respondents don't drive their cars as 87% respondents answered no when asked whether the respondent drive their private cars on their own. That is probably the reason why most of the respondents feel that the ridesharing services are satisfactory to use and feel safe while using it when they don't have a driver or don't have any car. And only 13% respondents responded to yes. These 13% who drives on their have mostly felt unsatisfied with the service quality of ridesharing services.

5.4.2 Monthly budget in Transportation:

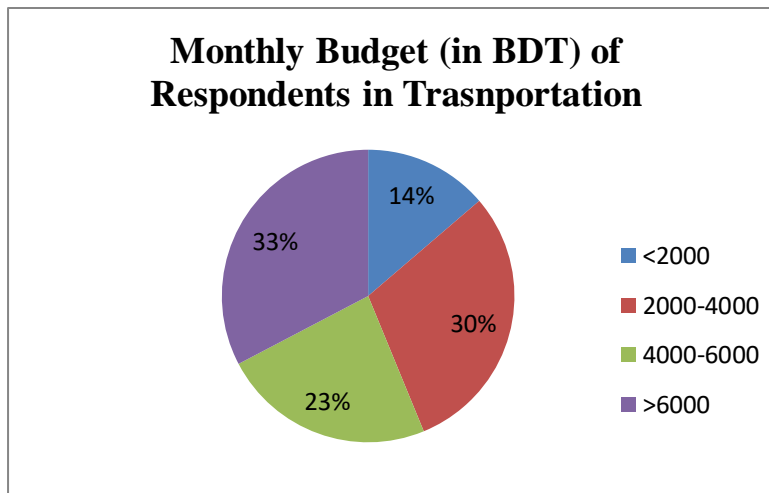


Figure 5.6: Monthly Budget (in BDT) for transportation of the respondents

33% respondents spend greater than Tk. 6000 monthly in transportation and 30% respondents spend between Tk. 4000 and Tk. 6000 in transportation. So the percentage of spending above Tk. 4000 is more or less similar. These respondents can thus be called as higher spending groups. So these people are most likely to feel satisfied with the service quality of ridesharing services as they probably use the Uber Premium cars or better quality car options in the ridesharing apps and probably don't have problem with the fare price system as well. Then 23% respondents spend between Tk. 2000 and Tk. 4000 monthly on transportation. This group of people probably doesn't have their own private cars or don't like to spend much on fuel consumption, so they are likely to travel with the ridesharing services with satisfaction.

5.4.3 Number of Trips taken by Respondents in a day:

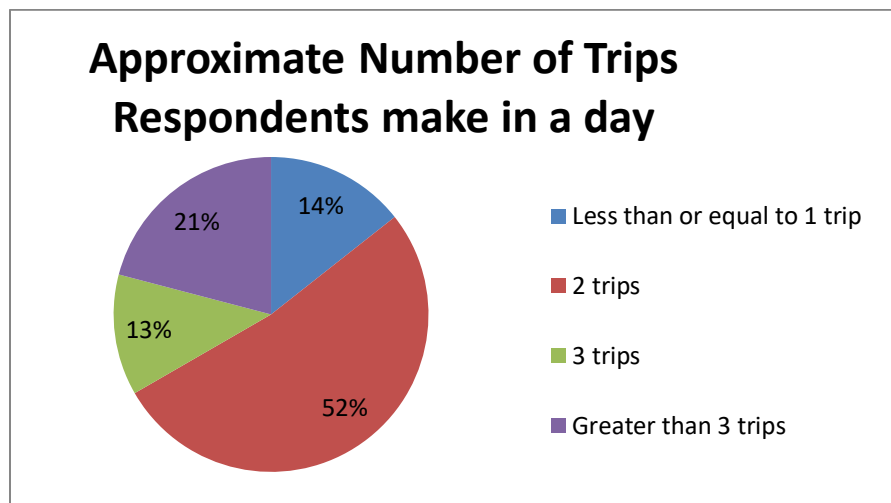


Figure 5.7: Commonly used ride-sharing services

52% respondents make 2 trips in a day, 14% respondent make less than or equal to 1 trip, 13% make 3 trips in a day and rest 21% make more than 3 trips in a day. So about half of the respondents in this survey make 2 trips in a day and also many respondents make more than 3 trips. Thus there is a combination of many and less trips made by respondents in a day. That is why most respondent were satisfied with the service quality of the ridesharing services as they have to go outside more and probably becomes tolerant of the services provided by the ridesharing services.

5.4.4 Preferable Ridesharing Services:

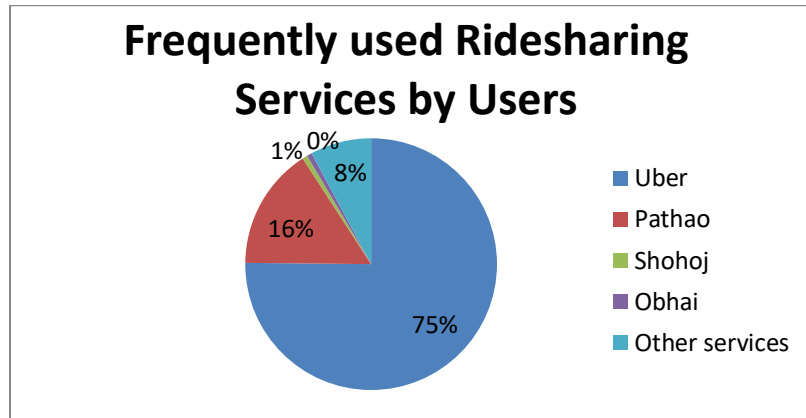


Figure 5.8: Different ride-sharing services used

Majority of the respondents prefer Uber services (75%) and 16% uses Pathao ridesharing app. And very few Shohoj (1%) and other services (8%) and no one use the ridesharing app, Obhai. Compared to Uber, Pathao services are used a bit less, probably that is an important reason why the people don't feel safe using the Pathao ridesharing service.

5.4.5 Preferable Time of Trip:

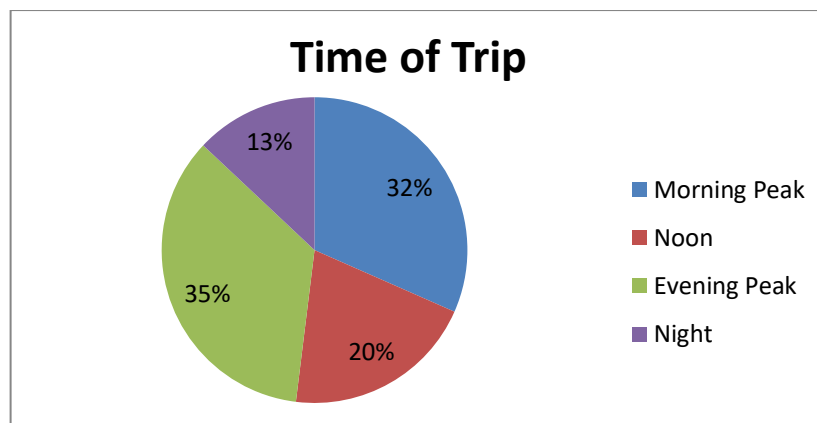


Figure 5.9: Time of trip made by respondents

It can be seen from the graph that most respondents make trips during the evening peak (35%) and in the morning peak (32%) which means during the morning peak the demand is too high for which the ridesharing services are not always available. Also 20% respondents responded that they usually take trip during the noon and 13% respondent prefers taking trips at night and are not satisfied with the service quality.

5.4.6 Major Travel Location:

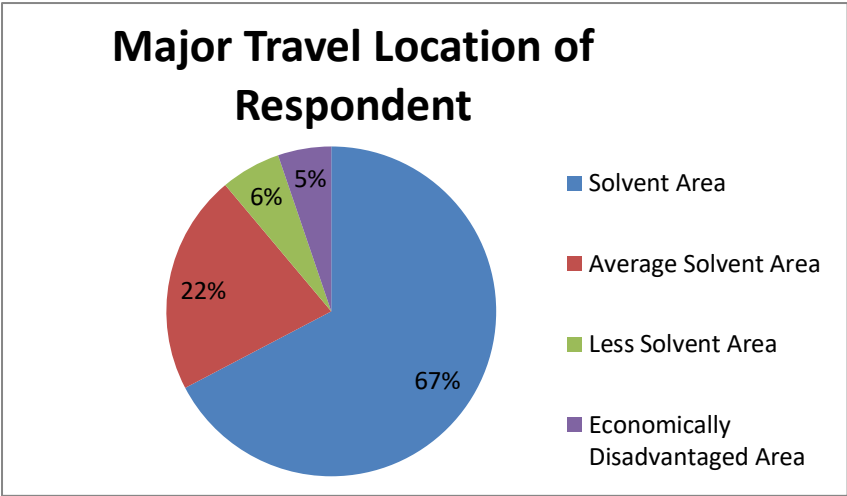


Figure 5.10: Major travel location of the respondents

It can be seen from the pie-chart that two third of respondent in our survey live in the solvent area (67%). On the other hand 22% respondent take rides to average solvent areas and 6% to less solvent area. These respondents are more likely to feel safe using the ridesharing services as per shown in the table- 5.2. And 5% respondent travels to economically disadvantaged areas. The probable reason why very few people travels to economically disadvantaged area is that the main routes of travelling in these ridesharing services are not outside Dhaka city, if so, the option is changed to intercity rides and costs way more than intra city services.

5.4.7 Reason of Choosing Ridesharing Services over Public Transport:

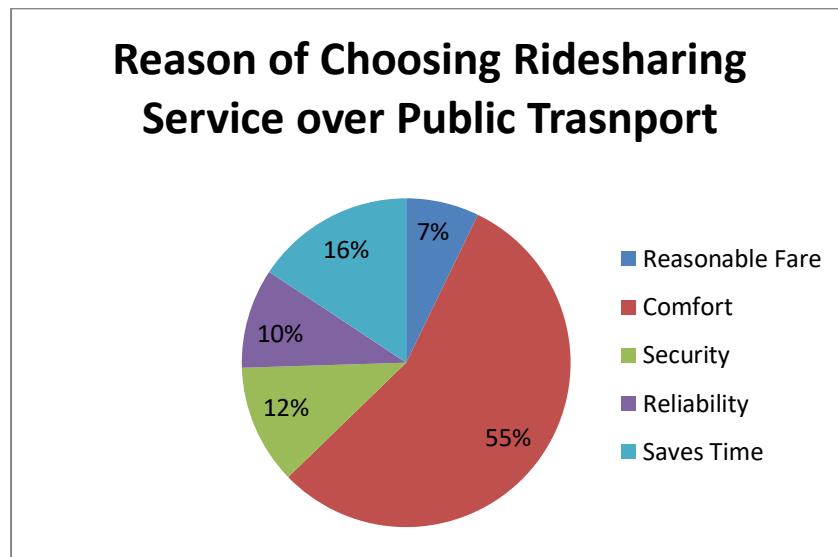


Figure 5.11: Reason of choosing ride-sharing service over Public transport

From the pie-chart we can tell that comfort (55%) is one of the main reasons behind using the ridesharing services. It is also worth mentioning that 16% respondents use the service to save time, 12% for security reasons and only 7% for reasonable fare. This tells that there are some respondent who finds the ridesharing services secured and reasonable fare with the services it provides compared to other public transportation system. But still reliability (10%) has significant effect with the safety and security of ridesharing services.

5.5 Explanation of Results Related to Service Quality

From the statistical analysis as shown in the table 5.5, different factors of service quality affecting the ridesharing services have been incorporated. There is a good goodness of fit as the R-square and Adjusted R values are relatively high and also the F- value is significantly low. Variables with only ninety percent confidence interval have been retained in the result table.

The main aim is to find the effect of service quality with socio-economic, demographic and travel characteristics on ridesharing services. The result in the table shows that gender ($\beta= 5.532$, $p= 0.013$) is a statistically significant variable at the 90% confidence interval and it has positive effect with service quality of the ridesharing services. In our study it means that the male group is less satisfied with the service quality. The probable reasons might be while using the ridesharing services most male might have found that the fare price is too high. And Dhaka city is a developing country, so mostly male dominated as such male have to travel more. For frequent travelling ride-sharing services are probably too expensive for them. And in our country, the ride-sharing services doesn't provide that high quality cars, so compared to the quality of the vehicles and the male groups mostly knows much about the quality of cars as such they easily finds fault in the quality of vehicles. This is probably another reason for not being satisfied with the service quality of ride-sharing services.

With respect to people who are self-employed which do not have any effect with the service quality of ridesharing vehicles, student ($\beta= -35.2086$, $p= 0.000$) shows significant effect with the service quality. From our study, the result shows that students are most likely to be satisfied with the service quality of ridesharing apps. It is a popular belief that the young generations are very good with technology. So they probably find the apps very easy to use and use it quite often. Also most students don't know the actual route to a destination, probably the student respondent have found the GPS map very useful. In a study from one of the interview with a student it was found that the student found the Uber app very easy to use, the pickup and arrival destination both are easy displayed and the payment system is handled very well. (Hasan&Birgach, 2016) As such for a comfortable ride they prefer the ridesharing transportation system.

Similarly, service-holderworking either in Government or Privatesector ($\beta= -28.9396$, $p= 0.000$) is also a statistically significant variable. It also has a negative effect on service quality which

means in our study service holders are most likely to be satisfied with the service quality of ridesharing vehicles. Service-holders are perhaps always very busy so they need to commute to places on time. They probably can find cars from ridesharing apps very quickly. Also CNG or auto rickshaws are not always available and since they don't follow the meter system, the fare becomes too high compared to the comfort these services provide as such bargaining causes higher waiting time. Service-holders probably don't have to face these problems while using the ridesharing vehicles. Thus they are mostly satisfied with the service quality of ride-hailing vehicles.

People who runs business ($\beta=-28.5561$, $p=0.000$) probably find the service quality of ride-hailing cars very satisfactory. In (Alemi et al., 2018) it was found that business travelers are most likely to pay higher amount to get door to door services and when away from home they have less access to their own cars so they prefer using the ridesharing services. Thus they also probably find the services comfortable with air conditioner working inside and along with it able to save their time.

Housewife ($\beta=-26.6868$, $p= 0.000$) has also significant effect on ride-sharing cars. Housewives in Dhaka city are also quite satisfied with the service quality of ridesharing vehicles. Housewives often take trips to drop their children to school or to visit the shopping malls. Reliability, availability and comfort of ridesharing services are probably the reason behind their satisfaction on service quality of ridesharing cars. From a research it was found that people who are unemployed usually drives less than those who are employed. (McDonald, 2015) Since housewives are unemployed people they tend to take ridesharing services mostly when drivers of their own cars are not available (if any). So this also might be the reason they are more tolerant and easily satisfied with the service quality of ridesharing services. Also other occupation ($\beta= -26.9331$, $p= 0.000$) except self-employed has also significant effect on service quality. All these people are also satisfied with the service quality of ridesharing service. People who have occupation except self-employed probably are busy and have found ridesharing services time saving and its picking up from their exact location in their hard earning life makes them satisfied with the service quality of ridesharing services.

Respondents living in economically disadvantaged area ($\beta=-10.1331$, $p=0.030$) has significant effect on the service quality of ridesharing vehicles with respect to people living in solvent,

average solvent or less solvent areas. The effect is negative which means in our study, the result analysis indicates that respondents living in the economically disadvantaged area find the ridesharing services very satisfactory. Keraniganj, Tongi and respondents living in outside Dhaka but have used the app in Dhaka have been considered as the economically disadvantaged areas. Better satisfaction mostly found in these areas, the probable reason might be the standard of living of these areas is low. Other public transportation systems of these areas are not always available and not clean enough. So compared to those services, they probably found the ridesharing- cars very available, maintaining proper arrival and departure time and clean. In fact the ridesharing services are not so flourished in those areas. So, they are most likely to not know much about the service and doesn't use it that often either. It was proved by (Payyanadan& Lee, 2018) that rural adults don't have adequate access to internet connections nor cell phones making it harder for passengers to communicate and set up rides. As such their expectation from ridesharing services is low and they probably are more tolerant. Thus overall they are mostly satisfied with the service quality of the ride-sharing vehicles.

People whose income is greater than Tk. 60000 ($\beta=-4.4097$, $p=0.064$) perhaps are very busy and are likely to spend more on transportation system for a comfortable ride. From a study in USA, it was found that the higher income people are most likely to use the ridesharing services. (*The New Digital Economy: Shared, Collaborative and On Demand* | Pew Research Center) Thus income greater than 60000(in BDT.) has a significantly negative effect on service quality. Higher income people might feel that the service quality of ridesharing vehicles is satisfactory enough. They probably have not found driver's behavior rude, unclean cars, GPS map working properly most of the times. These might probably the reasons behind higher income respondents to be satisfied with the service quality of ride-hailing services.

According to our research, we have found that monthly transportation budget Tk. 2000 to Tk. 4000. ($\beta=-4.4097$, $p=0.064$) and monthly budget between Tk. 4000 and Tk. 6000. ($\beta=-4.4097$, $p=0.064$) both have significant negative effect on the service quality of ridesharing services with respect to monthly budget less than Tk. 2000 and more than Tk. 6000. This means that the respondents who spend in between amount of money are mostly likely to have found the service quality very satisfactory. Because they probably need to travel a lot and so they probably are more tolerant to the services provided by the ridesharing services. Also these group of people

might probably be middle income people, so they probably overlook driver's attire, probably are more empathetic towards the driver's behavior etc. And since they travel a bit more, they probably have not faced much problem while operating the app. Thus these people tend to be satisfied with the service quality of ridesharing services.

The people who drive their own cars i.e. self-driving ($\beta = 5.9662$, $p = 0.015$) factor has a positive effect with the service quality of ridesharing cars. If the percentage of self-driving people increases, the satisfaction level of service quality of ridesharing services decreases. A study found that older people with high income drives on their own and less likely to use public transport. (Kim & Ulfarsson, 2004) The probable reason behind it might be people who drives on their own knows much about the functions of a car, its maintenance, cleanliness, comfort etc. Also they know the routes to the destination in the city properly. But the ride-sharing drivers in Dhaka city come from different districts in Bangladesh. So they don't always know the definite routes to the destination, the GPS maps in the app doesn't always work properly and thus cannot reach the destination on time. Respondents who drive on their own probably found these very disturbing and tend to use their own private cars instead as such they are unsatisfied with the service quality of the ridesharing services.

If the major travel location is solvent area ($\beta = -5.0599$, $p = 0.099$) most people are likely to be satisfied with the service quality of ridesharing services. In our analysis average solvent area ($\beta = -2.8964$, $p = 0.037$) was also found to have negative impact on the service quality of ridesharing services with reference to major travel location in less solvent and economically disadvantaged areas. Probable reason might be in both solvent and average solvent areas mostly the educated people travels and they know how to get the discount benefits and also the ridesharing services while travelling in those areas probably maintains hygiene, proper working air conditioner which makes the respondents feel satisfied with their service quality.

Table 5.5: Results of Linear Regression Model for Service Quality

Number of obs. = 153			
F(16, 136) = 5.07			
Prob>F = 0.0000			
R-squared = 0.3738			
Adj. R-squared = 0.3002			
Root MSE = 10.743			
Variable	Co-efficient	Standard error	P-Value
Gender	5.5321	2.196	0.013
Occupation			
Student	-35.2086	5.376	0.000
Service-holder (Government/Private)	-28.9396	5.261	0.000
Business	-28.5561	6.174	0.000
Housewife	-26.6868	6.078	0.000
OtherOccupation	-26.9331	7.065	0.000
Economically Disadvantaged Area	-10.1331	4.607	0.030
Monthly Income >60000	-4.4097	2.360	0.064
Monthly Budget Category			
Budget 2000-4000	-6.4446	2.394	0.008
Budget 4000-6000	-5.7508	2.353	0.016
Self-Driving	5.9662	2.429	0.015
Major Travel Location			
Solvent Area	-5.0599	3.046	0.099
Average Solvent Area	-6.1469	3.436	0.076
Time of Trip			
MorningPeak	3.7754	1.963655	0.057
Noon	3.6319	2.053	0.079
Night	4.4972	2.261	0.049
Constant	95.7783	5.806	0.000

With reference to evening peak, the other times of the trip i.e. morning peak, noon and night positively affect the service quality of ridesharing transportation system (cars). Morning peak

($\beta= 3.7754$, $p= 0.057$) have significant impact on service quality. Since most schools, colleges, offices starts at this time of the day, traffic congestion becomes a big issue. As such ridesharing drivers fail to reach the pick- up location on time and don't even want to pick the passengers from the exact location. So waiting time increases. And also since it's the 1st time of the day, ride-hailing vehicles are not always available in the morning peak. All these are probably the likely reasons for the declination of service quality in the morning peak. Similarly, Noon ($\beta= 3.6319$, $p=0.079$) have also positive impact on service quality. It is likely that during this hour parents make trips to pick up their children from school or they leave from their offices. Thus this is also a rush hour in Dhaka city. So the drivers tend to take as many rides as possible so they fail to reach the destination on time or don't want to pick up from the exact location. As drivers stay busy at this time, they don't usually show empathy towards passenger due to delay or any road hazard. This causes decrease in service quality. So at noon also there is declination of satisfaction level in service quality. Night ($\beta= 4.4972$, $p= 0.049$) is a statistically significant variable. At night people are not satisfied with the service quality of the ride-hailing cars. Probably at night the ridesharing cars are not so available and based on availability, the price increases which affect the users significantly. In a study it was found that between 10 pm to 4 am the on-demand services are very unavailable or not available at all. (SFCTA, 2017) Also at night some drivers tend to cancel trips based on location, since they don't want to make that many trip anymore and sometimes misbehaves with the passengers after a long tiring day. This results in decrease in service quality.

5.6 Explanation of Results Related to Safety & Security:

From the results of the statistical analysis as shown in the table-5.6 we can understand that the model has a good goodness of fit as it's R-square and Adjusted R values are relatively high and the F- value is significantly low. In this result table, we have only retained variables with at least ninety percent confidence interval.

The main aim is to find out the effect of road safety and personal safety with the socio-economic, demographic and travel characteristics. In (Lee et al., 2017) they have found that the more people feel safe and secure with ridesharing services (RSS), the more likely they are to use RSS. In our result analysis shown in Table 5.6, gender ($\beta=1.8336$, $p=0.094$) shows positively significant

effect with the safety and security of ridesharing vehicles. It means that the male are likely to feel unsafe while using the ridesharing services. The reason behind it might probably be in our developing country robbery, forgery, etc. are very common occurrence. And since most families are patriarchal, men mostly make the highest number of trips in the household. So they have probably faced accidents, robbery, assault etc. too many times. Also male gender probably found that ridesharing services doesn't provide advanced GPS tracks, trip details and personal safety features properly beneficial. Thus they are mostly not satisfied with the safety and security of ridesharing services. In a study it was found that most female passengers are concerned about safety while travelling at night. (Cynthia et al., 2019)

From the analysis it is seen that safety is significantly affected by students ($\beta = -2.8964$, $p = 0.037$). Students don't feel unsafe while using the ridesharing services. Students probably don't find the other public transportation system like bus, CNG, auto-rickshaws, buses etc. safe as these transportation systems don't have any helpline and the drivers drives their vehicles very roughly. And high chance of robbery, sexual assault etc. in these rides are common occurrence in Dhaka city. On the contrary ridesharing services have safety features and assault; accident etc. occurrences are still very less compared to other modes of public transportation system. In a study, it was found that the students are the main users of ridesharing transportation system. (Islam et al., 2019) Thus students probably have faced these situations very less while using ridesharing vehicles. As a result they are most likely to feel safe and secured in ridesharing services.

Our result also shows that self-employed ($\beta = 4.7148$, $p = 0.103$) people have significant positive effect on safety of ridesharing service compared to service-holders, housewife, businessmen and other occupation. It means self-employed people tend to feel less safe in ridesharing services. Self-employed people usually work at home doing freelancing, doing online business etc. So they tend to go out a little less than the other occupations. This makes them fearful of situations easily. So this group of people probably found that the drivers frequently or always misuse their personal information. (Mirsadikov et al., 2016) mentioned that trust is a very important factor which triggers safety of riders. So building trust based on information transparency plays an important role. Also since they probably don't use the app regularly, they don't check the driver's registration number that often and probably has faced accidents, robbery etc. in the ridesharing

services many times. These probably are the reasons self-employed people feel unsafe while using the ridesharing services.

From the estimated result compared to income less than Tk. 20000 and income in between Tk. 40000 and Tk. 60000 which have no effect on safety and security, we find that people who earns monthly between Tk. 20000 to Tk. 40000 ($\beta = -2.8964$, $p = 0.037$) and greater than Tk. 60000 ($\beta = -2.8964$, $p = 0.037$) have negative effect with safety and security of ridesharing services. Thus they are more likely to feel safe while using ridesharing services. People earning between Tk. 20000 to Tk. 40000 in a month, they probably uses the ridesharing services quite often as such they tend to have more trust on their services. Frequent users of this service probably become accustomed to its safety features and operating its security services becomes easier and familiar to them. On the other hand people who have income greater than Tk. 60000 probably uses mostly their own private cars as such they rarely faced troubles like accidents, robbery, sexual assault or drivers remaining fatigue etc. when using the ridesharing services. Also in a study it was found the higher income people usually uses the Premium and app-based taxi services so these are better quality ridesharing services. (Tang et al., 2019) That's also probably the reason why they faced no accidents or misconduct or sexual harassment.

The major route travelled by the respondents is also linked with the safety of ridesharing services. (Delbosch & Currie, 2012) neighborhood characteristics have influence on personal safety of passengers. The people mostly travelling in high income or solvent area ($\beta = -6.2801$, $p = 0.005$) has significant negative effect on the safety and security of ridesharing services. People who travels mostly to these areas, they most probably have not faced any accidents or harassment while using this service, the reason behind this might be the traffic rules and regulations of these areas are maintained properly. In some of the areas, there are speed limits at places and police checkpoints as well, so drivers maintains traffic rules and their behavior seems to be of no threat to the riders. Average solvent area ($\beta = -8.628$, $p = 0.000$) and less solvent area ($\beta = -7.8134$, $p = 0.010$) both have also negative effect on safety and security of ridesharing services with reference to the economically disadvantaged area which doesn't have any significant effect with the safety and security of ridesharing services. People who frequently travel in these middle income areas or less income areas have proper knowledge about the locations and are very well. So it is safe to say that ridesharing services as a whole in Dhaka city

tries to maintain the safety and security of passengers while taking trips to higher or middle income areas.

Table 5.6: Results of Linear Regression Model for Safety & Security

Number of obs. = 153			
F(12, 140) = 4.27			
Prob>F = 0.0000			
R-squared = 0.2680			
Adj. R-squared = 0.2052			
Root MSE = 5.9391			
Variable	Co-efficient	Standard Error	P- Value
Gender	1.8336	1.087	0.094
Occupation			
Student	-2.8964	1.373	0.037
Self-employed	4.7148	2.876	0.103
Monthly Income Category			
Income 20000 - 40000	-3.7453	1.260	0.003
Income >60000	-3.1991	1.261	0.012
Major Travel Location			
Solvent Area	-6.2801	2.214	0.005
Average Solvent Area	-8.6280	2.379	0.000
Less Solvent Area	-7.8134	3.010	0.010
Number of Trips			
Trips <=1	-3.6451	1.5995	0.024
Trips = 2	-2.3281	1.103	0.037
Pathao Ridesharing Service	2.5002	1.452	0.087
Reliability	-2.3026	1.355	0.092
Constant	41.2261	2.435	0.000

Safety is promoted by the number of trips made by the respondent everyday. Compared to people who takes more than 3 trips everyday, the people who take less than or equal to 1 trip ($\beta = -$

3.6451, $p=0.024$) and people who takes two trips ($\beta= -2.3281$, $p= 0.037$) everyday they are most likely to feel safe and secured in ridesharing services. People who travels less or takes 1 trip a day, they didn't face accidents or assaults that often as the probability of getting involved with such activities becomes very less compared with the trips taken. On the other hand taking two trips is a bit more, these people most probably need to go outside on regular basis as such they probably knows how to operate the helpline, always checks the registration number before boarding on the car, have proper knowledge about the safety features etc. Thus they are likely to have more trust on ridesharing services.

Compared to Uber, Shohoj and other ridesharing services, Pathao ($\beta= 2.5002$, $p= 0.087$) has very significant effect on safety and security of ridesharing services. People who use Pathao ridesharing apps mostly have lesser possibility of feeling safe. Unpopularity among car ride-sharing services i.e. Pathao being mainly popular among rideshare-bikes and low safety features in rideshare cars might be the probable reasons of our findings. In a study it was found that Pathao drivers are not experienced and riders are mostly fearful of possible accidents. (Showkat&Choudhury, 2019) This is probably another reason why Pathao users found the ridesharing services unsafe.

According to our study reliability ($\beta= -2.3026$, $p= 0.092$) have significant effect on safety and security of ridesharing services with reference to low-fare, comfort, security and saves time factors which have no effect on safety and security. In the study of Kualalampur, it was also found that the respondents agreed that the security of services was satisfactory because of the ride-hailing services reliability. (Man et al., 2019) So the more the ride hailing services are reliable the more satisfied the respondents of Dhaka city are with its safety and security.

Chapter 6: CONCLUSIONS AND RECOMMENDATIONS

6.1. Introduction

The objective of this study is to assess the service quality, safety and security of the ride sharing services. In order to achieve this objective, various factors from socioeconomic, demographic, peak/off-peak hours of the day, purpose of travel, and recurring use of app and so on have been investigated. Linear regression model was utilized for the assessment. Two aspects, i.e., service quality and safety have been chosen to accomplish the objective of this research work. For each aspect a separate linear regression model has been developed. Numerous factors have been found to be significant in each of the linear regression models. Some of the factors are found to be significant in both the aspects of the research along with other factors that are particularly significant to a specific aspect of the study.

This chapter provides an outline of the findings in this research work. The impacts of the findings on the research study are discussed. And finally few recommendations are provided for the enhancement of the service quality, safety and security of the ride sharing services along with few suggestions for future scope of work regarding this topic.

6.2. Conclusion

The study analysis suggests that the male gender have significant effect on service quality, safety and security of ridesharing services. The male are unsatisfied with the service quality. Similar result is observed with the safety and security where the male have faced the accidents, robbery, misuse of information frequently for which they feel unsafe while using the ridesharing services.

Our study also suggests that occupation have significant effect on the service quality and safety. Student, service-holder, businessmen, housewife and other occupation except self-employed all people of these occupation have found that the ridesharing services never or rarely remains unclean, app not responding, digital payment system not working properly etc. Similarly in our study it was also found that students have never or rarely faced problems with real time GPS tracking or rideshare trip details, accidents, robbery etc. or rarely felt unsafe while using the ride

during day or night time. Overall students felt safe using the ridesharing services. On the contrary, self-employed have found the ridesharing services unsafe.

According to our result analysis, types of area in the city have significant effect in assessing the service quality of ridesharing services. In economically disadvantaged area, people have never or rarely found the service quality unsatisfactory. But types of area have no effect on the safety and security of ridesharing services.

Monthly income is also a significant determinant in assessing the service quality, safety and security of ridesharing services. High income (greater than 60000 in BDT) group of people have not found that the service quality of ridesharing services unsatisfactory. And middle income (20000 to 40000 in BDT) and high income (greater than 60000 in BDT) group of people have never or rarely found the ridesharing services unsafe.

While examining the monthly budget spend on transportation, budget between 2000 and 4000 in BDT and budget between 4000 and 6000 in BDT have been found negatively significant with service quality that means these groups have not found the service quality of ridesharing services unsatisfactory. Then higher budget groups (greater than 6000 in BDT) when they use the ridesharing services don't feel unsafe.

People who drive their own cars have also a significant effect on the service quality of ridesharing services. Self-driving people have found the service quality unsatisfactory. Driving on their own doesn't have any effect on the safety and security of ridesharing services.

In this estimated result it was found that the major travel location has significant effect on service quality, safety and security of ridesharing services. People who travel mostly in solvent area and average solvent area while using the ridesharing services have not found the service quality unsatisfactory. And people who travel mostly in solvent, average solvent and less solvent areas have found the ridesharing service safe and secured.

Our study also found that the number of trips made everyday have also significant effect on safety and security of ridesharing services. When the trips taken is more (trips equal to 2, 3 and trips less than or equal to 1), these people never or rarely found the ridesharing services unsafe.

Time of trip (morning peak, noon and night) also play a significant role in assessing the service quality of ridesharing services. During the morning peak, noon and night people have found the service quality of ridesharing services unsafe.

Besides from the study, it was found that people who use Pathao ridesharing services frequently have found the ridesharing services unsafe. And reliability also affects the safety and security of ridesharing services. With the increase in reliability, people tend to feel safer in ridesharing services.

6.3. Recommendation

The results of the study will help the policy makers of ridesharing services and transportation system planners to increase the service quality and safety features of ridesharing services. Our study suggests that people who drive their own cars have found the ridesharing service quality unsatisfactory. In order to increase their satisfaction level, it is important that the vehicles of ridesharing services are maintained properly, it is important that the fitness of the vehicles are checked on regular basis and more experienced drivers need to be recruited.

Also the estimated result shows that during morning peak, noon and night, people are mostly dissatisfied with the service quality. To solve this problem, one of the best solutions would be to increase the no of ridesharing vehicles. More cars should be bought and more drivers need to be encouraged to work in the ridesharing companies. If possible a schedule for riders at night can be arranged so that the service is always available. The drivers should be trained about the app system properly, its functions including etiquettes towards passengers as the most popular ridesharing service is an international company i.e., Uber. Drivers tend to ask the passengers about the destination before even reaching the pickup location and cancel the trip according to driver's preferred location, this causes consumers serious hassle. These unprofessional behaviors should be stopped by arranging proper behavioral training for the app.

In our study respondents have frequently found that most drivers don't know the digital payment method, so it is important that they are trained on using the app and these payment methods. Some respondents in the questionnaire survey recommended adding some new safety measures

for women and also they have recommended improving the complaint handling system as these don't function properly in the app and the helpline 999 should be responsive 24/7.

Our research also suggests that besides Pathao and Uber, other ridesharing services should also be improved. Companies like Shohoz, Obhaietc. should improve their GPS map, trip details, safety features etc. This will enhance the ridesharing services and will reach the economically disadvantaged area as well which in this study doesn't have any effect in the safety and security probably because very few people of those areas know about these ridesharing services. Discounts should be arranged more; this encourages consumers to take more rides and eventually increases their satisfaction level.

From our study it can be understood that overall with the enhancement of ridesharing services in Dhaka city; people have become more accepting with this new mode of transportation. Most people have found the service quality satisfactory and safe while using the ridesharing services. But Dhaka city is expanding with addition of more communities at the outskirts. As such it is important that the policy makers and transportation planners use this research findings for the improvement of the service quality and safety of ridesharing services.

6.4. Limitations and Scope of Future research:

The research has been conducted considering several limitations. In this study many factors that could have an impact on the service quality, safety and security of the ride sharing services have been missed out due to the unavoidable circumstance from COVID- 19. Due to this situation only a handful of responses could be collected for the research work.

It is also noted that in this research we have not included the factor which asks the respondent the actual number of times they have faced accidents/ robbery. This would have given an accurate estimation to assess safety and security of ridesharing services for each of the respondents. Also we have not considered the household size, family arrangement, climate, infrastructure facilities etc. which might have significant effect in the service quality, safety and security of ridesharing services. So our study is not without limitation. There is more scope of research.

The introduction of ridesharing services started with cars. Thus cars had been the major mode of ridesharing services for a long time. As such in our study we had mainly assessed the service quality and safety of car ridesharing services. But with the introduction of motorbike in ridesharing services, the demand of motorbike increased tremendously. So a questionnaire survey on assessing the service quality and safety of motorbike services can be done in the future. This would give the respondents better perception to detect the service quality and safety according to the vehicle type and a comparison can be made between the two modes as well.

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