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ISSN Online: 2474-9257

Research Article | Journal of Computer Science Applications and Information Technology | Open Access

Case Study of Decision-Making Based Software Development: The Intention of Using Private Transportation Service over Public Transportation

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Received: August 27, 2018; Accepted: September 14, 2018; Published: September 27, 2018

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Abstract

In this paper, the delivery of bus services with different routes that comprise a public transit network and the users will be kept in consideration. A research is done to understand the factors that affected the demand of using the bus service and how can we alternate the demand to rise back up. This paper first reviews previous work on passengers' perspectives of transit service reliability and their response to service adjustments made by different agencies. Second, it analyzes transportation competitors like Uber and Grab to determine their pros and cons and use strategies to improve service reliability, while looking at the impacts of these strategies on service. Reviewing these two parts together provides a needed contribution to the literature from a practical viewpoint since it allows for the identification of gaps in the public transit planning and operations field in reliability and provides transit planners and decision makers with effective and valuable policy-relevant information.

Keywords: Bus transit; Malaysia transportation; Transportation system; Web system; Mobile applications;

Introduction

The transportation sector is significantly contributing to the socioeconomic development worldwide with intrinsic environmental impacts. Public transit is a shared passenger-transport service which is available for use by the public. Public transport modes include city buses, trolleybuses, trams and passenger trains, rapid transit (metro/subway/underground, etc.) and ferries. Public transport between cities is dominated by airlines, coaches, and intercity rail. High-speed rail networks are being developed in many parts of the world, but for the sake of this research we will only be focused on Bus service. Bus services use buses on conventional roads to carry numerous passengers on shorter journeys. Buses operate with low capacity (compared with trams or trains), and can operate on conventional roads, with relatively inexpensive bus stops to serve passengers.

In the past two years the demand over public transit has changed dramatically with the introduction of modernized solutions like Uber and Grab (Greg Lindsay, et al. [12]). Grab and Uber are a technology company that offers wide range of ride-hailing and logistics services through its app in Malaysia and other countries. These solutions have eliminated the wait time most public transportation suffer from due to improper organization or lack of information, not only that but in this digital world the public find it easier to get information instantly on their handheld device rather than memorizing a public transit map. Technologies like Uber has even created a much lower competitive fare compared to local taxi are which have resulted a decrease in taxi's demand (Salnikov, et al. [24]).

Also, in from different perspective, the number injuries and deaths caused by cars have increased in Malaysia that has prompted the Malaysian government to undertake various studies to address the problem. One of these studies was responsible for the shift in transportation mode and the creation of public transportation in 2004 (Nurdden, et al. [21]). Today Malaysia is ranked 11th among 138 nations in the latest World Economic Forum Global Competitive Index 2016-2017 ranking on transportation (mD, [19]).

This research will study the reasons behind the demand shift towards other services and its purpose is to renovate the transportation process to meet today's demands in a world driven by smart phones and instant information. This study will have various time and distance variables studied as well as price and fare to be compared with modern technologies like Uber and Grab. A questionnaire will be answered by university students to understand the shift in demand.

Background

Buses are the most commonly used form of public transport in Malaysia. According to Wikipedia there are about 400,000 daily bus riders taking the Rapid Bus service in Malaysia. However, while the number of passenger journeys by bus has risen slightly since 2004-11, this follows a period of steep and steady decline in bus passengers since the introduction of new transportation technologies. At the same time, car use in Malaysia has increased massively.

Bus rapid transit is a bus-based public transport system designed to improve capacity and reliability relative to a conventional bus system. Typically, a BRT system includes roadway that is dedicated to buses and gives priority to buses at intersections where buses may interact with other traffic; alongside design features to reduce delays caused by passengers boarding or leaving buses or purchasing fares. BRT aims to combine the capacity and speed of a metro with the flexibility, lower cost and simplicity of a bus system.

Rapid Bus Sdn Bhd is the largest bus operator in Malaysia operating mainly in urban areas of Klang Valley, Penang & Kuantan. As of 2011, Rapid KL service brands unit of Rapid Bus, has operates 167 routes with 1,400 buses covering 980 residential areas with a ridership of about 400,000 per day. Rapid Bus routes were previously operated by Intrakota Komposit Sdn Bhd, a subsidiary of DRB-Hicom Berhad and Cityliner Sdn Bhd, a subsidiary of Park May Berhad. When it took over, there were 179 routes. Since January 2006, Rapid KL has redrawn the entire network.

Commuters are more likely to stop using public transit when they experience delays they can blame on the transit agency, according to researchers at the University of California Berkeley. They are more likely to forgive delays caused by traffic, emergencies or mechanical failures. The researchers found that comfort is the least important factor influencing decisions to stop using public transit. Riders don't mind standing in crowded buses or trains if the vehicles move without delay and run frequently. Commuters are willing to wait 10.2 minutes, on average, before they consider a wait too long, the study found. All these kept in consideration a question arises "why do people tend to use private transportation services over bus transit".

Problem Statement

The Malaysian government has undertaken various studies to address the increased number of traffic jams, deaths by car accidents, etc. One of these studies was responsible for the shift in transportation mode and the creation of public transportation in 2004. However today there seems to be an increase in private cars and decrease in public transportation commuters. Most commuters now days would prefer to use a private transportation service over bus transit.

Several methods will be proposed to combat this. Perhaps the most popular solution and the simplest is to systemize and create a more informative bus system to be available for the public.

Commuters are switching to private transportation services by the day which could result in an increase number of vehicles on the road which will lead to the increase of accidents risks and traffic jam and could also decrease a countries income from the transportation sector that contributes for the people to maintain jobs in the public sector and helps commuters who are unable to afford the private transportation service fare to commute around the city on a budget.

Research Objectives

i- To study the reason behind the decline in bus transit demand.

ii- To suggest ways and means to improve the process of a bus transit

Research Questions

Q1- What affects a commuter decision in choosing the mean of transport?

Q2- what are the issues commuters face with bus transit?

Q3- how can the issues a commuter face be minimized or eliminated?

Significance of study

The importance of this study is for us to understand the collected information on the main reason why commuters tend to choose private transportation services over bus transit. At the same time looking in ways and methods to improve a bus transit process to meet today's technological demands.

Methodology

To achieve the objectives of this study a survey was carried out in the state of Selangor in Cyberjaya for 3 days of university student using bus transportation and private transportation services like Uber and Grab. Selangor was chosen for this study because it has a high number of university students with limited transportation budget who somehow depend on public transportation and specifically Cyberjaya as it's a small location with very few bus stops. SP and RP research methods were used in this study because of their successful previous use (Nurdden, et al. [21]).

The SP survey used in this study was designed to collect information about the choice of commuting by bus or private transportation services by using a couple of routes as an example question. The questionnaire was in 3 parts. The first part had 3 questions on general information about the surveyors that includes ages, sex, education, car ownership and income. The second part was about the surveyor's trip preference and characteristics in 7 questions that includes questions about prestige, comfort, flexibility, weather and satisfaction. The last part focused on the choice of transportation why for a commuter and the factors that could persuade a commuter to use a bus transit.

In a verbal way, too the respondents were asked about their last destination on what their mode of transportation was and how much did it cost. They were later asked for other ways of what they would have chosen if their current mode was not available. These answers were used to fill up the RP data. They were even asked on a couple of hypothetical scenarios with different realistic fare on which mod would they have chosen depending on the situation and why. The responses where written down to be later used if needed.

A binary logit was used (Nurdden, et al. [21) for three alternatives namely, bus and carto understand the factors

affecting commuters to switch from private transportation method and use a bus.

People and cars

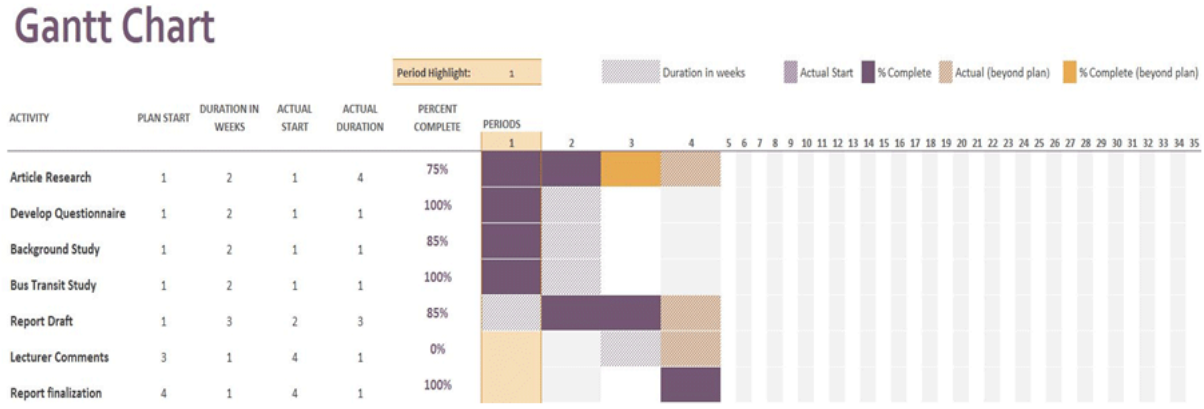
The appropriate model will be used in this study to bridge the gap of cars and public transit for modal shift to be implemented. A study of the differences between bus, train and car will be done in this research to be used in a hypothesis testing to understand whether car owners have outperformed buses and trains in relation to distance, time and cost. A binary model was used in this study to identify the factors that are significant in determining the choice of transport and to predict the change in bus and train rider ship within the perspective of the various travel times and cost.

They attempted to study the conduct mode choice behavior of travelers in three different types of transportation namely train, cars and buses to determine the trade-offs a commuter will make when considering the choice of transportation mode. The resources and utilities of all modes mentioned in this study was compared to understand and determine the reasons behind the choice of a commuter and the circumstances that's could also affect a commuter decision. There were two models used in this study, the binary and multinomial legit models to examine the characteristics of the bus and car trips by using travel time, travel cost, socioeconomic and demographic as variables and mode attributes on mode choice behavior. Multinomial legit examined cars and trains alternative modes, in order to promote greater use of public transport, this study examined the effect on car use if total bus and train travel time and travel costs were reduced which was very helpful for my research as the relation to the topics and objectives and close (Kamba, et al. [16]).

It was understood by solving the binomial legit equation for probability using several options of time and cost examples. The results suggest that travel time and travel cost are characteristics that determine why car use is a favored modal choice. The finding has revealed that the parameters where important in explaining the mode choice behavior. For the car mode, bus and train alternative comparison, the model estimation results have revealed that lower travel time. Lower travel costs are the major barriers not choosing the bus according to car users. To motivate commuters to the use of public transport and to also depend less on cars, a reliable and efficient public transportation system is needed. Higher capacity transit systems, use of bus lanes, bus gates, and IT systems are among the initiatives that could be implemented to improve the public transport system.

A policy that promotes public transport can be enhanced by the use of traffic restraint policies such as in France (Harrison, et al. [13]), Australia (Black, [4]), Area Licensing in Singapore (Geok, [10]) or London Road Pricing (Litman, [18]), policies that motivate commuters to move toward a more sustainable transport system rather than total dependence on private vehicles. Considering the discussions mentioned in this study, some reflection is necessary in relation to the modal split model for developing and newly developed countries. Although the tendency is more towards shifting to public transport, this has proven unsustainable, long-term, in the developed countries. As such, promoting a shift from car to an efficient.

Gantt chart of the actual research activities.



Gantt Chart

Bus demand in Putrajaya and Cyberjaya

In this study, an overview of Putrajaya and Cyberjaya transportation system will be covered, and then proceeds to a discussion about the used methods in this study, the econometric estimation and simulation of the model choice results will also be mentioned, and the policy implication of the various findings. The constants for the financial cost variable are of the correct sign and generally statistically significant (Nor, et al. [20]). Although the coefficients for headway and in-vehicle time mostly carry the correct sign, they are not statistically significant, suggesting that users are not particularly affected by changes in public transport service quality. This observation provides a very important policy implication between the relative efficacy of demand and supply measures, as discussed in the next section. The coefficients for financial cost, headway, and in-vehicle time are mostly negative, implying that the proportion of trips accounted for by public transport increases as the spread in generalized cost, waiting time, and travel time between private and public transport

increases. The relative impact certainly differs across factors but is consistent with the fundamental economic principle that demand for public transport should vary inversely with cost (financial or otherwise). The signs for the gender coefficients are negative and highly significant for business trips (and for both car and motorcycle), supporting the notion that, because of the generally lower occupational/income level of women and alleged bias in local custom against women riding motorcycles, there is greater certainty in the statistical sense that proportionally more women choose public transport compared to men. The results are rather mixed for the other two trip purposes. The coefficients for income are also as expected (all negative for car and generally positive for motorcycle), indicating that relative to the control group of higher income individuals, people in lower income categories are more likely to choose motorcycles and less likely to choose cars compared to public transport.

Commuters Satisfaction

Malaysia is well equipped and ready to develop a Bus services driven by customer satisfaction, safety and a current major infrastructure development project. In term of technology and cultural heritage it offers the best of both worlds, but if it is to succeed then all the pieces need to be in place. In this study, the quality factors that could use to measure customer satisfaction provided by the HBR is discussed. Quality factors that will affect customer satisfaction for causing greater productivity and higher performance of the transportation industry will be discussed (Islam, et al. [15]).

To summarize, the present paper tried to reveal the important factors measuring customer satisfaction in Bus transportation services provided by HBR in the city of Sintok located at the province of Kedah, Malaysia. Findings indicate that satisfaction in customers varies in line with the service dimensions which affect total satisfaction. More precisely, the results indicated that customers present a moderate to strong level of satisfaction along the line of service dimensions. The sub criteria "route safety", "service of personnel", "service inside the bus" comprises the strong points of the company. The overall result in this study shows how service quality attributes affects the customer satisfaction in using public bus transport. A bus transport should maintain a standard of quality High quality to not only maintain current commuters but to also attract potential travelers. Some interesting results were found while studying this literature: It was discussed that the Behavior of commuters and precisely behavior of bus driver, reliability and efficiency of services as well as time and mainly waiting time seemed to be the most crucial factors affecting customer satisfaction. These lead to the conclusion that HBR, to continue its satisfactory bus services for greater productivity and enhanced performance, must give due importance on these factors.

They proposed a model in this article that investigates the impacts of bus transit aspects on global customer satisfaction. To calibrate the model, data collected in a survey addressed to a sample of students were used. This article begins with an introduction to a theoretical framework of structural equation models. Next, the experimental survey is described and the statistical descriptive analysis of the sample is reported. The last section describes the general structure of the proposed model and presents the model results.

In this article, a structural equation model has been proposed to show the relationship between passenger satisfaction on bus services and the attributes of the services supplied. Although SEM methodology is well known and widely applied in several fields of research, presently there are not many practical applications in public transport, and specifically for measuring customer satisfaction. In this research, we have applied this methodology based on needs and expectations expressed by customers of a bus service. The proposed model identifies service quality attributes to improve, with the aim of offering bus services characterized by higher levels of quality.

In a turbulent commerce environment, to sustain the growth and market share, companies need to understand how to satisfy customers, since customer satisfaction play an important part for establishing long-term client relationships. Also, organizations want to increase their profits and that is only possible by increasing the demand on taxis and later they must gain as much as possible the satisfaction from customers. Hence, customer satisfaction is a critical issue in the success of any business system, traditional or online.

The researchers applied the multivariate statistical techniques with factor analysis, standard multiple regression and path analysis to investigate the relationships among variables of customer loyalty model. Interpretation and recommendations were proposed basing on the empirical findings of the research. In term of correlations between variables, bivariate correlations and Pearson product moment correlation coefficients were used to examine the relationships and its strength between each independent variable and customer loyalty, likewise between each mediating variable and the dependent variable of customer loyalty. The direct and indirect of independent variables on customer loyalty were interpreted and discussed to give clear answers and evidences for supporting all the research hypotheses. As the result of the research, not all the factors have direct and indirect impacts on customer loyalty. Moreover, the study only showed the direct effect of customer satisfaction on customer loyalty; this will be interesting for future study to explore the relationship between brand equity and customer loyalty (Khuong and Dai, [17]).

A lot of Researchers would argue that in order for the public transportation to grow the public should find the service reliable whereas it can decline if the service is unreliable (Bates, [2]; Diab and El-Geneidy, [7]; Diab and El-Geneidy, [8]). They mentioned Peek and Van Hagen (Peek and van Hagen, [22]) suggestion to an approach based on Maslow's pyramid that represents passenger's priorities. This approach argues that safety and reliability are the foundation of traveler satisfaction, and accordingly, must be provided. Other researchers have argued that reliability is not the most important transit quality before safety (Perk, et al. [23]; Taylor, et al. [25]; Yoh, et al. [27]; Iseki and Taylor, [14]).

This knowledge is important to help transit agencies prioritize one strategy or a set of strategies over the others. The current literature's limited focus on transit agencies' knowledge needs may be limiting the latter's ability to correctly anticipate the impacts of their efforts on the service, and accordingly, on passengers' perception. Therefore, it is suggested that researchers should provide more in-depth studies regarding the comprehensive impacts of improvement strategies while understanding how these may function together to affect the transit performance and its variation. This level of complexity can be investigated using different automatic data collection systems, thereby giving transit agencies a better idea about the impacts of efforts on service and on passengers (Diab, et al. [6]).

Uber effect on public transportation

Data was assembled from New York City and Chicago to test that hypothesis empirically. They tested whether the growth in ride-sharing has led to a decrease in consumer complaints about taxis. One benefit of regulation is that regulators often collect lots of data. Taxi's and Limousine Commission in New York has provided them with data on every taxi ride in the city from 2010 through 2014 (Wallsten, [26]). NYC's Open Data Project provides data on taxi complaints. Chicago does not routinely collect data on taxi rides but collects detailed complaint data. Ride-sharing companies are private and make. Little data available publicly (Beard, et al. [3]; Forbes, [9]; Cannon and Summers, [5]). Nevertheless, data from Google Trends on the largest of the ridesharing companies, Uber, makes it possible to generate an index of ride-sharing's growing popularity in NYC and Chicago. The data reveal that the number of complaints per taxi trip in NYC has declined along with the growth of Uber, even when controlling for underlying trends and seasonal events that may affect taxi use. The results suggest that customers who used to complain now take their business elsewhere and that taxi drivers are responding to competition from Uber by increasing the quality of their own service. Data from Chicago also provide some evidence that cab drivers respond to competition. In Chicago, the growth of Uber was correlated with fewer complaints by taxi riders about heating and air conditioning, broken credit card machines, and rude drivers. To be clear, specific data on prices and quantity are necessary to estimate changes in consumer welfare.

News reports suggest that taxi drivers want to compete with Uber. Long Beach, CA, for example, decided to allow cabs to offer variable fares to compete with Uber (Wallsten, [26]). If drivers are willing to reduce prices to compete, it seems possible that they would also make changes that are relatively costless. While the lack of repeat business in the same taxi might reduce the benefits to a driver of better behavior, he might still benefit from higher tips and lower likelihood of complaints. Even with its limitations, this analysis begins to shed empirical light on the competitive effects of the sharing economy, demonstrating that benefit may accrue not just to those who avail themselves of new options, like ride-sharing, but also to those who stick with traditional providers.

In another research Uber was scrutinize regarding its potential to affect work practices and labor conditions, what can be understand and learned from Uber. In the paper they have presented results from 32 different interviews with both Uber users and drivers, interviews with traditional taxi drivers, alongside ethnographic observations from over fifty rides in ridesharing and traditional taxis (Glöss, et al. [11]). Interviews were conducted in San Francisco and London, two cities with very different legislative and commercial history for taxi driving, as well as ridesharing app use.

In a study taken in Thailand its results have highlighted many insights regarding Grab Taxi from both the market demand and the market supply perspectives. Thai passengers cited prompt ride, sure ride, safe ride, and comfortable ride to be the most influencing factors behind their decision to ride with Grab Taxi. Likewise, taxi drivers appraised freedom in job selection, multiple channels to connect with passengers, an efficient system, higher income, and wellbeing and support to be the motives for their participation. Both Thai passengers and taxi drivers shared moments about their satisfactory experiences through their individual comments. Given that, there are prospective demands for Grab Taxi in the Thai taxi market. However, there are concerns and challenges to be faced in Grab Taxi's operation as well, with shaping traditional practices and enhancing regulations appearing to be the foremost challenges. Whether Grab Taxi can achieve its mission to improve the lives of Thai passengers and taxi drivers, as well as revolutionize the Thai taxi market and to what extent, the next stage of Grab Taxi as an emergent alternative ride service in Thailand depends on all players involved.

It is an exploratory study rather than a confirmatory study, where the analysis is principally based on a literature review, the results of an online survey, and on-site interviews. With the limited number of survey respondents and interview participants, as well as a limited time of execution, this study was subjected to land and transportation regulatory disputes and the results might reflect the restrictions from these boundaries (Ackaradejruangsri, [1]).

Methodology

Population

15 young adults who are student at Limkokwing University of Creative technology.

Sampling Method

15 Limkokwing students who have used or still using bus as a transport will be chosen for this study.

Data collection method

Data collection method used in this study will be answered questionnaire and notes from the verbal questioned asked.

Data Collection Instruments

- 15 Survey Questionnaire
- Verbal questions

4.5 Measurement of variables

time and students lose hope in some situation to wait for the bus. The 2 daily bus commuters lived in an area where there are 2 bus stops facing each other and they seemed to not face any issues in their travel but when it comes to university they even highlighted the time and low number of bus issues that they have faced.

The future

The future of Malaysia bus transportation system seems bright as Malaysia is well equipped with modern technology, infrastructure and experts to help improve the public transportation system.

There are multiple ways used in different countries around the world that can be implemented in Malaysia that both the government and the people can benefit from.

Data Analysis

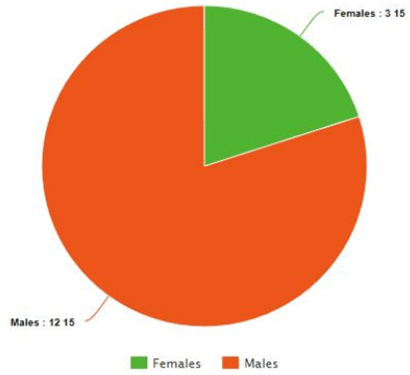


Figure 1: Population Gender

In this study, the majority of participants are male, while it should not affect the values of the research but sue to the imbalances of the genders and the small number of people who accepted to participate in this research result may be slightly inaccurate.

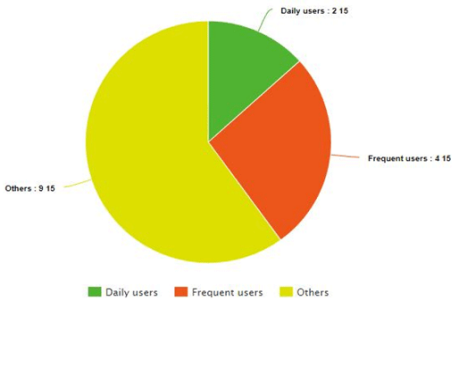


Figure 2: Type of bus user

Bus users were categorized into 3 different categories depending on the bus use frequency. Daily users are the commuter's whole will take a bus ride at least once a day, while frequent users are the commuters who will take the bus depending on their circumstances and finally other are the commuters who may not take the bus for over a week.

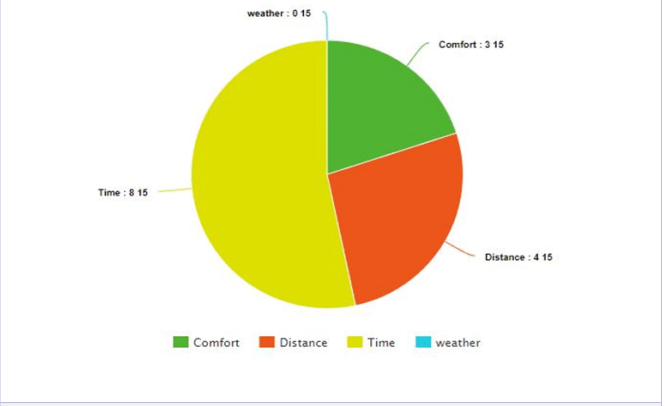


Figure 3: Factors Affecting Decision

As a result, the majority of student's decisions are affected by the time variable as no student found weather to have any effect on their decisions and some find comfort as an important factor while other found distance as a factor.

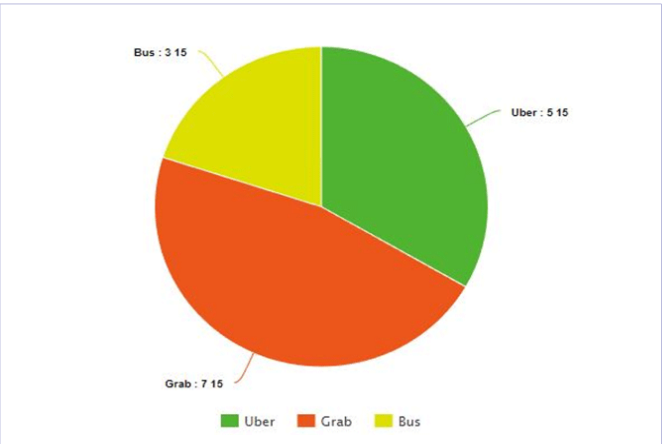


Figure 4: Preferred Mode of transportation

As reviewed in many literatures that modern transportation services like Uber and Grab are dominating the public transport as most student would prefer them over the bus even though the bus fare is much lower, but the time factor is very important in which the bus has no fixed time and therefore students cannot depend on the public transportation anymore.

As mentioned a binary logit model will be used to identify the factors that are important in determining the commuter's choice of transport and to be able to predict the probability of a change in bus and car with respect to different travel cost and time. The study has used the probability of car shifting to public transport based on scenarios of reduction in bus travel cost and time. The

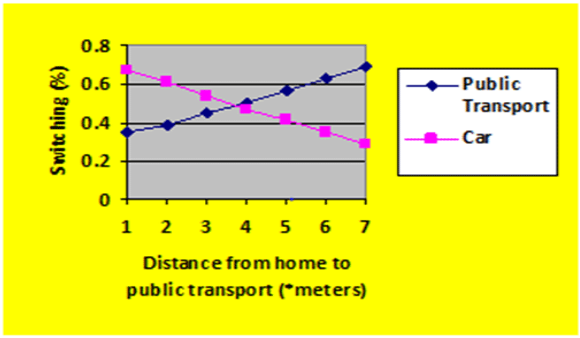


Figure 5: Effect of distance from home to a bus stop increases on car user's mode

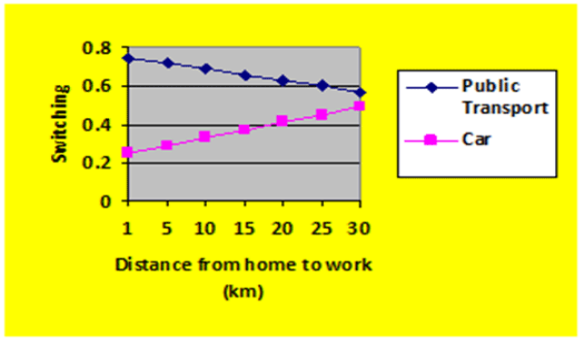


Figure 6: Effect of distance from home to university increase on car user's mode choice

mode shares probabilities categorized by various level of time and distance from home to university.

Conclusion

The study was aimed to understand the reason behind the decline in demand of public transportation and specifically the use of buses in Cyberjaya, Selangor. Even though public transportation is relatedly cheap when compared to other modes of private transportation, but it was found during the literature study that price isn't enough to have commuters to use a service. Public transportation is now challenged and are slowly being dominated by private international companies like Uber and Grab in the transportation sector as they study and understand the importance of customer satisfaction on the other hand commuters find it a hassle to complain about an issue and there is no direct contact with the public transportation customers that would use their engagement to understand the weak point of specific sector in order to improve and meet customers demand. Even though the whole world has adapted modern technologies and solution to their every day to day activity the one sector that seems to lack modern technology is the transportation sector as commuter's lack information on the timing and location of their nearby public transportation.

As a result, from the survey conduct it was found that there is one controlling factor that affects a commuter decision in choosing the mode of transportation and it is time. Most bus users suffer from long wait time and longer travel distance which forces them to consider other solutions and service. Moreover, the study only shows from a small perspective how time influences commuter's decision and the importance to study and understand customers satisfaction even in the public sector to maintain a sustainable and reliable transportation system.

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