APPLICABILITY AND EFFECTIVENESS OF THE PARK AND RIDE SYSTEM FOR KANDY CITY

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ABSTRACT

Applicability and Effectiveness of the Park and Ride System for Kandy City

J. M. A. I. Karunadasa[1] and H. R. Pasindu[2]

Kandy is the main city in Kandy district and Central province of Sri Lanka. As a result of increased car ownership with increase of income level among other reasons, modal share of public transport has decreased over the years. This will increase congestion of roads, reduction of mobility and reliability. One possible option is to reduce the private vehicle users to public transport modes or combination of both private vehicles with public transport mode. "Kandy City Transport Study, (KCTS)" and "Kandy Transport Improvement Program, (KTIP)" have proposed strategic plans to improve transportation system in Kandy city. Furthermore three Satellite Stations were proposed at Getambe, Katugasthota and Thennakumbura with Kandy Multimodal Transport Terminal. In this research, applicability and effectiveness of the park and ride system to Kandy city was studied. Recent studies found that 59.5% of passenger vehicles' trips end are in Kandy CBD. Willingness to use of park and ride system among private vehicle users were assessed through questionnaire.

Questionnaire was mainly focused on traveler's background information, travel behavior data, satisfaction of present transport mode and important factors for better Park and Ride system. Trip information data and other information given by the responders were analyzed through the statistical methods. Finally acceptability of the proposed Park and Ride system was analyzed with monthly income level, average travel time, average trip length, expected waiting time on average journey and average walking distance from point of egress from the public transport mode.

According to the results, acceptability of the proposed Park and Ride system mainly depends on present mode of transport, monthly income level and travel time. Travel distance, waiting time and average walking distance from the point of the egress from the public transport to destination are independent with acceptability of the proposed Park and Ride system. The most of responders were not satisfied with the current travel time, pedestrian walkways. Responders are expecting comfortable public transport system with high frequency for successful proposed Park and Ride system in Kandy city.

Key words: Park & Ride System, Private vehicle users, Public transport

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J.M.A.I.Karunadasa (138310R)

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1 INTRODUCTION

1.1 Background

Kandy is the main city in Kandy district and Central province of Sri Lanka. The city is bounded the north, east and west by Mahaweli river and to the south by Hanthana mountain. These natural barriers are affecting for the development of improved transport system in this heritage city. The Temple of Tooth that located at the center of Kandy city is recognized as one the most prestigious place to visit among world Buddhist community and therefore, it attracts significant number of local and foreign tourist every day. As a result, the city named as a of world heritage city by UNESCO in 1988.

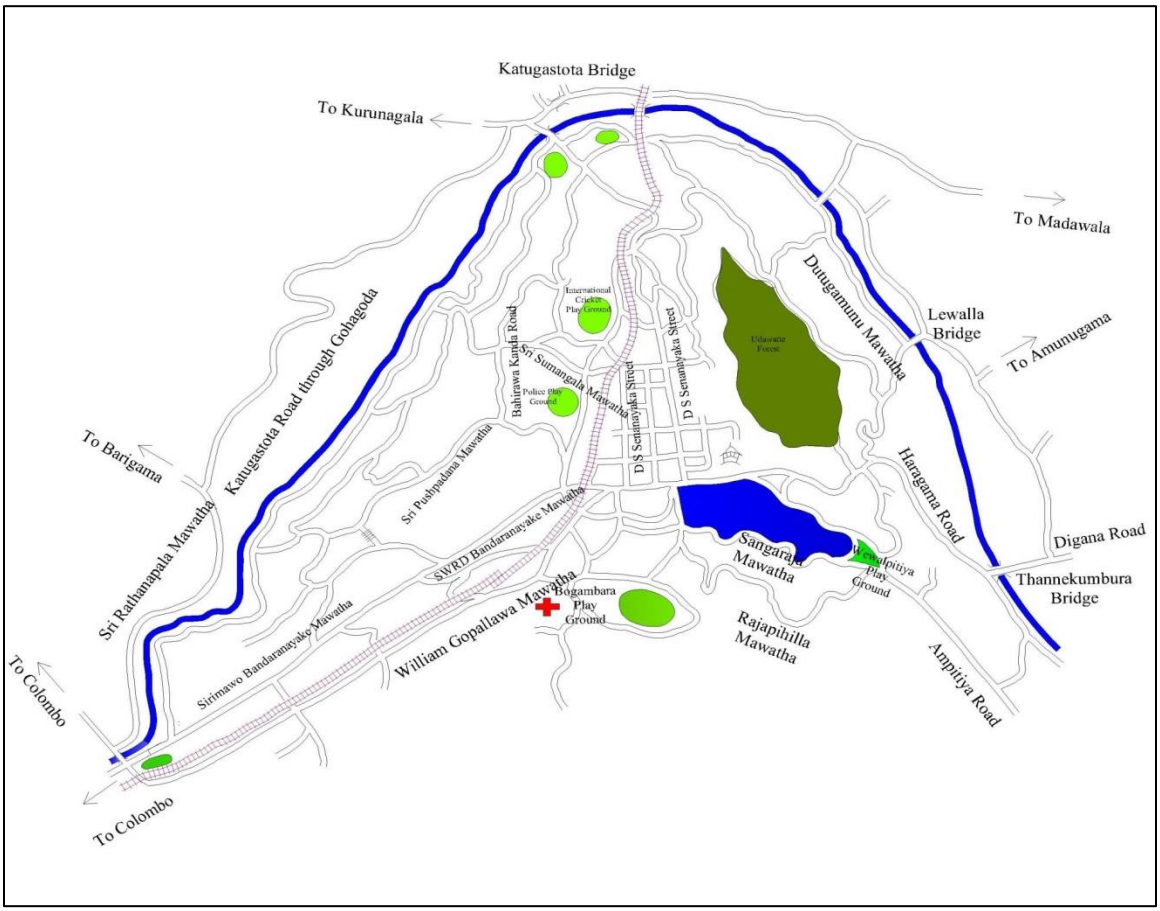

Figure 1.1: Map of Kandy city

The Kandy city is included with Four Gravets divisional secretarial division and its population was recorded as 158,561 as per the census records in 2012. Kandy City Transport Study in 2011 shown that approximately 112,000 vehicles cross the Kandy city daily (week day) in the both directions. The study further indicated approximately 56,000 vehicles enter in to Kandy city per a day carrying nearly 318,000 passengers. Table 1.1 shows the summary of vehicle and passenger flows in Kandy city by vehicle type (KCTS, 2011).

Table 1.1: Vehicle and passenger flow in Kandy city by vehicle type

Vehicle Type	2 - way, 24 hour flow			
	Vehicles		Passengers	
	Count	Percentage	Count	Percentage
Cycles	513	0.5%	513	0.1%
Motor Bikes	24,682	22.0%	32,260	5.1%
Three Wheeler	24,203	21.6%	34,673	5.4%
Car/ Jeep/Pickups	25,614	22.8%	53,957	8.5%
Passenger Van	11,469	10.2%	36,854	5.8%
School Van	1,837	1.6%	33,534	5.3%
Non Route Bus	954	0.9%	14,310	2.2%
Route Bus	9,602	8.6%	403,674	63.4%
Delivery Van	2,434	2.2%	4,836	0.8%
Light Goods	2,984	2.7%	5,918	0.9%
Medium Goods	6,990	6.2%	14,300	2.2%
Heavy Goods	676	0.6%	1,380	0.2%
Multi Axles	61	0.1%	122	0%
Tractors	105	0.1%	155	0%
Carts	46	0%	0	0%
Total	112,170	100%	636,485	100%

1.2 Road Network

It is clearly visualized that traffic attracted by the city in three sides; Peradeniya, Thennekumbura and Katugasthota. The main access to Kandy city are Colombo Kandy road (A001) and Willium Gopallawa Mawatha from Peradeniya side, Kandy Mahiyaganaya Padiyathalwa road (A 026) from Thennekumbura side and Kandy Jaffana road (A 009) from Katugasthota side. Several main roads were connected to these locations. Peradeniya Badulla Chenkaladi road (A 005) , Thennekumbura Ragala Rikillagaskada road (B 413), Katugathota Kurunegala Puttalam road (A 010) at the Peradeniya, Thennekumbura and Katugathota respectively. In addition to that significant traffic volume is coming from Kandy Kirimetiya (Ampitiya road) road (B 195) and Buwelikada Lewella road (B 551). There are not enough bypass roads or circular roads due to geographical constraints imposed by the Mahaweli River and the Hanthana mountainous range. So almost all the traffic flows through the Kandy city whether their destination at Peradeniya, Thennekumbura or Katugathota direction. Therefore these main access roads are congested at the most of the times.

1.3 Rail Network

There are two single railway tracks connected to Kandy city. The main line which is coming from Colombo to Badulla is branching to Kandy via peradeniya and Kandy Matale rail line via Wattegama from North direction. Currently the rail line between Gatambe and Kandy is planned to improve to double line. In addition to the main train movements, rail bus operates between Kandy and Peradeniya with 13 movements per day.

1.4 Problem Identification

According to traffic data of the Kandy City Transport Study (2011), all categories of private vehicles jointly carry 19% of the passenger percentage that contributes to 65% of the traffic flow entering in to Kandy city. Moreover, route buses contribute 8.5% to the total traffic flow, but they carry 63.4% of passenger movement. At present, vehicle ownership within study area is increasing at rapid rate. The rate of increase is nearly over 8% p.a. over the past decade. This will result increasing number of private vehicles entering in to CBD causing highly congested roads in near future.

This situation was identified by the government and number of investigations was conducted. Several proposals were provided to reduce the traffic congestion. One of the strategic plans proposed by the Kandy Transport Improvement Program (KTIP) in 2014 was to construct three satellite stations at Getambe, Thennekumbura and Katugasthota with the Multi modal station at the Goodshed. In addition, the final report of the study proposes to implement of Park and Ride system between the end nodes (i.e. Getambe, Thennekumbura and Katugathota).

These propose developments are significantly expensive and practical implementation will cause significant financial burden on taxpayers. Therefore, before implementing such projects it is essential to run a cost-benefit analysis. Typically, a Park and ride system is a useful technique to reduce traffic congestion. However, this method has negative impacts as well. There are number of examples in the world where this system did not provide successful results. Therefore; detailed investigation is required before implementing such development. The main questions associated with implementing the Park and ride system are, what are the problems in present transport mode? What kind of beneficial and facilities would expect? Whether the people willing to use such facilities after all the developments made? Therefore, it is required to identify the main factors affecting improving the effectiveness of the Park and Ride system.

1.5 Research Objectives

The primary objective of this study is to evaluate the factors that are affecting the choice of using Park and Ride system. These factors incorporate the user characteristics as well as the operational characteristics of the park and ride system.

In order to increase the demand for the proposed park and ride system, it is important to identify the key attributes of the services as well as characteristics of the user that contribute to increase the demand for the proposed Park and Ride system.

2 LITERATURE REVIEW

2.1 Park and Ride Concept

Basic operation of Park and Ride includes persuading motorist to transfer to public transport for part of their journey by offering a price discount or time saving against the driving for the whole journey. Krygsman and Dijst, (2001), provided following definition for the Park and Ride system.

"Park and Ride is generally associated with the notion of multimodal transport, which is the use of two or more modes to form a complete trip between its origin and destination".

Park and Ride concept can be disaggregated in to its three main constituent elements; (1) public transport access, (2) a planned service and (3) a private transport mode terminal.

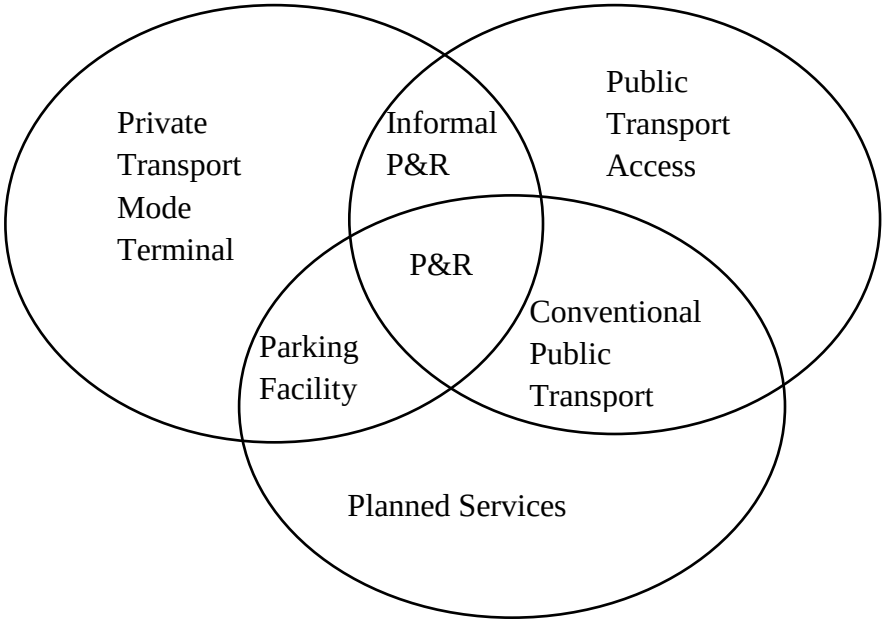

Figure 2.1: The components of Park and Ride system

2.1.1 Public Transport Access

Park and Ride sites are typically found at the boundary of urban areas. This enables the benefits of both private and public transport to be utilized. The flexibility benefits of private transport mean that Park and Ride can be accessed by passengers from diverse origins such as low density suburban areas. The use of public transport as main travel mode for high demand destinations such as urban centers provides efficiency benefits, offer significant time saving to users (in terms of both journey and search time for parking), removes traffic from the urbanized areas (Meek, 2008).

2.1.2 Planned Service

Park and Ride provides the international or planned integration of private and public modes. Park and Ride system can be implemented in varying scales, ranging from use of small shared-use sites to purpose-built with several thousands of spaces. However, distinction should be drawn between formal and informal Park and Ride systems where informal systems are practiced by individuals in ad hoc manner, (i.e. parking is found near to a public transport service that is not provided specifically for the purpose of Park and Ride (Meek, 2008)).

2.1.3 Private Transport Mode Terminal

All instances where travelers transfer to public transport from private transport modes cannot be classified as Park and Ride. For example, a bus passenger will walk to a bus stop and this situation is considered as conventional public transport use (Bos,2004). A Park and Ride scheme then is accessed by a private transport mode and provides a terminal for vehicles. Similar to car parking, cycle storage maybe provided either

alongside or exclusively at rail stations and bus stops with provision of Bike and Ride schemes. Kiss and Ride may be provided places where there are facilities for car passengers to be dropped-off to get the access to public transport services, such system allows car drivers to continue their journey. Terminal facilities are not necessarily dedicated to Park and Ride and shared-use sites are also used (Meek, 2008).

2.2 History of Park and Ride

Transit has been promoted in many cities around the world to facilitate people's travel needs (Qin et.al, 2013). It has been considered as an effective way to mitigate the growing traffic congestion in highly dense urban centers by encouraging public transport use through implementation of the congestion pricing and network users' must travel at cost in to urban centers using private cars (Liu et.al, 2014). To improve the practicality of the system and provide efficient solution to traffic congestion related problems, public transport facilities have been reviewed by the Transport Engineers, Transit Operators and Urban Planners. Eventually the considerations of various forms of public transportation, increase in the coverage of public transport systems, high passenger ridership, and affordable fare structure have been regarded as the measures to increase the public transportation usage (Rosli et.al, 2012). Park and Ride has been used as a method for travel demand management throughout many western countries since the 1930 s (Noel, 1988).

Park and Ride scheme has gained enormous popularity since its introduction during the 1930s in USA as a result of the city and federal transportation officials recognition of the need to plan for coordinated, continuous, and comprehensive urban transportation

modes, (Noel, 1988). The idea of Park and Ride originated in the 1960s with experimental services operated in Oxford, Nottingham and Leicester. Bus based Park and Ride scheme had been initiated during 1960s and 1970s in United Kingdom as a solution for infrastructural capacity constraints (Meek et.al, 2008). The existing Oxford Park and Ride system started in 1973 and is the oldest continuously operating service in UK. Regardless of the United Kingdom government's withdrawal of political support for Park and Ride scheme as there was conflict in understanding its role for reduction of car usage. However, local authorities had continued to adopt the scheme by considering it as a positive option for reducing traffic congestion (Islam et.al, 2014).

During 1990s Park and Ride was largely based around small and medium sized historic cities. Local authorities and small historic towns implemented Park and Ride schemes to improve accessibility and air quality. In addition, Park and Ride schemes have been considered as particularly suitable for historic towns with narrow streets. There were approximately 70 formal Park and Ride systems in 40 cities across the world in 2000.

Figure 2.2: Google image of the Pear Tree park and ride on the northern edge of Oxford

Success of the first trial of Park and Ride facility at Kowloon – Canton Railway Corporation (KCRC) rail network, Sheung Shui in Hong Kong in 1997 lead, the scheme has been in operation until now (Lam et.al, 2001). The Transport Department of Hong

Kong and the KCRC collaboratively provided the financial incentive for the use of this Park and Ride facility which benefitted them by the resulting of modal shift from private vehicle to rail mode, thus reducing the number of private vehicles on the roads, traffic congestion levels and increasing patronage for the KCRC. China is still in the beginning phase in terms of Park and Ride schemes. Beijing and Shanghai transport authorities recently conducted pilot studies on the feasibility of Park and Ride facilities in their cities (Qin et.al, 2013).

Park and Ride had an important role in Australian transportation system over last 40 years (Barter, 2010). It has become an important scheme to promote the public transport usage in number of major Australian cities. Rail based Park and Ride system that is implemented in Australian cities suitable to mitigate traffic congestion in cities (most of the congestions occurs in the CBD areas in Australia, (Islam et.al, 2014)).

Park and Ride was implemented in Putrajaya, Malaysia in 2006. The city of Putrajaya is situated 25 km south of the capital city of Malaysia (Kuala Lumpur), occupies a total land area around 4,932 ha and is divided in to 20 precincts. The Putrajaya Park and Ride station is located 5 km from the city of Putrajaya and it was managed by Putrajaya Corporation (Parking Division). The station provided 320 parking lots and the bus services operated by company named Nadi Putra with flat fare per a trip with frequency of 30 min. No fee were applied for the user of its Park and Ride facilities to encourage its usage (Borhan et al, 2011).

2.3 Reasons to use private vehicle

There are number of reasons why peoples use private cars (vehicles) as their primary transport mode for travelling (Cameron et al., 2004). Some of them are listed below:

- Convenience and comfort of travel.
- Privacy of driver and passengers travelling, undisturbed and feel secure.
- Easier door-to door travel.
- Journey time saving.
- Cultural and symbolic values.
- Quality of travelling.

2.4 Advantages and Disadvantages

2.4.1 Advantages

Many historic towns use Park and Ride to maintain the accessibility for local businesses and tourism whilst protecting their historic streets and buildings from the negative impacts of vehicular traffic. In addition, following advantages can be gained through implementing Park and Ride schemes.

- Reducing car traffic and congestion in and around city centers.
- Park and Ride system is a successful traffic management measure.
- Increasing economic development.
- Providing additional car parking.
- Improve air quality.
- Journey time saving.

2.4.2 Disadvantages

According to Friends of the earth (Birmingham), further Park and Ride expansion is inappropriate for the twenty first century, as it does not significantly contribute to more sustainable transport provision or offer any substantial environmental benefits.

Following areas were concerned;

- Park and Ride does not necessarily reduce overall traffic levels and it simply redistributes it.
- Vehicle miles and atmospheric pollution may increase.
- Most bus based Park and Ride schemes are subsidized by local authorities. Alternatively, the funding spent on Park and Ride could be used to develop more bus routes and cheaper bus journeys etc.
- Park and Ride schemes increase the social exclusion of those without access to a car.
- The large area of land devoted to parking is an inefficient use of land (which could be used for more productive usage).

Since the mid-1990s there has been growing opposition to Park and Rides systems. This was due to factors such as of building on green land (green belt land), damage to environment, localized congestion and pollution and effect on local amenities.

There is some debate over the environmental impacts of the Park and Ride scheme. Further, new parking areas may replace vegetated lands with an impermeable surfaces. This increases the risk of flooding, and may lead to reduction in water quality (oil and

particular matter may wash over the surface contaminating ground water and streams). In addition, the change in land use can effect valuable habitats for flora and fauna. Tarmacking the surface cuts off air and water getting to the soil and so the soil is essentially killed off. It is unlikely that Park and Ride schemes directly lead to a decline in biodiversity, as any rare species present could prevent the Park and Ride scheme from being built. There are others that believe Park and Ride schemes are compatible with floodplains, since during times of floods, vehicles can be moved away from the Park and Ride areas. Moreover, it is possible to use semi-permeable materials (bricks with holes in them) that would allow some drainage and aeration of the soil (BBC NEWS, 2005 June 08).

2.5 Factors for Successful of Park and Ride Systems

There are many factors to successful or failure for park and ride systems. The willingness of car drivers to use park and ride increases if the travel time when using park and ride is very low. Time needed to look for a parking place at the destination, the amount of traffic in the city and the extra travel time from the principal road to the park and ride. Cost was defined by attributes such as total cost of road pricing and parking cost at destination (Bos, I.P.et al, 2004).

Accessibility of the facility, the quality of connecting public transport and the availability of information are much needed things for success of the park and ride system. In addition to that modal choices may be dependent on temporal conditions such as weather and heavy luggage. Reliability and comfort are much needed attributes of the public transport. The introducing exclusive bus lane to the city and enabling efficient

transfer at the park and ride facility could produce low travel time. For maximize the attractiveness, services should be as efficient as using a private car (including interchange times), hence it is needed to consider service frequency and bus priority measures (Bos, I.P.et al, 2004).

Further, to successes Park and ride system, the chance of finding a parking place, the possibility of reserving one and the walking distance from car to public transport are the much needed attributes. Also social safety attributes such as supervision at parking area alighted pedestrian route, and liveness at the park and ride facility and additional provisions such as waiting room (Bos, I.P.et al, 2004).

2.6 Park and Ride Practices in the World

2.6.1 Canberra

Park and Ride strategies have evolved in Australian Capital Territory (ACT) in 2004 when ACT government has recognized the need to develop a sustainable transport plan (Smec, 2007). It focused on transport demand management and its objective was to attain a sustainable future transport system to uphold the values of living and working in Canberra. ACT Park and Ride facilities are mostly allocated, surface car parks close to the bus interchanges in the town centers which have approximately 200 spaces in total or surface car parks. Snowy Mountains Engineering Corporation (SMEC) Australia conducted a travel demand survey in Canberra to collect information about the travel patterns of Park and Ride users in Canberra (SMEC, 2007). Results from the survey indicated that 98% of the respondents park their cars and then ride buses for major portion of their journey and 73% of the respondents switched to new system from cars.

Issues such as lack of sufficient bus services, lack of safety of vehicles and people, crowded buses, and misuse of Park and Ride system have been identified during the demand survey (Islam et.al, 2014).

2.6.2 Adelaide

A research study in Adelaide captured travel behavior changes of the users due to newly established Park and Ride facility at Adelaide Entertainment Centre (AEC) Park and Ride facility (on the fringe of Adelaide) (Wiseman et.al, 2012). The results from the survey showed that 29.8% Park and Ride users have previously driven to the city but now they use car-mass transit combination (i.e., 29.8% car users shifted to Park and Ride scheme). However, there was a greater concern about the negative impacts of the new system. One example is people who used public transport for their entire journey (82.3%) now travel at least part of their journey by car to reach Park and Ride system. Park and Ride facility at AEC center has facilitated an increase of vehicles on the road network and there was rise in Vehicles Kilometers Travelled (VKT) for both car and overall transport network (Islam et.al, 2014).

2.6.3 Melbourne

In Melbourne, the public transport accounts only for 10% of travels in Metropolitan Melbourne, which has been significantly and historically lower against comparable cities such as Sydney, Toronto and Montreal. Victorian government introduced a levy for public and private car parking usage within the Melbourne city and adjacent inner city in January 2006. The objective of this levy was to encourage the public transport use and discourage the use of private and public transport use and discourage the use of private

and public vehicle on road (Hamer et.al, 2009). In 2006, a total of 36,500 parking spaces were available for travelers to use Park and Ride system at both regional and metropolitan railway stations in Victoria (Hamer, 2010). But the demand exceeded the supply by 40%. In response to these excess demand, Victorian State Government committed to provide additional 5000 car parking spaces in 2006 at railways stations in regional and metropolitan rail network and seven railway stations were upgraded to deliver additional 580 car parking spaces for commuters. A survey conducted at seven upgraded stations showed that 36% of car drivers shifted to public transport and 29% new users were added (who did not make similar trip prior to the upgrade: (Islam et.al, 2014)).

2.6.4 United Kingdom (UK)

Experience of Park and Ride in United Kingdom has been mainly confined to rail, with a few well-publicized bus-based schemes such as the one used in Nottingham and Oxford. Most 1970s schemes did not survive, but the Oxford services have endured and are very well patronized. There is now evidence of a revival of bus-based Park and Ride system in UK cities. Rail based Park and Ride has generally been on a relatively small scale (at least when compared to the USA) and has not contributed significantly to the relief of peak hour traffic congestion. The strategic use of Park and Ride to reduce congestion has never really been whole-heartedly employed, but various studies have shown that there is potential for great results. The main problems have been lack of finance and (particularly) of difficulty of obtaining land at the right price. Overall the system showed mixed results, and in some instances was disappointing. There has been an economic

gain from Park and Ride system, but implementation of the system seems to have made no real impact on either traffic flows or parking demand in the city center. However given the general rise in car ownership and use, it may safely be concluded that Park and Ride has eased the situation and slowed down rises in traffic and parking demand. It has also increased the overall capacity of the transport system and attracted some journeys that would not otherwise have been made (Dickins, 1991).

2.6.5 United States

Most cities in United States are aiming to increase their facilities. Many cities have identified Park and Ride system could lead to improved use of their rapid transit networks and way of encouraging a modal transfer from car to public transport for work related journeys. Rises in road traffic volumes have been decreased in both Boston and Washington cities (Dickins, 1991). Some West coast cities with very high levels of car use have adopted strategic Light Rail Transit (LRT) or Park and Ride system as primary solution for tackling congestion. A typical example is Sacramento, whose LRT system consists of two lines totaling 30 km and carrying 3,000,000 passengers a year. Eight stations have Park and Ride facilities, making a total of 3,270 spaces. The largest site is at Roseville Road with 1,100 stalls. All parking is free, to encourage the use, and two of the sites have connecting bus services. Some 650,000 Park and Ride trips are made annually.

The Park and Ride spaces are not, however, fully used. Sacramento transit surveys show that in September 1988 only between 30 to 50% of stalls were occupied. There thus seems to be a degree of over provision at present, or conversely under-promotion, in

contrast to some other cities where Park and Ride lots are regularly at or near capacity (Dickins, 1991).

2.6.6 Canada

The city of Calgary has made a comprehensive study about Park and Ride compare to all other cities in the world. The total number of stalls at present is 8,627 that located at 14 stations. The majority of lots have 300 to 800 stalls. Park and Ride facilities are deliberately restricted to suburban stations in order to maximize the reduction in road traffic in the vicinity of city center. Parking at any stall is totally free. The stations are also served by bus feeders, although transfer facilities are not specifically provided, In addition to Park and Ride, Kiss and Ride areas are also available. Short-term parking provided adjacent to LRT stations at home locations.

Usage of Park and Ride varies from 15% of LRT user on the north east line to 21% on the South line. Calgary believe that any use in excess of about 20% to 25% would detract from the use of feeder buses, and therefore do not wish to see usage exceed those levels. One reason for this is that greater usage would entail the provision of over-large lots, which would create local traffic and access problems.

Lot use is very high, particularly on the south line where one station had occupancy rates of 90% to 100%. Occupancy was over 80% many of the other lines as well. Despite the very high occupancy rates Calgary city report no significant dissatisfaction of the availability of spaces for south line users (Dickins, 1991).

2.6.7 Malaysia

Effectiveness of Park and Ride facilities at Putrajaya area was studied (Borhan et al, 2011). The outcome of this study was showed that only 2% of the parking lots were occupied from 320 parking lots. This is because, a lot of parking spaces were providing at government offices area and the parking is free of charge. The main contributing to the domination of private transport as preferred mode of travel in city Putrajaya include the provision of high quality road network with generous space, the availability of ample parking spaces provided free of charge, and generally modest cost of owing and operating private vehicles. Generally, the buses were served in Putrajaya Park and Ride station has poor service frequency with an average of two per hour, even during the peak periods. It is concluded that the parking fee shall be an important factor in contributing to the success of Park and Ride use. Increasing parking charges would cause a decrease in term of private cars travel in to the CBD area. It is noticeable that a free parking provided at worksite one of the factor why Park and Ride is unpopular among an employees in Putrajaya. Further study reveals that, the longer waiting time for the buses is the one of the major factor why people refused to use Park and Ride facilities. Increasing the bus frequency from 30 min to 15-10 min will directly affect the use of the Park and Ride facility (Borhan et al, 2011).

2.7 Origin – Destination of Traffic Movements in Kandy City

Origin-Destination data and the outcomes of such data were given in the Kandy City Transport Study (KCTS, 2011) and Kandy Transport Improvement Program (KTIP, 2014), were given below for private vehicles, Goods vehicles, Bus Transport and railway services and school services.

2.7.1 Private Vehicles

59.5 % of private vehicle trips or 51,000 vehicles, entering the city have their trip – ends within the CBD. Another 16.3% or around 14,000 private vehicles entering the city do not terminate within the city, and instead go through the city to terminate outside. Beside these trips entering the CBD along the major arteries, there are around 20,000 vehicle trips arriving through minor corridors such as Ampitiya Road, Rajapihilla Mawatha and others (KCTS, 2011).

2.7.2 Goods Vehicles

Around 13,250 goods vehicles, making up 11.8% of the total traffic flow, cross the city cordon daily. Foodstuffs, Building Materials and Industrial Products dominate the commodity types carried across the city. Of this, special consideration is made of the movement of around 2,500 trucks carrying building materials, of which around 1,100 movements are heavily loaded vehicles from outside the city travelling to a destination beyond Kandy but passing through both the city as well as the CBD. There are an estimated 225 Tipper trucks carrying sand from Mahiyangana in East, that go through the study area daily (KCTS, 2011).

2.7.3 Bus Transport

The CBD cordon handles 10,182 bus movements per day carrying 427,628 passengers in the two-way count of 24 hours. The average occupancy rate of buses at the CBD cordon is 42.1 while for the city boundary it is 40.4. During peak periods, this increases to an unacceptable 49.1 at CBD cordon and an even more unacceptable 56.7 passengers per bus at the city boundary cordon.

It is shown that 47.2% of the passengers boarding at the terminals within the city (approximately 200,000) have one end of their trip in the Kandy CBD. Of these trips, the major origins are, in order, Pilimathalawa, Yatinuwara and Kundasale followed by Harispattuwa, Katugasthota, Udunuwara and Pathadumbara DSDs. Of passengers boarding the long distance inter provincial buses, approximately 18,000 passengers have their origins in the CBD. Inter-provincial passengers amount to 1/3 rd of all passenger boarding, highlighting the importance of Kandy bus terminals in the national bus network. Around 50% of passengers have both their trip ends outside the study area. This means around 100,000 passengers arrive in the CBD just in order to transfer from one bus to another (KCTS, 2011).

2.7.4 Railway Services

Around 6,000 passengers arrive by railway to the city every day making it less than 2% of the traffic load of the CBD. The origin-destination surveys show that over 50% of these passengers are from outside the province, using long distance trains. Short distance trains, serving stations such as Perdeniya, Gampola, Kadugannawa, Katugastota, and Wattegama attract only around 100 trips a day. Given that the railway operates 20 trains

a day this is well below par and indicates an under performance of the railway compared to Colombo (KCTS, 2011).

2.7.5 School Services

There is an estimated 1,000 school vans transporting students to Kandy of which around 850 were registered at the provincial in 2010 (KCTS, 2011).

2.8 Traffic data in Kandy city

Traffic survey details for Kandy city were given in Kandy City Transport Study in 2011. In addition to that planning division of Road Development Authority conducted the traffic survey for improvement to few roads in Kandy in 2013. Summarized traffic details for William Gopallawa Mawatha present in table 2.1 from survey details given by Kandy City Transport Study (2011) and Road Development Authority (2013).

Table 2.1: Summarized traffic details for William Gopallawa Mawatha

Vehicle Type	**Category**	**Number of Vehicle (KCTS,2011)**	**Number of Vehicle (RDA,2013)**
Car/Van/Jeep/Pickups(4W)	Personal	16,803	24,846
Motorcycles (2W)			
Three-wheelers (3W)			
Buses	Public	2,101	2,680
Truck/Lorries	freight	2,402	2,714

3 METHODOLOGY

3.1 Overview

Details of the park and ride systems, its underling principals and the factors influencing for the success or failure of park and ride systems was identified in the literature review. In addition, available traffic details related to Kandy city was found from the traffic surveys conducted by various organizations such as planning division of Road Development Authority, Faculty of Engineering, University of Peradeniya and from other past studies.

A questionnaire was developed to identify the people's interest on proposed Park and Ride system for Kandy city in this study. After doing pilot survey and interviewing number of people, the questionnaire was modified best information. Using the questionnaire, a survey was conducted to obtain people's view on this concept.

Subsequently, traffic data and data collected from questionnaire were analyzed. Statistical methods were used for analyzing the data collected from questionnaire. Advance statistical tests such as Chi-Square Test, Fisher's Exact Test were used with the aid of SPSS (Statistical Package for the Social Sciences) software package to get a thorough understanding on the peoples' personal background, travel behavior with the acceptance of the park and ride system.

3.2 Design of the Questionnaire

Study was focused on traveler's which their trip destination on Kandy (Kandy Four Gravest DSD). They are the potential group of people who are effective to use proposed park and Ride system. Questionnaire had four main sections.

- User background data
- User Travel behavior data
- User satisfactory level of their present transport mode
- People sensitivity level of proposed park and ride system

Almost all questions are stated preference questions which had number of alternative solutions and responders need to get their preferred answer from the given list. Responders are expected to provide their answers for other questions. Survey questionnaire is presented in Annexure-I.

3.2.1 Details about user background data

Responders' background data was collected and only limited number of personal data were collected which are essential to develop the relationship with other information given by the responders. Table 3.1 present the questions and the answer options which are provided in the questionnaire related to the responder's personal data.

Table 3.1: Summary of user background data

	Variable	Options
1	Your current residence	Please write ……
2	Your monthly income	1. Less than Rs 50,000 2. Rs 50,000 - Rs 75,000 3. Rs 75,000 - Rs 100,000 4. Rs 100,000 - Rs 150,000 5. Above Rs 150,000
3	You are currently	1. Government Employed 2. Private Employed 3. Retired 4. Higher Studies 5. Schooling 6. Other

3.2.2 Identification of user travel behavior data

User travel behavior data such as trip destination, trip purpose, travel distance, travel time, mode of transport, travel frequency, comfortable walking distance, waiting time on their journey and use of railway were collected. The relevant variables and options are presented in table 3.2.

Table 3.2: Summary of user travel behavior data

	Variable	Options
1	Nearest city or suburb (GN division) to your destination	All GN Divisions in Kandy Four Gravets Divisional Secretariat are provided
2	Purpose of entering Kandy city	1. Work or official purpose 2. School or higher studies 3. Business 4. Shopping or leisure 5. Residence 6. Other
3	Distance from your current resident to your destination (km)	Please write ……
4	Average travel time (min)	Please write ……
5	Mode of major transport which you use to enter Kandy city	1. Private vehicle (Car/Van/Cab/Jeep) 2. Bus 3. Train 4. Bus + Train 5. Staff Vehicle 6. Bicycle 7. Three Wheeler 8. Other
6	If you use a private Vehicle, frequency of travelling to Kandy	1. Daily 2. Every week day

		3. 2-4 days per week 4. 10-20 days per month 5. I don't use private vehicle
7	Currently, If you are a private vehicle user, your comfortable walking distance to change your traveling mode to public transport	1. 0- 100 m 2. 100 -500 m 3. 500 -1000 m 4. Above 1000 m 5. I use public vehicles
8	If you are willing to use proposed public transport, Your expected waiting time on average journey (min)	1. 0 - 5 min 2. 5 – 10 min 3. 10 – 15 min 4. 15 – 20 min
9	Your ability to use railway between Gatambe and Katugasthota	1. Can use 2. Cannot use 3. I can use but I'm not preferred

3.2.3 Identification of users' perspective on present transport mode

In this section stated preferences choice questions are given in the questionnaire for the public vehicle users as well as private vehicle users. Main purpose of this section is to identify key factors which are having least satisfaction of the users for their present transport mode. It is very important to understand the variables which are having least satisfaction level for public vehicle users. To provide better public transportation system under the proposed park and system, it is required to understand these factors. Table 3.3 and table 3.4 provide variables with set of answer options for private vehicle users and public vehicle users respectively.

Table 3.3: Summary of user satisfactory level of their present transport mode as public transport

	Variable	Options
1	Current travel time of your journey	0- Extremely Dissatisfied 1- Very Dissatisfied 2- Somewhat Dissatisfied 3- Somewhat Satisfied 4- Very Satisfied 5- Extremely Satisfied
2	Comfortability of your transport mode	0- Extremely Dissatisfied 1- Very Dissatisfied 2- Somewhat Dissatisfied 3- Somewhat Satisfied 4- Very Satisfied 5- Extremely Satisfied
3	Reliability of your transport mode	0- Extremely Dissatisfied 1- Very Dissatisfied 2- Somewhat Dissatisfied 3- Somewhat Satisfied 4- Very Satisfied 5- Extremely Satisfied
4	Economy of your transport mode	0- Extremely Dissatisfied 1- Very Dissatisfied 2- Somewhat Dissatisfied 3- Somewhat Satisfied 4- Very Satisfied 5- Extremely Satisfied
6	Satisfactory level of Pedestrian walkways	0- Extremely Dissatisfied 1- Very Dissatisfied

		2- Somewhat Dissatisfied 3- Somewhat Satisfied 4- Very Satisfied 5- Extremely Satisfied

Table 3.4: Summary of user satisfactory level of their present transport mode as private transport

	Variable	Options
1	Current travel time of your journey	0- Extremely Dissatisfied 1- Very Dissatisfied 2- Somewhat Dissatisfied 3- Somewhat Satisfied 4- Very Satisfied 5- Extremely Satisfied
2	Comfortability of your transport mode	0- Extremely Dissatisfied 1- Very Dissatisfied 2- Somewhat Dissatisfied 3- Somewhat Satisfied 4- Very Satisfied 5- Extremely Satisfied
3	Reliability of your transport mode	0- Extremely Dissatisfied 1- Very Dissatisfied 2- Somewhat Dissatisfied 3- Somewhat Satisfied 4- Very Satisfied 5- Extremely Satisfied
4	Economy of your transport mode	0- Extremely Dissatisfied

		1- Very Dissatisfied 2- Somewhat Dissatisfied 3- Somewhat Satisfied 4- Very Satisfied 5- Extremely Satisfied
5	Operational Frequency of your present transport mode	0- Extremely Dissatisfied 1- Very Dissatisfied 2- Somewhat Dissatisfied 3- Somewhat Satisfied 4- Very Satisfied 5- Extremely Satisfied
6	Satisfactory level of Pedestrian walkways	0- Extremely Dissatisfied 1- Very Dissatisfied 2- Somewhat Dissatisfied 3- Somewhat Satisfied 4- Very Satisfied 5- Extremely Satisfied

3.2.4 Identification of user expectation on new Park and Ride scheme

Proposed park and ride system will success and people will use if they satisfy with the facilities of the proposed public transportation system. When considering the proposed Park and Ride system in Kandy city, three satellite stations are proposed at Getambe, Katugasthota and Thennekumbura with having Kandy Good shed multi modal station. Vehicle parking facilities will be provided at the satellite stations (Getambe, Katugasthota and Thennekumbura). Then onwards public transportation is provided to complete the journey in to the city. Public buses will travel between these three satellite stations in addition to the railway transport between Getambe and Katugasthota.

In this questionnaire, Peoples' sensitivity level evaluated for both public buses and railway. Main facilities in each public transport system given and their level of importance can be evaluated. Table 3.5 and Table 3.6 provide the parameters proposed for the better public buses and railway transportation separately.

Table 3.5: Parameters proposed for the better public bus transport

	Variable	Options
1	Reliability of the proposed public transport system within the city.	0- Not at all Important 1- Slightly Important 2- Moderately Important 3- Important 4- Very Important 5- Extremely Important
2	Availability of parking lots at the parking areas in the terminals.	0- Not at all Important 1- Slightly Important 2- Moderately Important 3- Important 4- Very Important 5- Extremely Important
3	Security of the parked vehicle.	0- Not at all Important 1- Slightly Important 2- Moderately Important 3- Important 4- Very Important 5- Extremely Important
4	Comfortability of the proposed public transport system.	0- Not at all Important 1- Slightly Important 2- Moderately Important 3- Important

		4- Very Important 5- Extremely Important
5	Frequency of proposed public transport system within the city.	0- Not at all Important 1- Slightly Important 2- Moderately Important 3- Important 4- Very Important 5- Extremely Important
6	Introduce lower parking charges and attractive parking charging system at the terminals.	0- Not at all Important 1- Slightly Important 2- Moderately Important 3- Important 4- Very Important 5- Extremely Important
7	Increase the parking charges in the city.	0- Not at all Important 1- Slightly Important 2- Moderately Important 3- Important 4- Very Important 5- Extremely Important

Table 3.6: Parameters proposed for the better railway transport

	Variable	Options
1	Increase number of frequency of travel between Gatambe and Katugasthota.	0- Not at all Important 1- Slightly Important 2- Moderately Important 3- Important 4- Very Important 5- Extremely Important
2	Increase the number of halts between Gatambe and Katugastota.	0- Not at all Important 1- Slightly Important 2- Moderately Important 3- Important 4- Very Important 5- Extremely Important
3	Increase the comfortability of the trains.	0- Not at all Important 1- Slightly Important 2- Moderately Important 3- Important 4- Very Important 5- Extremely Important
4	Develop the stations and halts up to proper standards with new technology.	0- Not at all Important 1- Slightly Important 2- Moderately Important 3- Important 4- Very Important 5- Extremely Important

3.3 Questionnaire Survey

Questionnaire was designed and pilot survey was conducted. Subsequently, the questionnaire was modified according to the feedbacks. Data was collected by distributing questionnaire sheet and conducting discussions with the responders. When conducting questionnaire survey, park and ride concept was explained to responders who did not have knowledge about its basic operating principals. In addition, separate questionnaire was prepared as google document and distributed among the engineers and other professionals focusing Central province. Data was collected from officers in Kandy city including Road Development Authority, Sri Lanka Telecom, National Water Supply and Drainage Board, Ceylon Electricity Board.

3.4 Data Analysis Method

Descriptive statistics was used for analysis to identify the responders' basic characteristics. It includes measure of central tendency including average (mean), median, percentage, sum and other basic statistical quantification methods. In addition, Likert method was used to select level of satisfaction and level of importance of the responders' on present transportation mode and responders' sensitivity level for the proposed park and ride system. Values given to level of importance and level of satisfactions were weighted. Most important factors for better park and ride system and factors classified as satisfied and dissatisfied factors for responders' present travel mode was selected accordingly. Further, Chi Square Test and Fisher Exact Test were conducted to obtain detailed understanding of the responder's personal background data, traveling behavior data and the acceptability of the proposed park and ride system using SPSS modeler.

3.4.1 Chi-Square Test

Chi-Square Test was used to determine whether there is significant difference between the expected frequencies and the observed frequencies in one or more categories. The Chi-Square Test was conducted by using SPSS software package. Significant level is considered as 5% (0.05) and checked against significant coefficient (p-value). If the p-

value is less than 0.05, null hypothesis cannot accept. Therefore, it is concluded that there is relationship between variables.

In this study, Chi-Square Test was conducted to investigate further relationship between responders personal back ground data, travel behavior data with the acceptability of the proposed park and ride system.

3.4.2 Fisher's Exact Test

Chi-Square Test provides good approximations when the sample size is large. When the sample size small or the data in the sample unequally distributed among the cells, expected count given the lower values. Fisher's Exact Test provides good approximation in such situations. This test can be conducted when the expected count of cells less than 5 (exceed 20% of the total number of cells).

While analyzing on SPSS, when the expected count of the cells less than 5 exceeds 20% of the cells in the total number of cells. Fisher's Exact Test was conducted to identify the relationships for acceptance of the proposed park and ride system.

4 DATA ANALYSIS

4.1 Overview

This chapter consists of three main sections. The first section illustrates about user characteristics and park and ride preference. In here, responders traveling behavior was analyzed with the help of descriptive statics. Several underlying relations in terms of respondent's background, travel behavior with acceptability of park and ride system was developed by developing hypothesis testing such as Chi-Square testing Fisher's Exact testing. The second Chapter consists of analyzing of data related to user perspective on their present transport mode. It was done separately for public vehicle users and private vehicle users. Key variables were identified which was having better satisfaction and least satisfaction of their present transport mode. Weighted average values were used for identified the most satisfied and dissatisfied variable of their present transport mode. Third section consists of analyzing user sensitivity on proposed park and ride scheme. Main facilities provide to public buses, railway and parking area was considered. The most important facilities for public transportation were identified from the weighted average values.

Responders those were within the Kandy Four Gravest DS divisional area were filtered and taken for analysis. They are considered as the potential group of people who will likely to use the proposed park and ride system. There were total 152 responders which fell in to this group. In addition, questionnaire survey was mainly targeted the private vehicle users. This is because, at present, this group of people is considered as potential group who are ready to use proposed park and ride system. Further, questionnaire survey was extended within public vehicle users as well. Their opinions in related to proposed public transport system that will be a part of the proposed park and ride system are important. Their inputs are important to understand the areas of the public transport that should be improved to accommodate more people. These public transport users have a potential of using private vehicles in the future and their ideas for proposed Park and Ride system are necessary.

4.2 User Characteristics and Park and Ride Preference

4.2.1 Analysis of Present Transport Mode

Responders modal share were obtained from the questionnaire survey and the outcome of the data presented in table 4.1 and figure 4.1

Table 4.1 Responders Modal Share

Travel mode	**Number of responders**	**Percentage%**
Private vehicle User	103	68%
Bus User	35	23%
Train User	2	1%
Bus + Train User	1	1%
Staff Vehicle User	5	3%
Bicycle User	5	3%
Three Wheeler User	1	1%
Total Responders	**152**	**100%**

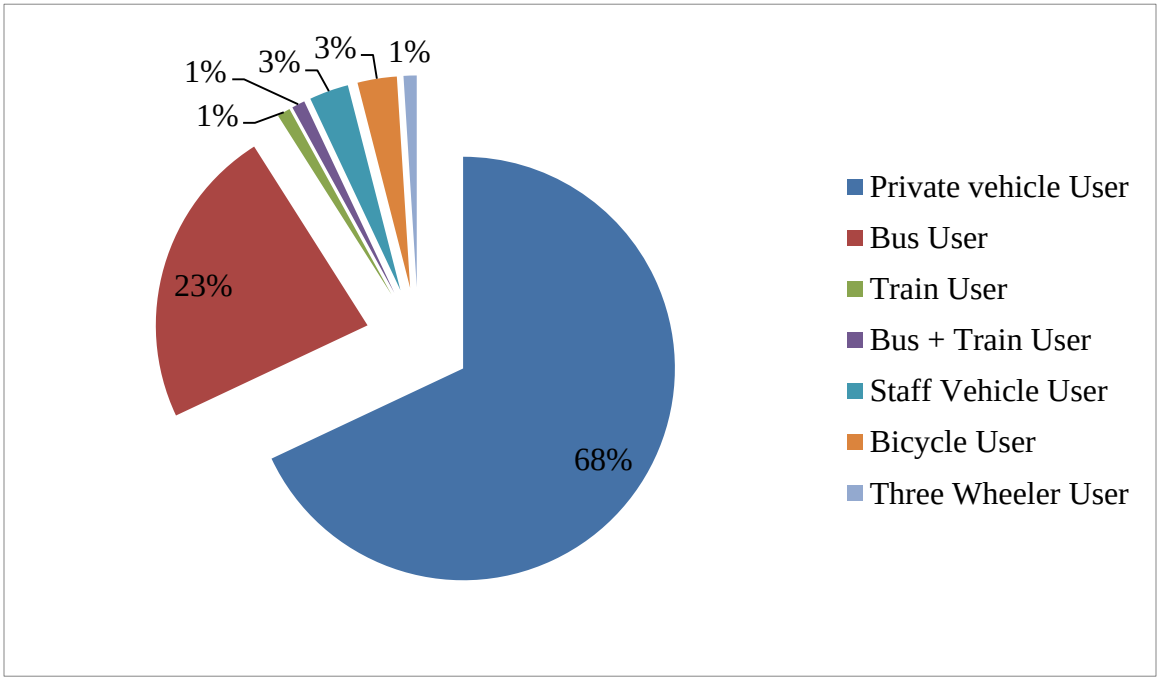

Figure 4.1: Variation of modal share

It is really helpful to identify the variation of travel mode with acceptance of proposed park and ride system. According to the analysis, 58% of private vehicle users were accepted the proposed park and ride system and almost all public transport users were accepted the proposed park and ride system. Table 4.2 and Figure 4.2 show that variation of modal share with acceptance of park and ride system.

Table 4.2 Modal share with acceptance of proposed park and ride system

Travel mode	**Number of responders**	**Park and ride accept**	**Percentage accept**
Private vehicle User	103	60	58%
Bus User	35	34	97%
Train User	2	2	100%
Bus + Train User	1	1	100%
Staff Vehicle User	5	2	40%
Bicycle User	5	4	80%
Three Wheeler User	1	0	0%

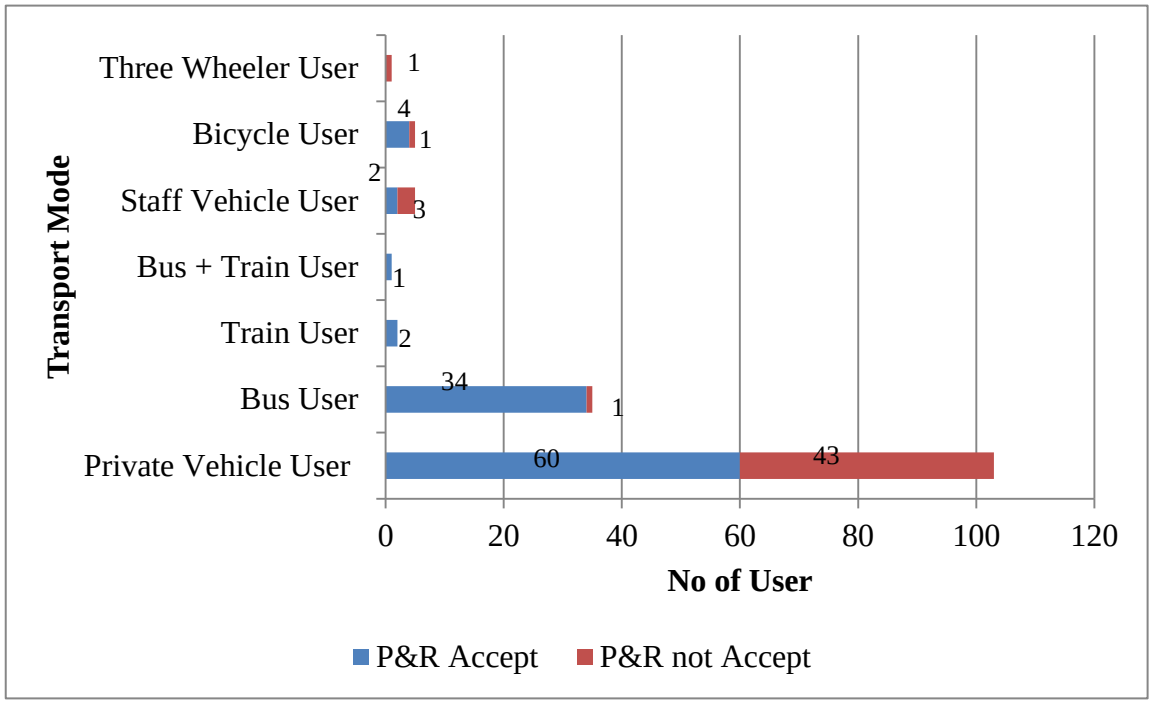

Figure 4.2: Variation of Modal Share with acceptance of proposed park and ride system

Advance statistical test was conducted by using SPSS software to determine the relationship between the present transport mode and likely acceptance of the proposed Park and Ride system. Following hypothesis was tested by Chi-Square Test for independence using significant level 0.05 (5%).

Test hypothesis is;

Ho: Present mode of transport and park and ride acceptability are independent.

Ha: Present mode of transport and park and ride acceptability are not independent.

In this cases the assumption of Chi-Square Test is violated (i.e. expected count is less than 5 in more than 20% number of cells). Therefore, the hypothesis was checked with the Fisher Exact test. (See Annexure II)

According to the outcome of SPSS analysis result, the P-value (0.000) is less than the significance level (0.05), hence null hypothesis cannot be accepted. Therefore, it is concluded that there is a relationship between traveler's present mode of transport and acceptability of the proposed Park and Ride system.

4.2.2 Anaysis of Monthly Income Level

Responders' monthly income level was categorized in to the five categories. The highest numbers of responders were in monthly income range between Rs. 75,000 – Rs. 100,000. 44 responders were in this category. Table 4.3 and Figure 4.3 provide the variation of monthly income level in the sample.

Table 4.3 Variation of monthly income level

Monthly income	**Number of responders**	**Percentage (%)**
Less than Rs.50,000	26	17%
Rs.50,000 - Rs.75,000	14	9%
Rs.75,000 - Rs.100,000	44	29%
Rs.100,000 - Rs.150,000	39	26%
Above Rs.150,000	29	19%
Total responders	**152**	**100%**

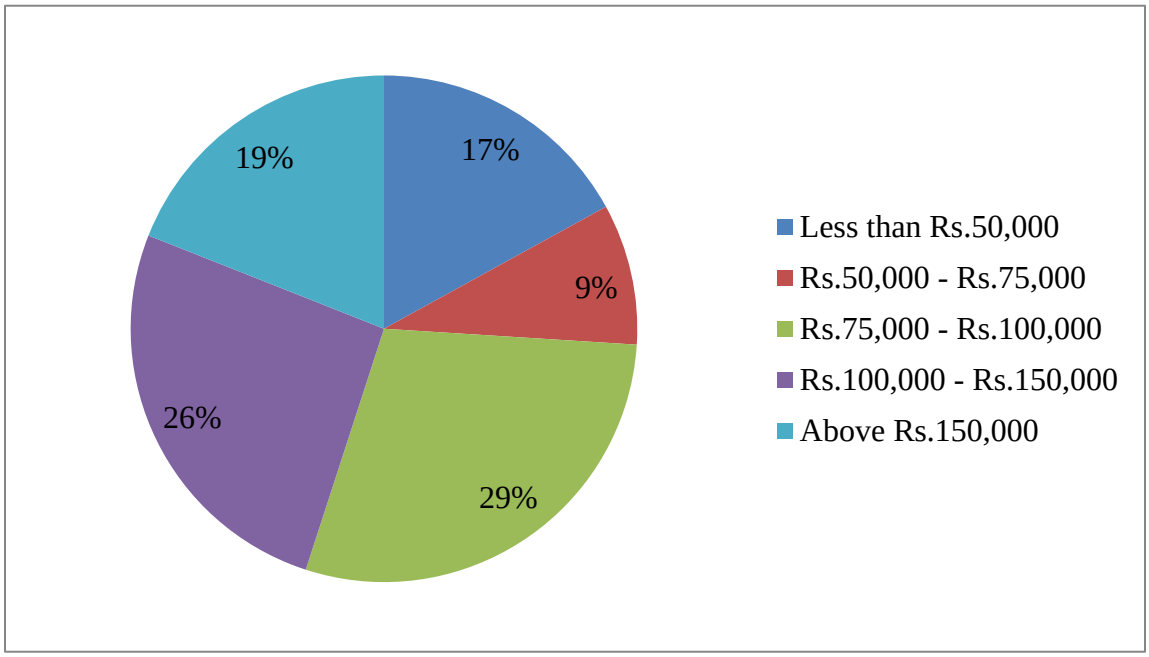

Figure 4.3: Variation of monthly income levels in the sample

Table 4.4 shows the variation of monthly income level with responder's travel mode. Generally, when the monthly income is high, people have their own vehicle and there is a trend of using their private vehicles for their day to day activities. In table 4.5, responders' monthly income level with the acceptance of proposed park and ride system was analyzed. Table 4.5 and figure 4.4 show the variation of monthly income level with acceptance of proposed park and ride system. It can be seen from this data when the monthly income is lesser than the Rs. 100,000 percentage of acceptance of proposed Park and Ride system is greater than 85%.

Table 4.4 Variation of monthly income level with travel mode

Monthly income level	**Private Vehicle User**	**Bus User**	**Train User**	**Bus + Train User**	**Staff Vehicle User**	**Bicycle User**	**Three Wheeler User**
Less than 50,000	0	21	1	0	0	3	1
50,000 - 75,000	7	3	0	1	2	1	0
75,000 - 100,000	34	8	1	1	0	1	0
100,000 - 150,000	33	3	0	0	3	0	0
Above 150,000	29	0	0	0	0	0	0

Table 4.5 Variation of monthly income level with acceptance of proposed park and ride system

Monthly income level	**Park and ride accept**	**Percentage accept**
Less than 50,000	23	88%
50,000 - 75,000	12	86%
75,000 - 100,000	39	89%
100,000 - 150,000	20	51%
Above 150,000	9	31%

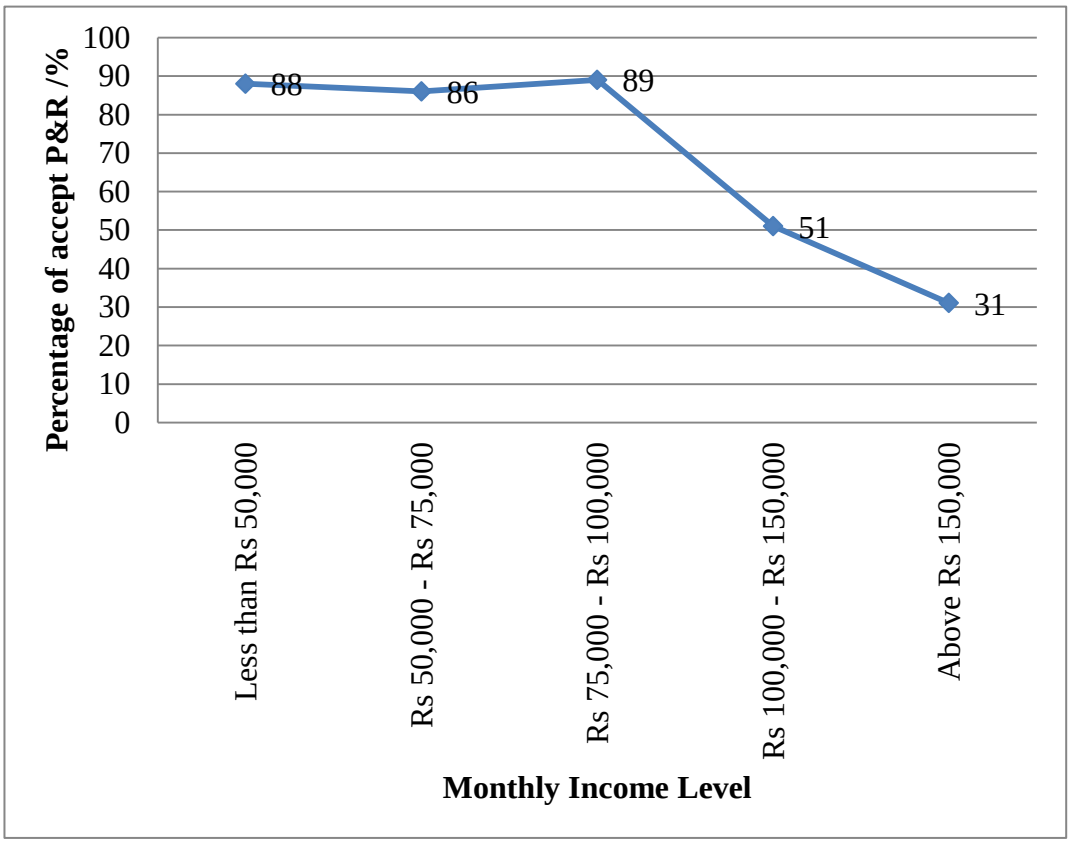

Figure 4.4: Variation of monthly income levels with acceptance of proposed park and ride system

Advance statistical test was conducted using SPSS software to determine the relationship between the monthly income level and acceptability of proposed park and ride system. Following hypothesis was tested by Chi-Square Test using significant level 0.05 (5%).

Test hypothesis is;

Ho: Monthly income level and park and ride acceptability are independent.

Ha: Monthly income level and park and ride acceptability are not independent.

In this cases the assumption of Chi-Square Test is satisfied (i.e. expected count is less than 5 in less than 20% number of cells). Therefore, the hypothesis checked with the Chi-squared test. (See Annexure III)

According to the outcome of SPSS analysis results, the P-value (0.000) is less than the significance level (0.05), therefore null hypothesis cannot be accepted. It is concluded that there is a relationship between monthly income level and acceptability of the proposed park and ride system.

Further, regression analysis was done to find out P-value of independent variable. According to the analysis results, P- value was 0.04 for 95% confidence level. As P-value (0.04) is less than significance level (0.05), it is concluded that there is relationship between monthly income level and acceptability of the proposed park and ride system. Analysis results are given in Annexure III.

4.2.3 Analysis of trip purpose related data

Data collected from various offices including Road Development Authority, Ceylon Electricity Board, National Water Supply & Drainage Board and some other private organizations was used for this analysis. Majority of responders' trip purpose was work related. Table 4.6 provides the information about the trip purpose to enter to Kandy city in the sample.

Table 4.6: Trip purpose to enter to Kandy city

Trip purpose	**Number of responders**	**Percentage %**
Work or official purpose	107	70%
School or higher studies	12	8%
Business	10	6%
Shopping or leisure	7	5%
Residence	7	5%
Other	9	6%
Total	**152**	**100%**

4.2.4 Analysis of frequency of entering Kandy city

It is necessary to identify the frequency of the private vehicle users entering Kandy city from the sample taken during the questionnaire survey. Table 4.7 shows the frequency of responders entering in to Kandy city by private vehicle users. It can be seen that 45% of the sample represents the daily travelers and 36% of the sample represents the weekday travelers.

Table 4.7: Frequency of private vehicle users entering Kandy city

Frequency of entering city	**Number of responders**	**Percentage %**
Daily	55	45%
Every week day	44	36%
2-4 days per week	14	12%
10-20 days per month	9	7%
Total responders	**122**	**100%**

4.2.5 Analysis of trip related data

In this section, basic trip related data (i.e. trip length, travel time and speed) were analyzed. It is shown that staff vehicle users travel higher average travel distance and average travel time than other transport mode users. On the other hand three wheel users are traveling shorter distance and shorter travel time trips. In questionnaire, responders were provided average distance to nearest kilometer and average travel time in nearest five minute. Average speed calculated from average travel distance and travel time which was provided by responders in their questionnaire. Peak and off peak speeds of seveal roads were given in Kandy city transport study (2011) and Kandy transport improvement program (2014) reports. It is noted that calculated average speed is differ from peak or off peak speed. Analysis shows that average speed of most of vehicles' is around 27 km/h.

Table 4.8: Basic trip related data

Travel mode	**Average trip length / km**	**Average travel time / (min)**	**Average speed /(km/h)**
Private vehicle	17.76	41.50	26
Bus	24.20	61.00	24
Train	10.00	17.50	34
Bus + Train	18.00	40.00	27
Staff vehicle	37.00	70.00	32
Bicycle	21.00	37.00	34
Three wheeler	4.00	10.00	24

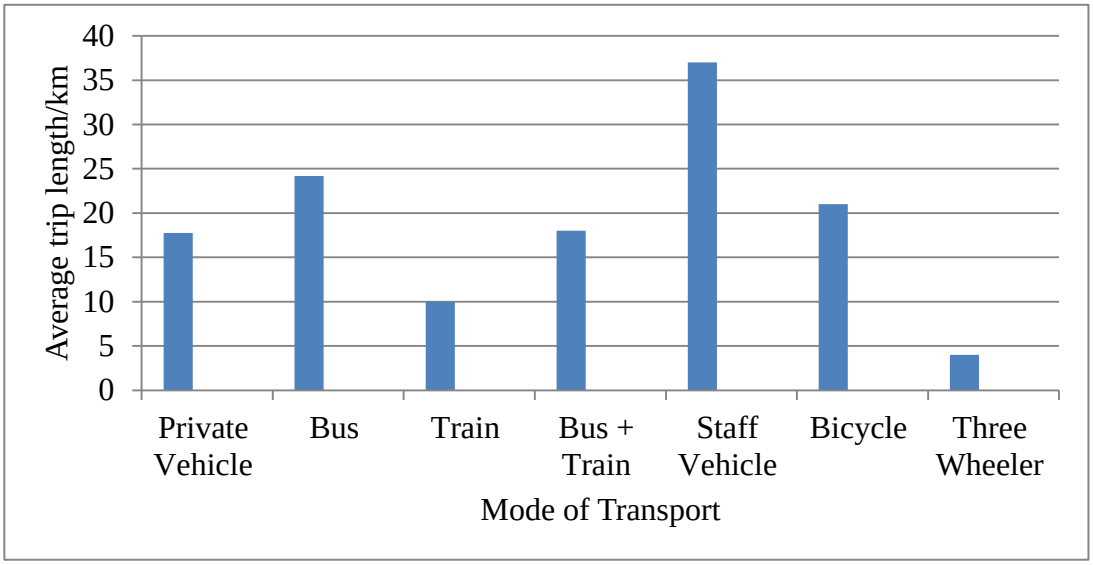

Figure 4.5: Variation of average trip length with transport mode

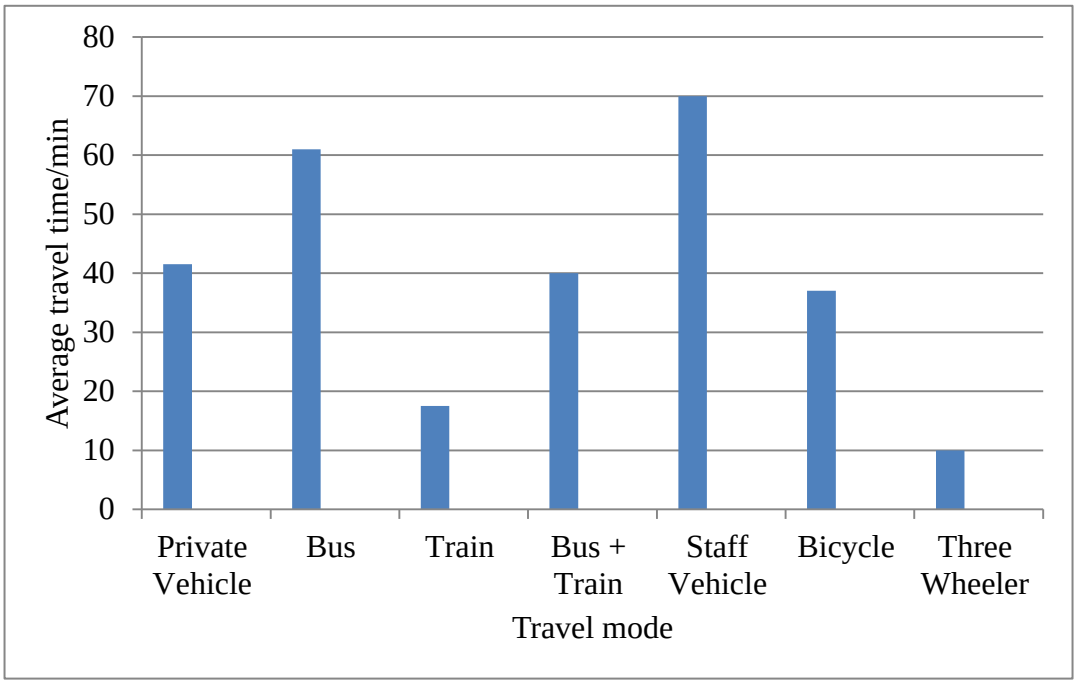

Figure 4.6: Variation of average travel time with transport mode

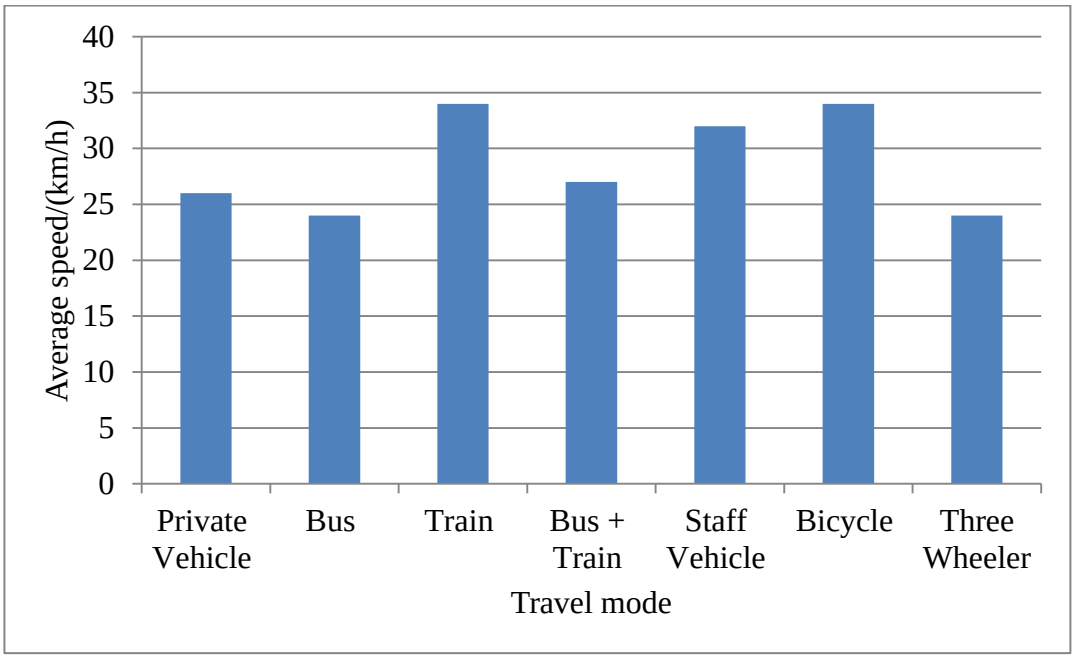

Figure 4.7: Variation of average speed with transport mode

It is required to identify, how the acceptance of proposed park and ride system vary with the average travel distance and the average travel time. Analyzed results show the highest percentage of responders (88%) accepted proposed park and ride system when the travel distance between 30 and 40km. More than 85% of the responders accepted proposed park and ride system when their travel time is greater than 45min. Tables 4.9, 4.10, and figures 4.8, 4.9 show the acceptance of proposed park and ride system with average travel distance and average travel time.

Table 4.9: Variation of average travel distance with acceptance of proposed Park and Ride system

Travel distance/km	**Number of responders**	**Park and ride accept**	**Percentage accept**
Distance ≤ 10	63	36	57%
10< Distance ≤20	49	36	73%
20< Distance ≤30	19	15	79%
30< Distance ≤40	8	7	88%
Distance > 40	13	9	69%

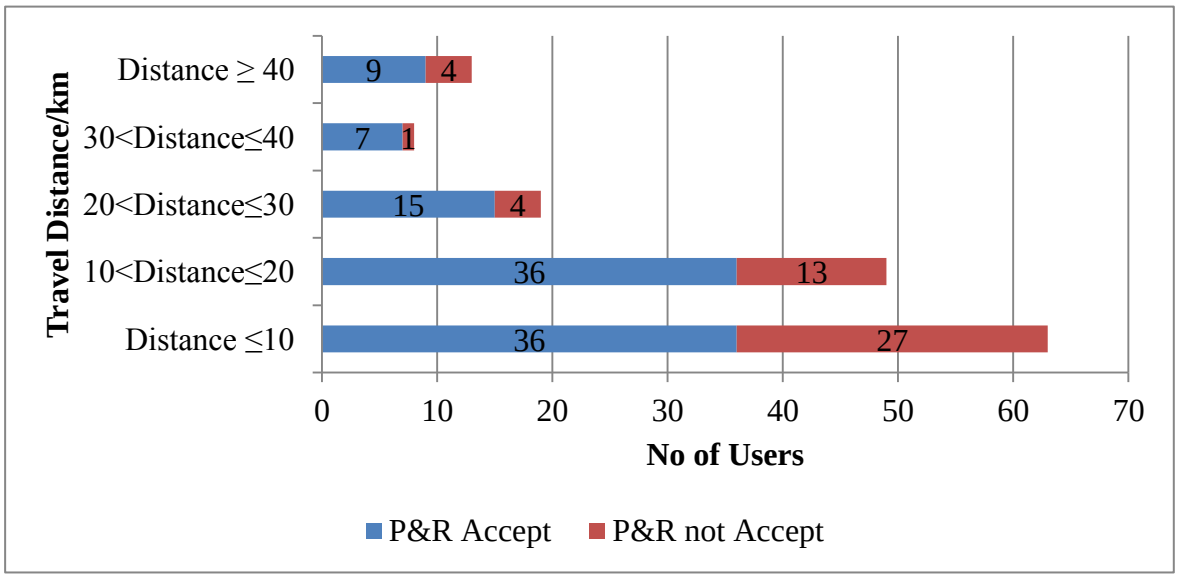

Figure 4.8: Variation of average travel distance with acceptance of proposed P&R system

Advance statistical test was conducted using SPSS software to determine the relationship between the average travel distance and the acceptability of proposed park and ride system. Following hypothesis was tested by Chi-Square Test using significant level 0.05 (5%).

Test hypothesis is;

Ho: average travel distance and park and ride acceptability are independent.

Ha: average travel distance and park and ride acceptability are not independent.

In this cases the assumption of Chi-Square Test is violated (i.e. expected count is less than 5 in more than 20% number of cells). Therefore, the hypothesis checked with the Fisher Exact Test. (See Annexure IV)

According to the outcome of SPSS analysis, the P-value (0.260) is higher than the significance level (0.05), therefore, null hypothesis can be accepted. It is concluded that average travel distance and park and ride acceptability are independent.

Table 4.10: Variation of average travel time with acceptance of proposed Park and Ride system

Travel time/min	**Number of responders**	**Park and ride accept**	**Percentage accept**
Travel time ≤ 15	15	6	40%
15< Travel time ≤ 30	56	35	63%
30< Travel time ≤ 45	40	26	65%
45< Travel time ≤ 60	18	16	89%
60< Travel time ≤ 90	14	12	86%
Travel time > 90	9	8	89%

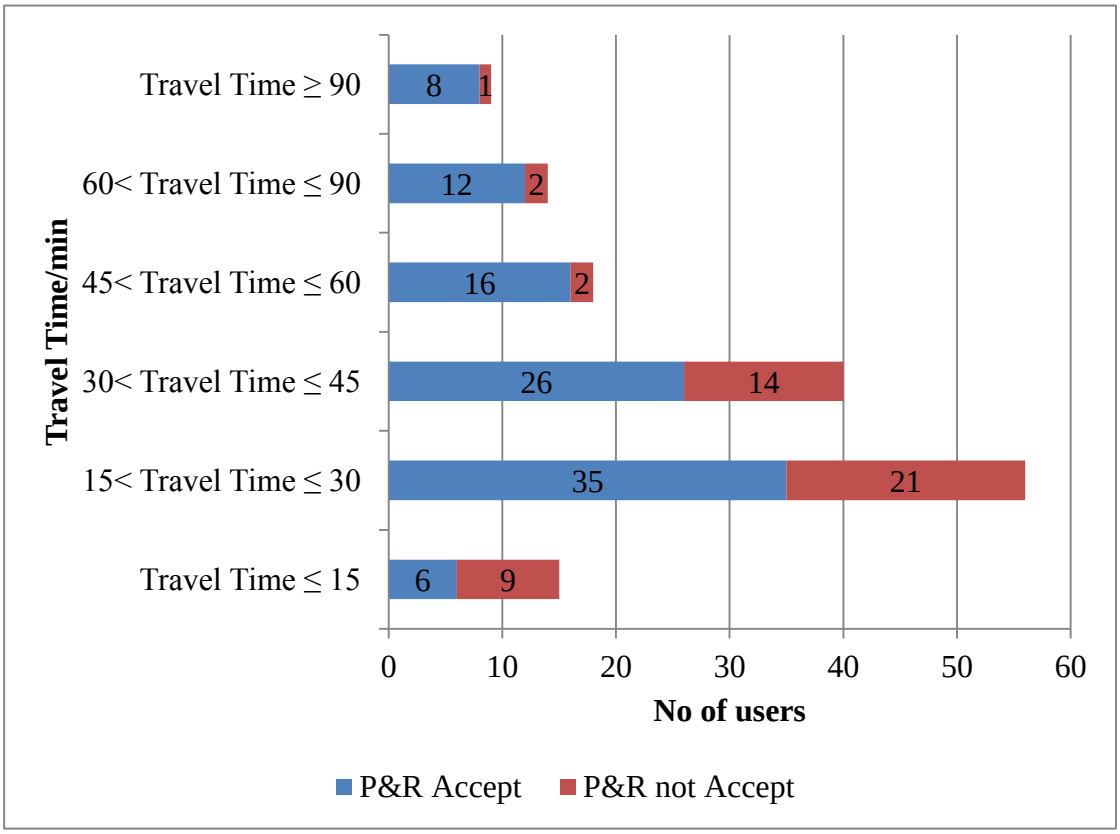

Figure 4.9: Variation of average travel time with acceptance of proposed park and ride system

Advance statistical test was conducted by using SPSS software to determine the relationship between the average travel time and the acceptance of the proposed park and ride system. Following hypothesis was tested by Chi-Square Test using significant level 0.05 (5%).

Test hypothesis is;

Ho: average travel time and park and ride acceptability are independent.

Ha: average travel time and park and ride acceptability are not independent.

In this cases the assumption of Chi-Square Test is violated (i.e. expected count is less than 5 in more than 20% number of cells). Therefore the hypothesis checked with the Fisher Exact Test. (See Annexure V)

According to the outcome of SPSS analysis, the P-value (0.019) is lesser than the significance level (0.05), therefore null hypothesis cannot be accepted. It is concluded that there is a relationship between traveler's average travel time and acceptability of the proposed park and ride system.

4.2.6 Analysis of Average walking distance

Average walking distance of responders is another the main factor for that can have influence on accept or reject of park and ride system. This is because people have to walk from the point of egress from public transport to their destination in park and ride system. Preferred walking distance of responders is an essential input to decide bus stops and railway halts. In this survey, responders' current walking distance from the point of egress from public transport to their final destination was recorded for both current public transport users and private vehicle users assuming they use public transport. In addition, acceptance of proposed park and ride system with average walking distance was analyzed for private vehicle users. Analysis results showed that most of the responders' average walking distance was between 100 – 500m. Percentage acceptance of proposed park and ride system was greater than 60% when the average walking distance less than 500m.

Table 4.11: Average walking distance of public vehicle users and private vehicle users

Avg. walking distance from point of egress public transport to destination/m	Private vehicle user	Public vehicle user
0 - 100	28	8
100 -500	65	23
500 – 1000	17	6
Greater than 1000	4	1

Table 4.12: Average walking distance with acceptance of proposed Park and Ride system for private vehicle users

Avg. walking distance from point of egress public transport to destination/m	Private vehicle user	Park and ride accept	Percentage accept
0 - 100	28	17	61%
100 -500	65	41	63%
500 – 1000	17	8	47%
Greater than 1000	4	0	0%

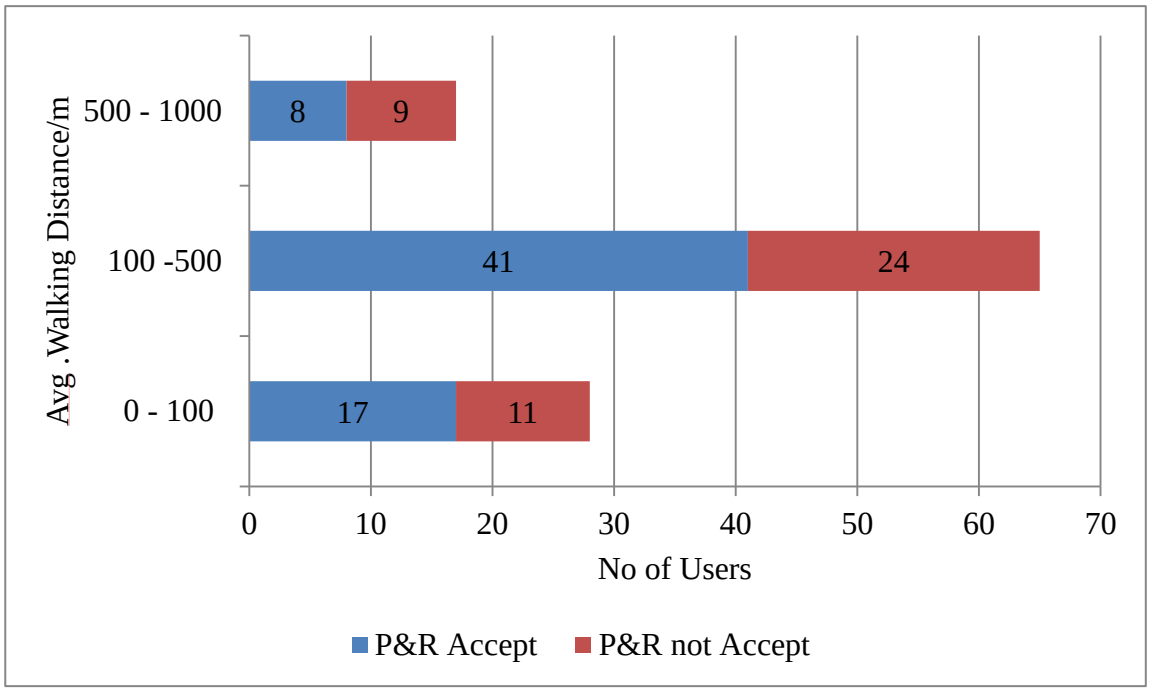

Figure 4.10: Variation of average walking distance with acceptance of proposed park and ride system for private vehicle users

Advance statistical test was conducted by using SPSS software to determine the relationship between the average walking distance from point of egress public transport mode to destination and the acceptability of proposed Park and Ride system. Following hypothesis was tested by Chi-Square Test using significant level 0.05 (5%).

Test hypothesis is;

Ho: average walking distance from point of egress public transport mode to destination and park and ride acceptability are independent.

Ha: average walking distance from point of egress public transport mode to destination and park and ride acceptability are not independent.

In this cases the assumption of Chi-Square Test is violated (i.e. expected count is less than 5 in more than 20% number of cells). Therefore, the hypothesis checked with the Fisher Exact test. (See Annexure VI)

According to the outcome of SPSS analysis, the P-value (0.070) is higher than the significance level (0.05), therefore, null hypothesis can be accepted. It is concluded that average walking distance from point of egress from public transport mode to final destination and park and ride acceptability are independent.

4.2.7 Analysis of expected waiting time

Expected waiting time on an average journey is another main factor that can have influence to accept or reject the park and ride system. It expected that waiting time of the responders' will be helpful for designing frequency of proposed public transport system. Table 4.13, 4.14 and Figure 4.11 show the survey and analyzed results.

Table 4.13: Expected waiting time of private vehicle users and public vehicle users

Expected waiting time on an average journey/min	Private vehicle user	Public vehicle user
0 - 5	114	38
5 - 10	86	30
10 - 15	21	7
15 - 20	4	1

Table 4.14: Expected waiting time with acceptance of proposed park and ride system for private vehicle users

Expected waiting time on an average Journey/min	Private vehicle user	Park and ride accept	Percentage accept
0 - 5	114	66	58%
5 - 10	86	59	69%
10 - 15	21	17	81%
15 - 20	4	3	75%

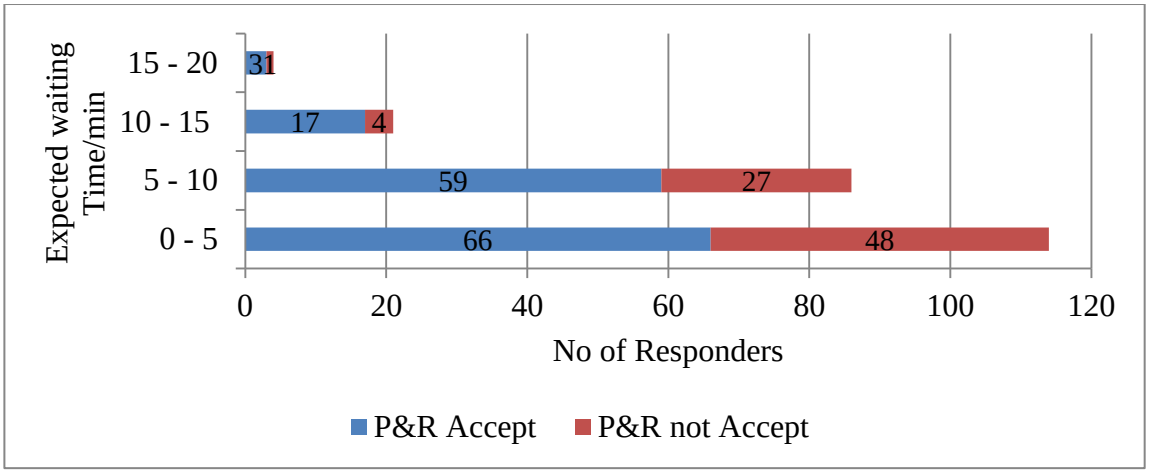

Figure 4.11: Variation of expected waiting time with acceptance of proposed park and ride system for private vehicle users

Advance statistical test was conducted by using SPSS software to determine the relationship between the expected waiting time on an average journey and the possible acceptability of proposed Park and Ride system for the private vehicle users. Following hypothesis was tested by Chi-Square Test using significant level 0.05 (5%).

Test Hypothesis is;

Ho: Expected waiting time on average journey and park and ride acceptability are independent.

Ha: Expected waiting time on average journey and park and ride acceptability are not independent.

In this cases the assumption of Chi-square test is satisfied (expected count is less than 5 in less than 20% number of cells). Therefore, the hypothesis checked with the Chi-squared test. (See Annexure VII)

According to the outcome of SPSS, the P-value (0.312) is higher than the significance level (0.05), hence null hypothesis can accept. Therefore, it is conclude that expected waiting time on average journey and Park and Ride acceptability are independent.

4.2.8 Overview of user characteristics and park and ride preference

Acceptability of proposed park and ride system was analyzed with main attributes such as present transport mode, monthly income level, average travel distance, average travel time, average walking distance from point of egress from public transport to destination and expected waiting time on average journey. According to outcome of the analyzed results, present transport mode, monthly income level and average travel time are the key attributes for accepting proposed park and ride system. These attributes have relationship with acceptability of proposed park and ride system. Users believe that they need to complete their journey with minimum travel time. Travel distance is not much concern attribute. It means that users are prefer to select paths which have lesser travel time but it may takes longer travel distance rather use higher travel time which has shorter travel distance. Also users are not concern about cost but they concern about time. When responder's monthly income level increases, acceptability of proposed park

and ride system is low. Because private vehicle own by people who has higher income level, prefer to use their own vehicle rather than use public transportation. They are believed that they can achieve convenience and comfortable journey with their private/own vehicle.

Average travel distance, average walking distance from point of egress from public transport to destination and expected waiting time for average journey are independent attributes with acceptability of proposed park and ride system. According to literatures, comfortable walking distance was around 0.25 miles. In this study confirm that when average walking distance from point of egress from public transport to destination between 100 – 500 m, users are accept proposed park and ride system. The target group of users for proposed park and ride system bounded to this distance not exceed 500m. Also users believe that they would prefer minimum expected waiting time for taking public transport to complete their journey. Therefore, it is better to arrange frequency of public transportation accordingly.

4.2.9 Analysis of ability to use railway

At the moment single railway line travels between Gatambe and Katugasthota. Therefore, responders who accessing proposed Park and Ride system from Getambe and Katugasthota, can use railway as the public transport mode complete their journey. Therefore, a potential ability to use the railway between Getambe and Katugasthota is assessed. Below table 4.15 given the summary of results related to ability to use railway between Getambe and Katugasthota.

Table 4.15: Ability to use railway between Getambe and Katugasthota

Mode	Can use	P&R accept	% accept	Can't use	P&R accept	% accept	Can use but not preferred	P&R accept	% accept
Private transport	43	39	91%	37	21	57%	34	6	18%
Public transport	22	22	100%	13	12	92%	3	3	100%

Results show that almost all public transport users were accepted proposed park and ride system. 91 % of the private vehicle users were preferred to use railway as their public transport mode which is part of proposed park and ride system. Further, Results shows that 36% of responders are not preferred to use railway although they have access to use the railway. Therefore, it was necessary to identify the reasons why people not prefer to use railway. In this section, factors which are important for the better railway service was identified with their level of importance.

4.3 Analysis of users' perspective on present transport mode

Satisfactory level of present transport mode was evaluated for both private vehicle users and public vehicle users independently. Satisfactory level of travel time, level of safety, comfortability, economy of travel mode, condition of walkways, condition of bus terminals and stops, and railway station and halts were evaluated. For the analysis, following weightages were assigned for values used marked their level of importance.

Table 4.16: Weightage use for analysis

Level of Satisfaction	Weightage
0- Extremely Dissatisfied	1
1- Very Dissatisfied	2
2- Somewhat Dissatisfied	3
3- Somewhat Satisfied	4
4- Very Satisfied	5
5- Extremely Satisfied	6

Table 4.17 Quality of service of present transport mode (public transport users)

Variable	No of responders					
	Level of satisfaction					
	0	1	2	3	4	5
Travel time	17	12	6	0	3	0
Level of safety	6	16	9	4	3	0
Comfortability	13	18	7	0	0	0
Economy of travel mode	0	1	9	16	12	0
Operational frequency of travel mode	2	4	13	14	5	0
Condition of pedestrian walkaways	9	16	9	2	2	0
Condition of bus terminals and stops and railway station and halts	8	15	9	6	0	0

Table 4.18 Weighted values for quality of service of present transport mode (public transport users)

Variable	Weighted values							Weighted Average	Out of 100
	Level of satisfaction						Total Weightage		
	0	1	2	3	4	5			
Travel time	17	24	18	0	15	0	74	1.95	11
Level of safety	6	32	27	16	15	0	96	2.53	14
Comfortability	13	36	21	0	0	0	70	1.84	10
Economy of travel mode	0	2	27	64	60	0	153	4.03	22
Operational frequency of travel mode	2	8	39	56	25	0	130	3.42	18
Condition of pedestrian walkaways	9	32	27	8	10	0	86	2.26	12
Condition of bus terminals and stops and railway station and halts	8	30	27	24	0	0	89	2.34	13

Satisfactory level of present transport mode was evaluated from public vehicle users and private vehicle users separately. Above tables 4.16, 4.17 and 4.18 illustrate data and results related to satisfactory level of present transport mode of public vehicle users. Average weightages were used to find out the most dissatisfied and the most satisfied variable of the public transport users which was their present transport mode. Further these weighted average values were simplified to percentage values. According to the analyzed results, comfortability (10%) was the most dissatisfied variable among the public transport users. Also they were not satisfied with their travel time (11%). On the other hand, economy of public transport (22%) was the most satisfied variable among the public transport users. Also they were satisfied with operational frequency (18%) of their travel mode. Identification of dissatisfied particulars will be essential to provide

better park and ride system which is part of the journey complete through public transportation. They are the potential group of users who will shift to private vehicles due to unhappy with their present travel mode (public transportation). Therefore it is required to improve public transportation to attract more users and success proposed park and ride system.

Table 4.19 Quality of service of present transport mode (private transport users)

Variable	No of responders					
	Level of satisfaction					
	0	1	2	3	4	5
Travel time	30	32	26	16	4	0
Level of safety	4	2	18	35	39	10
Comfortability	0	1	3	16	44	44
Economy of travel mode	0	9	33	60	6	0
Condition of pedestrian walkaways	33	31	33	10	1	0
Condition of bus terminals and stops and railway station and halts	25	31	40	8	4	0

Table 4.20 Weighted values for quality of service of present transport mode (private transport users)

Variable	Weighted values							Weighted Average	Out of 100
	Level of satisfaction						Total Weightage		
	0	1	2	3	4	5			
Travel time	30	64	78	64	20	0	256	2.37	12
Level of safety	4	4	48	140	195	60	457	4.23	21
Comfortability	0	2	9	64	220	264	559	5.18	26
Economy of travel mode	0	18	99	240	30	0	387	3.58	18
Condition of pedestrian walkaways	33	62	99	40	5	0	239	2.21	11
Condition of bus terminals and stops and railway station and halts	25	62	120	32	20	0	259	2.40	12

Satisfactory level of present transport mode was evaluated from public vehicle users and private vehicle users separately. Above tables 4.16, 4.19 and 4.20 illustrate data and results related to satisfactory level of present transport mode of private vehicle users. Average weightages were used to find out the most dissatisfied and the most satisfied variable of the private transport users which were their present transport mode. Further these weighted average values were simplified to percentage values. Analyzed results show that, condition of pedestrian walkways (11%) was the most dissatisfied variable among the private vehicle users. Also private vehicle users were not satisfied with condition of bus terminal, bus halts/stops, railway station and stops (12%) and travel time of their journey. On the other hand, comfortability (26%) was the most satisfied variable among the private vehicle users. Also they satisfied with level of safety (21%)

of their travel from their private vehicle. Therefore it is required to improve infrastructure facilities related to public transportation including bus terminals, bus halts/stops, railway station and halts and pedestrian walkways to attract more private vehicle users to success of proposed park and ride system.

4.4 Analysis of user expectation on proposed P&R scheme

It is necessary to improve public transport system within the park and ride stations to attract more users. Therefore, factors which have effect on better transportation system using public buses and railway were evaluated separately with their respective level of importance. For the analysis, following weightages were assigned for different level of importance.

Table 4.21: Weightage use for analysis

Level of Importance	Weightage
0- Not at all Important	1
1- Slightly Important	2
2- Moderately Important	3
3- Important	4
4- Very Important	5
5- Extremely Important	6

Table 4.22 User perception over the facilities proposed P&R system (public bus transportation)

Variable	No of responders					
	Level of Importance					
	0	1	2	3	4	5
Reliability of the proposed public transport system within the city	0	2	3	2	43	96
Availability of parking lots at the parking areas in the terminals	2	1	2	10	37	94
Security of the parked vehicle	2	1	1	10	28	104
Comfortability of the proposed public transport system.	0	2	1	3	26	114
Frequency of proposed public transport system within the city	0	1	0	5	26	114
Introduce lower parking charges and attractive parking charging system at the terminals	1	3	5	21	45	71
Increase the parking charges in the city	1	4	14	32	38	57

Table 4.23 Weighted values for user perception over the facilities proposed P&R system (public bus transportation)

Variable	Weighted values							Weighted Average	Out of 100
	Level of Importance						Total Weightage		
	0	1	2	3	4	5			
Reliability of the proposed public transport system within the city	0	4	9	8	215	576	812	5.56	14.6
Availability of parking lots at the parking areas in the terminals	1	2	6	40	185	564	799	5.47	14.4
Security of the parked vehicle	0	2	3	40	140	624	811	5.55	14.6
Comfortability of the proposed public transport system	0	4	3	12	130	684	833	5.70	15.0
Frequency of proposed public transport system within the city.	0	2	0	20	130	684	836	5.73	15.0
Introduce lower parking charges and attractive parking charging system at the terminals	1	6	15	84	225	426	757	5.18	13.6
Increase the parking charges in the city	0	8	42	128	190	342	711	4.87	12.8

User expectation on proposed park and ride scheme was evaluated for public bus transportation and railway transportation separately. Above tables 4.21, 4.22 and 4.23 illustrates data and results related to user expectation on park and ride scheme related to public bus transportation. Weighted average was used to identify the most important variable for better public bus transportation. Further it was simplified to percentage values. According to the analyzed results, comfortability of proposed public transportation (15%) and operational frequency of public bus transportation (15%) of the proposed park and ride system were the most expecting variable among the users related to public bus transportation. It means that private vehicle users will be shifted to new park and ride scheme, if new system has same comfortability level which is having their private vehicle. Also they need to higher operational frequency of bus transport to avoid delays in waiting for public buses after parking their private vehicle at the terminal. Additional bus lanes, given priority measures for buses at the junctions will be added advantage for attractiveness of propose park and ride system. Also it was noted that other variables also have higher importance. Propose park and ride scheme must address mainly on the comfortability and the operational frequency of public bus transportation. Further it should be considered other variables related to better public bus transportation while improving public bus transportation.

Table 4.24 User perception over the facilities proposed P&R system (Railway transportation)

Variable	No of responders					
	Level of Importance					
	0	1	2	3	4	5
Increase number of frequency of travel between Gatambe and Katugasthota	0	1	2	1	51	91
Increase the number of stops between Gatambe and Katugastota	0	3	8	33	65	37
Increase the comfortability of the trains	0	0	3	4	28	111
Develop the stations and stops up to proper standards with new technology	0	2	13	50	43	38

Table 4.25 Weighted values for user perception over the facilities proposed P&R system (Railway transportation)

Variable	Weighted Values							Weighted Average	Out of 100
	Level of Importance						Total Weightage		
	0	1	2	3	4	5			
Increase number of frequency of travel between Gatambe and Katugasthota	0	2	6	4	255	546	813	5.57	26.8
Increase the number of halts between Gatambe and Katugastota	1	6	24	132	325	222	709	4.86	23.3
Increase the comfortability of the trains	0	0	9	16	140	666	831	5.69	27.3
Develop the stations and halts up to proper standards with new technology	0	4	39	200	215	228	686	4.70	22.6

User expectation on proposed park and ride scheme was evaluated for public bus transportation and railway transportation separately. Above tables 4.21, 4.24 and 4.25 illustrates data and results related to user expectation on park and ride scheme related to railway transportation. Weighted average was used to identify the most important variable for better railway transportation. Further it was simplified to percentage values. According to the analyzed results, comfortability of proposed railway transportation (27.3%) was the most expecting variable among the users related to railway

transportation. Also increasing number of travel frequency between Getambe and Katugasthota (26.8%) has next higher importance variable among other variables related to better railway transportation. As same as public bus transportation, users are expecting comfortable travel with higher operational frequency. This would be similar situation for them to compare with their own vehicle. Developing the stations and halts/stops to proper standards with new technology and increasing more halts between Getambe and Katugasthota will be added advantage for attract more users to railway.

4.4 Acceptability of the Park and Ride system after all development made

Final question of the questionnaire was that weather you accept or reject proposed park and ride system after the all the developments were made. According to the analyzed results, 68% of the responders are accepted to proposed park and ride system. Also 32% of the responders are opposed to proposed park and system. Below figure 4.12 shows that the graphical way of acceptability of proposed park and ride system.

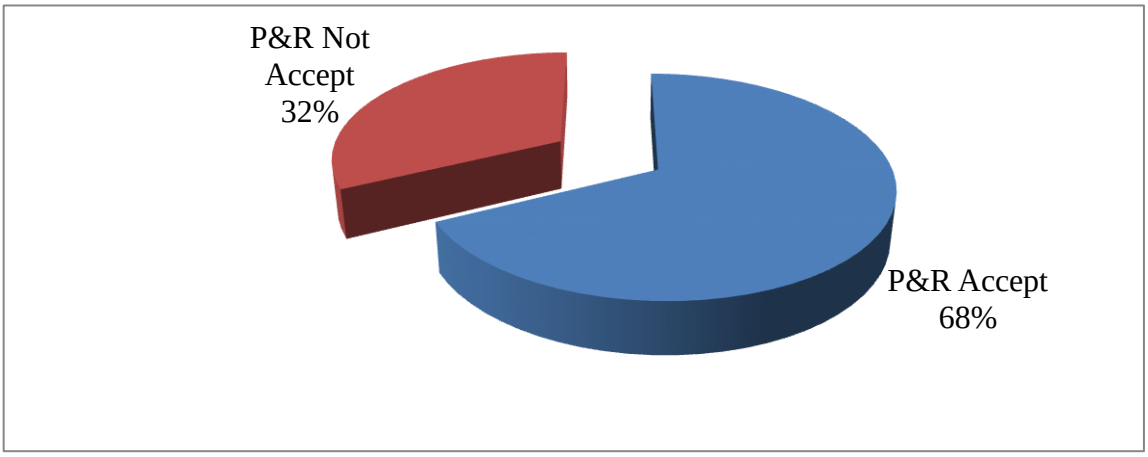

Figure 4.12: Acceptability of proposed Park and Ride system after all development

Some of responders are explained the reasons to reject the proposed park and ride system. Responders who were opposed to proposed park and ride system, mention that their main concern about the condition, reliability and travel frequency of the proposed

park and ride system. Simply, they are doubtful about the proposed public transportation, weather this will be happen after the park and ride operation is going on. Further, responders believe that, current condition of roads/accesses and public transportation in outside the city area is not ideal situation to success of proposed park and ride system. Therefore, it is required to consider to the whole study area, when developing infrastructure facilities related to proposed park and ride system. Other main reasons were to opposing proposed park and ride system were privacy, security, and personal reasons such as dropping children to schools, attending to work at emergency time/night times, health problems, having permission to use office vehicle …etc.

5 CONCLUSIONS

At the present, vehicle ownership is increasing at rapid rate nearly over 8% p.a. over the past decade. This will results increasing number of private vehicles entering in to CBD and shifting from using public transport modes to use of private vehicles causing highly congested roads and reduction of mobility. One of strategic plan proposed by the Kandy Transport Improvement Program (KTIP) in 2014 was that to construct three satellite stations at Getambe, Katugasthota and Thennekumbura with multi modal station at Goodshed. In addition to that, it proposes to implement park and ride system between these three nodes. (i.e. Getambe, Katugasthota and Thennekumbura). These developments are significantly expensive and cause financial burden to country. Therefore, before implementing these kinds of projects, proper studies necessary to identify key attributes to success of these projects. Typically park and ride system is a useful technique to reduce traffic congestion but it should be carefully designed for better results otherwise it would not be successful.

Identification of user perspective on their present transport mode, user expectation on proposed park and ride system and identification of key attributes related to user characteristics as well as operational characteristics for better park and ride system were the main objectives of this study.

Analyzed data related to user perception on their present transport mode shows that comfortability was the most dissatisfied variable among the public transport users and economy of their travel mode was the most satisfied variable among them. On the other hand, comfortability of their travel mode was the most satisfied variable among the private vehicle users. Condition of pedestrian walkways was the most dissatisfied variable among the private vehicle users. Furthermore, both public transport users and private vehicle users are not satisfied with current travel time of their journey.

Acceptability of proposed park and ride system was analyzed with main attributes such as present transport mode, monthly income level, average travel distance, average travel time, average walking distance from point of egress from public transport to destination

and expected waiting time on average journey. According to outcome of the analyzed results, present transport mode, monthly income level and average travel time are the key attributes for accepting proposed park and ride system. These attributes have relationship with acceptability of proposed park and ride system. Users believe that they need to complete their journey with minimum travel time. Travel distance is not much concern attribute. It means that users are prefer to select paths which have lesser travel time but it may takes longer travel distance rather use higher travel time which has shorter travel distance. Also users are not concern about cost but they concern about time. When responder's monthly income level increases, acceptability of proposed park and ride system is low. Because private vehicle own by people who has higher income level, prefer to use their own vehicle rather than use public transportation. They are believed that they can achieve convenience and comfortable journey with their private/own vehicle.

Analyzed data related to user expectation on proposed park and ride system shows that increasing comfortability of proposed public bus transportation and railway transportation was the most important attribute to success to proposed park and ride system. Also users are expecting higher operational frequency of public bus transportation and railway transportation.

This study has been carried out based on traffic data and data collected from the users who are current destination at Kandy city. It would be better to have broadly expanded survey to collect more data and other required information for expand the analysis and sharpen the results. Further studies are necessary to identify and calculate capacities and other facilities at terminals which are proposed at Getambe, Katugasthota and Thennekumbura will be necessary for attract more park and ride users. Also it is essential to identify and provide priority measures to public transportation where park and ride service is going on. Specially priorities provide by the junctions, exclusive bus lanes need to be designed by further studying of the traffic movement.

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Applicability and Effectiveness of the Park and Ride System in Kandy City.

* Required

1. **Your Current Residency ? ***
   Eg: Gampola,Matale,Kundasale

2. **You are Currently ***
   Mark only one oval.

   - ◯ Government Employed
   - ◯ Private Employed
   - ◯ Retired
   - ◯ Higher Studies
   - ◯ Schooling
   - ◯ Other: _____

3. **Your monthly Income** *

Mark only one oval.

- Less than Rs.50,000
- Rs.50,000 - Rs.75,000
- Rs.75,000 - Rs.100,000
- Rs.100,000 - Rs.150,000
- Above Rs.150,000

4. **Nearest City or Suburb (GN Division) to your destination ? ***

Mark only one oval.

- Kandy
- Buwelikada
- Thalwatte
- Lewella
- Aruppola West
- Aruppola East
- Niththawela
- Siyabalagasthenna
- Mawilmada
- Watapuluwa
- Watapuluwa West
- Watapuluwa south
- Mahaweli Uyana
- Dodanwela
- Aniwatte West
- Aniwatte East
- Asgiriya
- Bahirawakanda
- Mapanawathura
- Wattaranthenna
- Mahaiyawa
- Poornawatta West
- Poornawatta East
- Heerassagala
- Mulgampola
- Udabowala
- Bowala
- Ogastawatta
- Bowalawatta
- Palleperadeniya
- Udaperadeniya
- Pitakandagama
- Senkadagala
- Ampitiya North
- Ampitiya South
- Malwatta
- Katukelle

- ◯ Katukelle West
- ◯ Katukele Up
- ◯ Gatambe
- ◯ Welata
- ◯ Deiyannewela
- ◯ Nagastenna
- ◯ Hanthana
- ◯ Boganbara
- ◯ Suduhunpala East
- ◯ Suduhumpala West
- ◯ Hindagala
- ◯ Mahakanda
- ◯ Ampitiya Udagama North
- ◯ Ampitiya Udagama South
- ◯ Ampitiya Pallegama
- ◯ Meddegama
- ◯ Ulpathakumbura
- ◯ Wawethenna
- ◯ Thennekumbura
- ◯ Gurudeniya East
- ◯ Gurudeniya Dambawela
- ◯ Gurudeniya West
- ◯ Maligathenna
- ◯ Lewla
- ◯ Katawala
- ◯ Pahala Iriyagama
- ◯ Godagandeniya

5. **Purpose of entering Kandy city ?**
Mark only one oval.

- ◯ Work or Official purpose
- ◯ School or Higher Studies
- ◯ Business
- ◯ Shopping or Leisure
- ◯ Residence
- ◯ Other: _____

6. **Distance from your current resident to your destination (km) ?** *

_____

7. **Mode of major transport which you use to enter Kandy city ?** *
Mark only one oval.

- ◯ Private Vehicle (Car/Van/Jeep/Cab)
- ◯ Bus
- ◯ Train
- ◯ Bus + Train
- ◯ Staff Vehicle
- ◯ Bicycle
- ◯ Three Wheeler

8. **Average Travel time (min) ?** *

_____

9. **If you use a private vehicle,Frequency of traveling to Kandy ?** *
Mark only one oval.

- ◯ Daily
- ◯ Every week day
- ◯ 2 - 4 days per week
- ◯ 10 - 20 days per month
- ◯ I don't use private vehicle

10. **Your ability to use railway between Gatambe and Katugasthota** *
Mark only one oval.

- ◯ Can Use
- ◯ Can't Use
- ◯ Can use but I'm not preffered to use

Satisfaction level of your present transport mode

11. **Current Travel time of present journey** *
Mark only one oval.

	0	1	2	3	4	5	
Not Satisfied	◯	◯	◯	◯	◯	◯	Highly Satisfied

12. **Current level of Safety of your present journey** *
Mark only one oval.

	0	1	2	3	4	5	
Not Satisfied	◯	◯	◯	◯	◯	◯	Highly Satisfied

13. **Comfortability of your present transport mode** *
Mark only one oval.

	0	1	2	3	4	5	
Not Satisfied	◯	◯	◯	◯	◯	◯	Highly Satisfied

14. **Reliability of your present transport mode** *
Mark only one oval.

	0	1	2	3	4	5	
Not Satisfied	◯	◯	◯	◯	◯	◯	Highly Satisfied

15. **Economy of your present travel mode** *
Mark only one oval.

	1	2	3	4	5	
Not Satisfied	◯	◯	◯	◯	◯	Highly Satisfied

16. **Operational frequency of your present travel mode** *
Mark only one oval.

	0	1	2	3	4	5	
Not Satisfied	◯	◯	◯	◯	◯	◯	Highly Satisfied

17. **Satisfactory level of Pedestrian walkways** *
Mark only one oval.

	0	1	2	3	4	5	
Not Satisfied	◯	◯	◯	◯	◯	◯	Highly Satisfied

18. **Satisfactory level of Bus Stands,Bus Halts, Railway Stations and Halts/Stops** *
Mark only one oval.

	0	1	2	3	4	5	
Not Satisfied	◯	◯	◯	◯	◯	◯	Highly Satisfied

19. **Other ...(Please specify and mark it's level of satisfaction)**

20. *Mark only one oval.*

	0	1	2	3	4	5	
Not Satisfied	◯	◯	◯	◯	◯	◯	Highly Satisfied

How far the following improvements will help for better "Park and Ride" system ?

21. **Reliability of the proposed public transport system within the city** *
Mark only one oval.

	0	1	2	3	4	5	
Not Important	◯	◯	◯	◯	◯	◯	Very Important

22. **Availability of parking lots at the parking areas in the Terminals (Gatambe,Thennekumbura & Katugasthota)** *
Mark only one oval.

	0	1	2	3	4	5	
Not Important	◯	◯	◯	◯	◯	◯	Very Important

23. **Security of the parked vehicle** *
Mark only one oval.

	0	1	2	3	4	5	
Not Important	◯	◯	◯	◯	◯	◯	Very Important

24. **Comfortability of the proposed public transport system** *
Mark only one oval.

	0	1	2	3	4	5	
Not Important	◯	◯	◯	◯	◯	◯	Very Important

25. **Frequency of proposed public transport system within the city** *
Mark only one oval.

	0	1	2	3	4	5	
Not Important	◯	◯	◯	◯	◯	◯	Very Important

26. **Introduce lower parking charges and attractive parking charging system at the Terminals** *
Mark only one oval.

	0	1	2	3	4	5	
Not Important	◯	◯	◯	◯	◯	◯	Very Important

27. **Increase the parking charges within the City** *
Mark only one oval.

	0	1	2	3	4	5	
Not Important	◯	◯	◯	◯	◯	◯	Very Important

28. **Other... (Please specify and mark it's level of importance)**

29. *Mark only one oval.*

	0	1	2	3	4	5	
Not Important	◯	◯	◯	◯	◯	◯	Very Important

How far the following improvements will help for attractiveness of railway between Gatambe and Katugasthota

30. **Increase the number of frequency of travel between Gatambe and Katugasthota** *
Mark only one oval.

	0	1	2	3	4	5	
Not Important	◯	◯	◯	◯	◯	◯	Very Important

31. **Increase the number of halts/stops between Gatambe and Katugasthota** *
Mark only one oval.

	0	1	2	3	4	5	
Not Important	◯	◯	◯	◯	◯	◯	Very Important

32. **Increase the Comfortability of Trains** *
Mark only one oval.

	0	1	2	3	4	5	
Not Important	◯	◯	◯	◯	◯	◯	Very Important

33. **Develop the stations and halts/stops up to proper standards with new technology. (Wi-fi,Traveler information system,Advance bookings parking lots and tickets)** *
Mark only one oval.

	0	1	2	3	4	5	
Not Important	◯	◯	◯	◯	◯	◯	Very Important

34. **Other... (Please specify and mark it's level of importance)**

_____

35. *Mark only one oval.*

	0	1	2	3	4	5	
Not Important	◯	◯	◯	◯	◯	◯	Very Important

36. **If you are willing to use proposed public transport,Your expected waiting time on average journey (min)** *
Mark only one oval.

- ◯ 0-5
- ◯ 5-10
- ◯ 10-15
- ◯ 15-20

37. **Average walking distance from the point of egress from public transport mode to your destination** *

Mark only one oval.

- 0 - 100 m
- 100 m - 500 m
- 500 m - 1000 m
- above 1000 m

38. **Currently, If you are a private vehicle user, Your comfortable walking distance to change your traveling mode to public transport** *

Mark only one oval.

- 0 - 300 m
- 300 m - 500 m
- 500 m - 750 m
- above 750 m
- I use public vehicle

39. **After all developments made, Do you wish to use public transport ?** *

Mark only one oval.

- Yes
- No

40. **If No, Please specify the reasons ?**

ANNEXURE II: ANALYZED RESULTS OF PRESENT TRANSPORT AND ACCEPTABILITY OF PROPOSED P&R SYSTEM

```
CROSSTABS
  /TABLES=Mode BY Acceptance
  /FORMAT=AVALUE TABLES
  /STATISTICS=CHISQ
  /CELLS=COUNT EXPECTED
  /COUNT ROUND CELL
  /METHOD=EXACT TIMER(5).
```

Crosstabs

Notes

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	Cases Used	Statistics for each table are based on all the cases with valid data in the specified range(s) for all variables in each table.
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[DataSet1] J:\P&R\Report-2017\Analysis 1.sav

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Travel Mode * Acceptability of P&R	152	100.0%	0	0.0%	152	100.0%

Travel Mode * Acceptability of P&R Crosstabulation

			Acceptability of P&R		Total
			Yes	No	
Travel Mode	Private vehicle (Car/Van/Cab/Jeep)	Count	60	43	103
		Expected Count	69.8	33.2	103.0
	Bus	Count	34	1	35
		Expected Count	23.7	11.3	35.0
	Train	Count	2	0	2
		Expected Count	1.4	.6	2.0
	Bus + Train	Count	1	0	1
		Expected Count	.7	.3	1.0
	Staff Vehicle	Count	2	3	5
		Expected Count	3.4	1.6	5.0
	Bicycle	Count	4	1	5
		Expected Count	3.4	1.6	5.0
	Three Wheeler	Count	0	1	1
		Expected Count	.7	.3	1.0
Total		Count	103	49	152
		Expected Count	103.0	49.0	152.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	23.731[a]	6	.001	.000	
Likelihood Ratio	30.322	6	.000	.000	
Fisher's Exact Test	26.944			.000	
Linear-by-Linear Association	.689[b]	1	.407	.451	.230
N of Valid Cases	152				

Chi-Square Tests

	Point Probability
Pearson Chi-Square	
Likelihood Ratio	
Fisher's Exact Test	
Linear-by-Linear Association	.042[b]
N of Valid Cases	

a. 10 cells (71.4%) have expected count less than 5. The minimum expected count is .32.

b. The standardized statistic is -.830.

Test Hypothesis is;

Ho: Present mode of transport and Park and Ride acceptability are independent.

Ha: Present mode of transport and Park and Ride acceptability are not independent.

In this cases the assumption of Chi-square test is violated (expected count is less than 5 in more than 20% number of cells). Hence the hypothesis checked with the Fisher Exact test.

According to the outcome of SPSS, the P-value (0.000) is lesser than the significance level (0.05), hence null hypothesis cannot accept. Therefore, it is conclude that there is relationship between traveler's present mode of transport and acceptability of the proposed Park and Ride system.

ANNEXURE III: ANALYZED RESULTS OF MONTHLY INCOME LEVEL AND ACCEPTABILITY OF PROPOSED P&R SYSTEM

```
CROSSTABS
  /TABLES=Income BY Acceptance
  /FORMAT=AVALUE TABLES
  /STATISTICS=CHISQ
  /CELLS=COUNT EXPECTED
  /COUNT ROUND CELL
  /METHOD=EXACT TIMER(5).
```

Crosstabs

Notes

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Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics for each table are based on all the cases with valid data in the specified range(s) for all variables in each table.
Syntax		CROSSTABS /TABLES=Income BY Acceptance /FORMAT=AVALUE TABLES /STATISTICS=CHISQ /CELLS=COUNT EXPECTED /COUNT ROUND CELL /METHOD=EXACT TIMER(5).
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[DataSet1] J:\P&R\Report-2017\Analysis 1.sav

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Income * Acceptability of P&R	152	100.0%	0	0.0%	152	100.0%

Income * Acceptability of P&R Crosstabulation

			Acceptability of P&R		Total
			Yes	No	
Income	Less than Rs 50,000	Count	23	3	26
		Expected Count	17.6	8.4	26.0
	Rs 50,000 - Rs 75,000	Count	12	2	14
		Expected Count	9.5	4.5	14.0
	Rs 75,000 - Rs 100,000	Count	39	5	44
		Expected Count	29.8	14.2	44.0
	Rs 100,000 - Rs 150,000	Count	20	19	39
		Expected Count	26.4	12.6	39.0
	Above Rs 150,000	Count	9	20	29
		Expected Count	19.7	9.3	29.0
Total		Count	103	49	152
		Expected Count	103.0	49.0	152.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	38.698[a]	4	.000	.000	
Likelihood Ratio	39.907	4	.000	.000	
Fisher's Exact Test	38.112			.000	
Linear-by-Linear Association	28.675[b]	1	.000	.000	.000
N of Valid Cases	152				

Chi-Square Tests

	Point Probability
Pearson Chi-Square	
Likelihood Ratio	
Fisher's Exact Test	
Linear-by-Linear Association	.000[b]
N of Valid Cases	

a. 1 cells (10.0%) have expected count less than 5. The minimum expected count is 4.51.

b. The standardized statistic is 5.355.

Test Hypothesis is;

Ho: Monthly income level and Park and Ride acceptability are independent.

Ha: Monthly income level and Park and Ride acceptability are not independent.

In this cases the assumption of Chi-square test is satisfied (expected count is less than 5 in less than 20% number of cells). Therefore, the hypothesis checked with the Chi-squared test.

According to the outcome of SPSS, the P-value (0.000) is lesser than the significance level (0.05), hence null hypothesis cannot accept. Therefore, it is conclude that there is relationship between monthly income level and acceptability of the proposed Park and Ride system.

DATA

Monthly Income level	% Acceptance
Rs :25000	88
Rs :62500	86
Rs :87500	89
Rs :125000	51
Rs :150000	31

SUMMARY

Regression Statistics	
Multiple R	0.886662856
R Square	0.786171021
Adjusted R Square	0.714894694
Standard Error	14.17239175
Observations	5

ANOVA

	df	SS	MS	F	Significance F
Regression	1	2215.429936	2215.43	11.0299	0.045016091
Residual	3	602.5700637	200.8567		
Total	4	2818			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	111.7643312	14.35179625	7.78748	0.004406	66.09051024	157.43815	66.090510	157.438152
X Variable 1	-0.000475159	0.000143072	-3.32113	0.045016	-0.000930477	-1.984E-05	-0.0009304	-1.9842E-05

ANNEXURE IV: ANALYZED RESULTS OF AVERAGE TRAVEL DISTANCE AND ACCEPTABILITY OF PROPOSED P&R SYSTEM

```
CROSSTABS
  /TABLES=Distance BY Accept
  /FORMAT=AVALUE TABLES
  /STATISTICS=CHISQ
  /CELLS=COUNT EXPECTED ROW
  /COUNT ROUND CELL
  /METHOD=EXACT TIMER(5).
```

Crosstabs

Notes

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Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics for each table are based on all the cases with valid data in the specified range(s) for all variables in each table.
Syntax		CROSSTABS /TABLES=Distance BY Accept /FORMAT=AVALUE TABLES /STATISTICS=CHISQ /CELLS=COUNT EXPECTED ROW /COUNT ROUND CELL /METHOD=EXACT TIMER(5).
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[DataSet1] J:\P&R\Report-2017\Analysis 3.sav

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Travel Distance * P&R Accepatance	152	100.0%	0	0.0%	152	100.0%

Travel Distance * P&R Acceptance Cross tabulation

			P&R Acceptance		Total
			No	Yes	
Travel Distance	Distance ≤ 5	Count	8	10	18
		Expected Count	5.8	12.2	18.0
		% within Travel Distance	44.4%	55.6%	100.0%
	5< Distance ≤10	Count	19	26	45
		Expected Count	14.5	30.5	45.0
		% within Travel Distance	42.2%	57.8%	100.0%
	10< Distance ≤20	Count	13	36	49
		Expected Count	15.8	33.2	49.0
		% within Travel Distance	26.5%	73.5%	100.0%
	20< Distance ≤30	Count	4	15	19
		Expected Count	6.1	12.9	19.0
		% within Travel Distance	21.1%	78.9%	100.0%
	30< Distance ≤40	Count	1	7	8
		Expected Count	2.6	5.4	8.0
		% within Travel Distance	12.5%	87.5%	100.0%
	Distance > 40	Count	4	9	13
		Expected Count	4.2	8.8	13.0
		% within Travel Distance	30.8%	69.2%	100.0%
Total		Count	49	103	152
		Expected Count	49.0	103.0	152.0
		% within Travel Distance	32.2%	67.8%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)
Pearson Chi-Square	6.540[a]	5	.257	.260
Likelihood Ratio	6.757	5	.239	.271
Fisher's Exact Test	6.192			.284
N of Valid Cases	152			

a. 2 cells (16.7%) have expected count less than 5. The minimum expected count is 2.58.

Test Hypothesis is;

Ho: average travel distance and Park and Ride acceptability are independent.

Ha: average travel distance and Park and Ride acceptability are not independent.

In this cases the assumption of Chi-square test is violated (expected count is less than 5 in more than 20% number of cells). Hence the hypothesis checked with the Fisher Exact test.

According to the outcome of SPSS, the P-value (0.260) is higher than the significance level (0.05), hence null hypothesis can accept. Therefore, it is conclude that average travel distance and Park and Ride acceptability are independent.

ANNEXURE V: ANALYZED RESULTS OF AVERAGE TRAVEL TIME AND ACCEPTABILITY OF PROPOSED P&R SYSTEM

```
CROSSTABS
  /TABLES=time BY Accept
  /FORMAT=AVALUE TABLES
  /STATISTICS=CHISQ
  /CELLS=COUNT EXPECTED ROW
  /COUNT ROUND CELL
  /METHOD=EXACT TIMER(5).
```

Crosstabs

Notes

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Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics for each table are based on all the cases with valid data in the specified range(s) for all variables in each table.
Syntax		CROSSTABS /TABLES=time BY Accept /FORMAT=AVALUE TABLES /STATISTICS=CHISQ /CELLS=COUNT EXPECTED ROW /COUNT ROUND CELL /METHOD=EXACT TIMER(5).
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[DataSet1] J:\P&R\Report-2017\Analysis 3.sav

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Travel Time * P&R Accepatance	152	100.0%	0	0.0%	152	100.0%

Travel Time * P&R Acceptance Cross tabulation

			P&R Acceptance		Total
			No	Yes	
Travel Time	Travel Time ? 15	Count	9	6	15
		Expected Count	4.8	10.2	15.0
		% within Travel Time	60.0%	40.0%	100.0%
	15< Travel Time ? 30	Count	21	35	56
		Expected Count	18.1	37.9	56.0
		% within Travel Time	37.5%	62.5%	100.0%
	30< Travel Time ? 45	Count	14	26	40
		Expected Count	12.9	27.1	40.0
		% within Travel Time	35.0%	65.0%	100.0%
	45< Travel Time ? 60	Count	2	16	18
		Expected Count	5.8	12.2	18.0
		% within Travel Time	11.1%	88.9%	100.0%
	60< Travel Time ? 90	Count	2	12	14
		Expected Count	4.5	9.5	14.0
		% within Travel Time	14.3%	85.7%	100.0%
	Travel Time ? 90	Count	1	8	9
		Expected Count	2.9	6.1	9.0
		% within Travel Time	11.1%	88.9%	100.0%
Total		Count	49	103	152
		Expected Count	49.0	103.0	152.0
		% within Travel Time	32.2%	67.8%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)
Pearson Chi-Square	13.724[a]	5	.017	.016
Likelihood Ratio	14.706	5	.012	.017
Fisher's Exact Test	13.132			.019
N of Valid Cases	152			

a. 3 cells (25.0%) have expected count less than 5. The minimum expected count is 2.90.

Test Hypothesis is;

Ho: average travel time and Park and Ride acceptability are independent.

Ha: average travel time and Park and Ride acceptability are not independent.

In this cases the assumption of Chi-square test is violated (expected count is less than 5 in more than 20% number of cells). Hence the hypothesis checked with the Fisher's Exact test.

According to the outcome of SPSS, the P-value (0.019) is lesser than the significance level (0.05), hence null hypothesis cannot accept. Therefore, it is conclude that there is relationship between travel time and acceptability of the proposed Park and Ride system.

ANNEXURE VI: ANALYZED RESULTS OF AVERAGE WALKING DISTANCE FROM POINT OF EGRESS FROM PUBLIC TRANSPORT TO DESTINATION AND ACCEPTABILITY OF PROPOSED P&R SYSTEM

```
CROSSTABS
  /TABLES=walking_distance BY Acceptance
  /FORMAT=AVALUE TABLES
  /STATISTICS=CHISQ
  /CELLS=COUNT EXPECTED TOTAL
  /COUNT ROUND CELL
  /METHOD=EXACT TIMER(5).
```

Crosstabs

Notes

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	Definition of Missing	User-defined missing values are treated as missing.
Missing Value Handling	Cases Used	Statistics for each table are based on all the cases with valid data in the specified range(s) for all variables in each table.
Syntax		CROSSTABS /TABLES=walking_distance BY Acceptance /FORMAT=AVALUE TABLES /STATISTICS=CHISQ /CELLS=COUNT EXPECTED TOTAL /COUNT ROUND CELL /METHOD=EXACT TIMER(5).
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[DataSet1] J:\P&R\Report-2017\Analysis 2.sav

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Avg. walking distance from point of egress public transport to destination * Acceptance	114	100.0%	0	0.0%	114	100.0%

Avg. walking distance from point of egress public transport to destination * Acceptance Crosstabulation

			Acceptance		Total
			yes	no	
Avg. walking distance from point of egress public transport to destination	0- 100 m	Count	17	11	28
		Expected Count	16.2	11.8	28.0
		% of Total	14.9%	9.6%	24.6%
	100 m-500 m	Count	41	24	65
		Expected Count	37.6	27.4	65.0
		% of Total	36.0%	21.1%	57.0%
	500 m-1000 m	Count	8	9	17
		Expected Count	9.8	7.2	17.0
		% of Total	7.0%	7.9%	14.9%
	Above 1000 m	Count	0	4	4
		Expected Count	2.3	1.7	4.0
		% of Total	0.0%	3.5%	3.5%
Total		Count	66	48	114
		Expected Count	66.0	48.0	114.0
		% of Total	57.9%	42.1%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	7.126[a]	3	.068	.062	
Likelihood Ratio	8.544	3	.036	.049	
Fisher's Exact Test	6.738			.070	
Linear-by-Linear Association	3.521[b]	1	.061	.070	.040
N of Valid Cases	114				

Chi-Square Tests

	Point Probability
Pearson Chi-Square	
Likelihood Ratio	
Fisher's Exact Test	
Linear-by-Linear Association	.018[b]
N of Valid Cases	

a. 2 cells (25.0%) have expected count less than 5. The minimum expected count is 1.68.

b. The standardized statistic is 1.876.

Test Hypothesis is;

Ho: average walking distance from point of egress public transport mode to destination and Park and Ride acceptability are independent.

Ha: average walking distance from point of egress public transport mode to destination and Park and Ride acceptability are not independent.

In this cases the assumption of Chi-square test is violated (expected count is less than 5 in more than 20% number of cells). Hence the hypothesis checked with the Fisher's Exact test.

According to the outcome of SPSS, the P-value (0.070) is higher than the significance level (0.05), hence null hypothesis can accept. Therefore, it is conclude that average walking distance from point of egress public transport mode to destination and Park and Ride acceptability are independent.

ANNEXURE VII: ANALYZED RESULTS OF EXPECTED WAITING TIME ON AVERAGE JOURNEY AND ACCEPTABILITY OF PROPOSED P&R SYSTEM

```
CROSSTABS
  /TABLES=waiting_time BY Acceptance
  /FORMAT=AVALUE TABLES
  /STATISTICS=CHISQ
  /CELLS=COUNT EXPECTED TOTAL
  /COUNT ROUND CELL
  /METHOD=EXACT TIMER(5).
```

Crosstabs

Notes

Output Created		26-MAR-2017 15:36:58
Comments		
Input	Data	J:\P&R\Report-2017\Analysis 2.sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	114
	Definition of Missing	User-defined missing values are treated as missing.
Missing Value Handling	Cases Used	Statistics for each table are based on all the cases with valid data in the specified range(s) for all variables in each table.
Syntax		CROSSTABS /TABLES=waiting_time BY Acceptance /FORMAT=AVALUE TABLES /STATISTICS=CHISQ /CELLS=COUNT EXPECTED TOTAL /COUNT ROUND CELL /METHOD=EXACT TIMER(5).
Resources	Processor Time	00:00:00.02
	Elapsed Time	00:00:00.02
	Dimensions Requested	2
	Cells Available	174762
	Time for Exact Statistics	0:00:00.02

[DataSet1] J:\P&R\Report-2017\Analysis 2.sav

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
waiting_time * Acceptance	114	100.0%	0	0.0%	114	100.0%

waiting time * Acceptance Cross tabulation

			Acceptance		Total
			yes	no	
waiting time	0 - 5 min	Count	7	21	28
		Expected Count	16.2	11.8	28.0
		% of Total	6.1%	18.4%	24.6%
	5 – 10 min	Count	42	25	67
		Expected Count	38.8	28.2	67.0
		% of Total	36.8%	21.9%	58.8%
	10 – 15 min	Count	14	2	16
		Expected Count	9.3	6.7	16.0
		% of Total	12.3%	1.8%	14.0%
	15 – 20 min	Count	3	0	3
		Expected Count	1.7	1.3	3.0
		% of Total	2.6%	0.0%	2.6%
Total		Count	66	48	114
		Expected Count	66.0	48.0	114.0
		% of Total	57.9%	42.1%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	20.995[a]	3	.000	.000	
Likelihood Ratio	23.115	3	.000	.000	
Fisher's Exact Test	20.599			.000	
Linear-by-Linear Association	19.817[b]	1	.000	.000	.000
N of Valid Cases	114				

a. 2 cells (25.0%) have expected count less than 5. The minimum expected count is 1.26.

b. The standardized statistic is -4.452.

Test Hypothesis is;

Ho: Expected waiting time on average journey and Park and Ride acceptability are independent.

Ha: Expected waiting time on average journey and Park and Ride acceptability are not independent.

In this cases the assumption of Chi-square test is violated (expected count is less than 5 in more than 20% number of cells). Hence the hypothesis checked with the Fisher's Exact test.

According to the outcome of SPSS, the P-value (0.000) is lesser than the significance level (0.05), hence null hypothesis cannot accept. Therefore, it is conclude that there is relationship between expected waiting time on average journey of private vehicle users and acceptability of the proposed Park and Ride system