



A CRITICAL REVIEW ON TRANSPORT PLANNING ANALYSIS OF AIRPORT CONNECTIVITY – AIRPORT SURFACE ACCESS

Engineering

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ABSTRACT

Airport surface access being a major part of study in all the developed and developing countries across the World. Due to growing population globally, an increase in income and automobiles have paved their contribution in increased congestion and pollution. The trend followed globally is almost similar irrespective of the economy, where the private transport contributes more towards the journey made for Airports. Key factors that govern the mode choice behaviour of the Air passengers include travel cost, travel time, comfort to carry luggage and in a special condition citizenship too effects the same in countries like Saudi Arabia.

KEYWORDS

Airport surface access, Modal split, Mode choice, Public Transport System, Travel Behaviour, Transit, Ground access.

INTRODUCTION

Aviation Industry being the major transport sector in the World and being the faster transport system for passenger and goods. A successful Airport is not just about timely operation and sufficiency of flights for air travel, but it also includes the well-organized ground transport network which includes both private and public sector. Globally people switch to private transport out of comfort and efficiency of the sector being operated. But the major issue faced by country like US, UK, India, China, Australia, Saudi Arabia, Italy, Iran etc is the difficulty to switch the mode of transport from private to public transport system. Modal shift from private to public transport has many benefits like growth in economy, reduced congestion and reduced pollution which are the major global concerns which need keen governance for the improvement in the present operating public transport systems with any new addition to the same. Passenger mode choice behaviour has slight variation with respect to countries studies. Ultimate results of the study are to present the guidelines to government and transport planners to improve the efficiency of public transport system with respect to improved time and minimum cost of journey.

CRITICAL REVIEW ON AIRPORT ACCESS

Lucy Budd, Stephen Ison, Thomas Budd (2016), this paper studies the Surface access of six busiest Passenger Airports of London, London Heathrow, London Gatwick, London Stansted, London Luton, London City, London Southend. Detailed study of modes of public transport, percentage of passengers using Airport is studied with an outcome of 95% of surface access journeys are made by private vehicles. Several reasons like gender, age, journey time, cost, convenience, safety and ease of handling baggage are supporting to switch to private transport. To encourage public transport usage, two types of policies are studied and to be implemented i.e., Strategic policies and Operational policies. Some of the reasonable improvements to be done to improve public transport usage are smart ticketing, green technology, shared ride schemes, part and ride schemes and customer advisors and passenger experiences which ultimately decreases the carbon footprint.

Dileep Dixit, Phua Chai Teck (2010), this paper deals with study of network connectivity, design concept and surface access modes and their efficiency of Indira Gandhi International Airport, New Delhi. Scientific approach was adopted to study the efficiency of public transport and analysis is done through key traffic characteristics like travel pattern, socio economic behaviour, percentage of meters and greeters though primary survey and secondary data. Modal split analysis gave out the result to be 48% and 38 % of travel done by taxi and cars respectively, accounting to a huge sum of 86% of total vehicles at airport. Conclusion includes improvement in present public transport and metro (which wasn't available for Airport line) with respect to efficient tale end connectivity to Air Passengers.

Saad N. Alhussein (2011), this paper aims to study the Airport surface access and user characteristics of King Khaled International Airport, Riyadh, Saudi Arabia. A questionnaire survey was done for 3 days in 2010 during regular days (not peak season) with 500 questionnaires distributed and the response rate to be only 60.4%. Questionnaire has

20 questions divided into three parts, general passenger information, trip information and access mode chosen. Binary logit model was used to evaluate model choice. Results of the survey and the model split are tabulated in a table where in only 2.3% passengers use public transport. Nationality plays a major role in choosing of mode where a citizen of Saudi preferably chooses a personal car. They conclude by stating a large sample size was required to perform model split analysis more efficiently. Survey would help the public transport providers to improve the efficiency of the system.

Giuseppe Guido, Alessandro Vitale, Daniele Rogano (2016), the study area being Southern Italy, this paper deals with operational performance of bus services using Automated Vehicle Location (AVL) and Geographic Information system. Reliability measures have been done with on-time performance indicator, the results of the same shows the on-time performance indicator ranging from 80% (good level of service) to 91% (very good level of service) with an extremely poor ridership of 9% for public transport connecting to Lamezia Airport which requires a modal shift to increase it. This study gives essential tools and key elements to transport planners and transit providers about the present working efficiency for which they can work on to bring the operational improvement in the present public transport system.

Stephen Ison , Rico Merkert , Corinne Mulley (2014), This paper deals with a comparative approach of Surface Access of UK Airports to Australian Airports. 10 airports each from UK and Australia are taken up for study with respect to their Master Plan and emissions of per capita CO₂. Comparison gives out the fact that Australian Airports need better Ground access plans as in UK Airports which helps in reducing the carbon footprint too.

Esmat Zaidana, Ammar Abulibdeh (2018), This paper does a study of detailed Surface access of Hamad International Airport, Doha, Qatar. The main focus is to improve the public transport system before 2022 FIFA World Cup, when the demand of transport goes to maximum. Face to face interview was conducted to collected the primary data on passenger mode choice details. Binary logit is used to analyse public transport currently working and multinomial logit is used to analyse the future trend of mode choice after addition of new Doha Metro. Out of 1535 samples, 81% tend to use private cars, 12.7% taxis, 2% limousine, 1% buses and 2.15% others and with the future projection 57% of respondents are willing to use the Doha Metro. Paper assists Qatar authorities to improve the transport system and help in modal shift to public transport.

Stephen Carstens (2014), this paper deals with passenger's behaviour in modal choice of transport of two Airports in Johannesburg, South Africa with respect to travel time, travel cost, parking time and parking cost. Survey has been carried out for 618 passengers with 10 choice situations and getting out 6180 records in total. The results obtained are 31% self-drive, 56% drop off, 10% by train and 4% by taxi. Road transport being the dominate mode, Airport Authorities should see for time effectiveness in drop-off. Point to be noted is, this research took place before the e-toll was placed in Gauteng in its major freeways,

which will affect the passenger mode choice.

Mahdi Yazdanpanah, Mansour Hadji Hosseinlou (2016), this paper studies the personality traits of Airport users in mode choice for Imam Khomeini International Airport (IKIA), Tehran, Iran. Survey was conducted in the months of January and February 2015 in the Imam Khomeini International Airport with 557 valid responses. Hybrid discrete latent class (HLC) modeling approach was used based on Five Big personality traits i.e., openness to experience, conscientiousness, extraversion, agreeableness, neuroticism. Results are tabulated with respect to all five big personality traits with 64% of passengers using private cars. Conclusion goes with mention of some errors like the Airport is purely for International flights and the users would be well off to opt for higher fare travel to Airport, which much be considered in the later studies and 16 personality trait analysis gives much accurate results required for planning of a Transport System.

Megha V, Dahiphale Rasika S, Kamble Rohit R, Kul Gaurav A., Shaikh Arbaz R, Shaikh Salman S (2019), this paper studies the special analysis of Transport Network of new Purandar Airport, Pune to come out with best suited mode for passengers with respect to cost and time. GIS 10 is being used to extract the data and the required traffic data is being taken from Puna Municipal Corporation and PCMC. Results came out to be, Metro would be the best suited mode of transport to connect Purandar Airport, being the simplest and the fastest.

Sangho Chooa, Soyoung Youb ,Hyangsook Lee (2013), this paper studies the air passenger travel mode choice behaviour for two major domestic airports Gimpo Airport and Daegu Airport, Korea. Data was collected from Pilot survey of Air passengers in 2004. Transport facilities available for the Airport being auto, bus, public transit and subway. Logistic regression model was used to analyse the data for model choice. Number of samples being collected were 1588 and 702 being the effective sample for the analysis. For the Gimpo Airport users of bus, public transit and subway being over 20% while for Daegu Airport is was different as 60% of passengers used cars for their travel. Conclusion states that model choice is effected by travel time, travel distance, trip purpose, age, gender, occupation and income.

Peter B. Mandle, Douglas M. Mansel, Matthew A. Coogan (2000), this paper reviews the use of rail, bus and van services connecting to US Airports. It studies how an added rail service to the present public transport can change Airport users to switch to public transport from Private transport. The results come out to be the ceiling on Airport users using Public transport is about 10% to 15% for US cities. This paper provides guidelines for the Transport planners to implement cost effective and more readily available public transport to improve the condition to get a modal shift towards public transport.

Thomas Budd, Tim Ryley, Stephen Ison (2014), This paper is based on surface access studies of Manchester Airport, UK. Preliminary survey is carried out in Manchester Airport to arrive at eight behavioural constraints of passengers to choose private cars over public transport. Manchester Airport had an over all share of 86.8% travel by private cars. A questionnaire survey was conducted in a face-to-face interview at the Airport with 44 attitude statements. An explanatory factor analysis was done to analyse the data and attitudinal and situational profiles were created. Results came to be car users being 45.8%, drop-off being 53.5% for complacent motorists and 16.7% for cars, 50.8% for drop-off for Dogmatic drop-offs and so on are tabulated in a table for Ardent taxi, Devoted drivers, Conflicted greens, Environmental champions, Pessimistic lift seekers and Public transport advocates. Conclusion is on reducing the private cars for the journey to airport by implementing better planning for improvement in public transport facilities.

Dragan Pamucar, Muhammet Deveci, Fatih Canitez, Vesko Lukovac (2020), This paper does an analysis to arrive at best suited public transport system for Istanbul Airport. The present operating ground access modes to be underground metro, bus rapid transit, light rail transit and premium bus services. Hybrid fuzzy multi-criteria decision-making model is being used which is based on LBWA-WASPAS-H to solve the mode selection in ground access. The decision criteria for the mode choice had four variants such as financial aspects, operational characteristics, project characteristics and environmental sustainability. Results show the highest score goes with underground metro followed by light rail transit, bus rapid transit and premium bus services.

Yu-Chun Chang (2013), This paper studies mode choice behaviour of elderly passengers in travel to Taipie International Airport, Taiwan. The questionnaire survey was conducted in the Airport. Factors affecting the choice of mode possessing a car, luggage, time, ticket price of public transport. A total valid sample of 675 out of which 150 were of elderly (age above 65) were obtained for analysis. Importance performance analysis was performed to examine the gaps in service and hierarchical regression analysis was used for modal split analysis. Results came out to be elderly passengers prefer to ask their family members to drop them (34%) and followed by using taxi (24.4%) and convenience for storing the luggage being their first priority. Private transport is mostly preferred by elderly than non-elderly. In addition, improving qualities like to set up a check-in counter in public transport so that passengers need not carry luggage all over the journey to airport, etc.

Ian Humphreys, Stephen Isona, Graham Francis, Kelly Aldridge (2005), This paper deals with study of 27 Airports of UK to analyse their surface access modes and to study about the further government guidelines being implemented to change the modal shift from private cars to public transport. The data of Airport surface access strategy (ASAS) were collected from all the Airports and the additional data was collected by the interviews taken up for Managers of Airport. UK government has failed to implement the guidelines for modal shift so the results would be better if the Government is passing on the responsibility to individual Airports.

Ian Humphreys, Stephen Ison (2005), This paper is about study of UK Governments initiatives for improving the Airport surface access of Airports. ASAS data being collected and analysed along with interview data from Managers of Airport. Managers came up with certain policies that could be implemented like subsidised bus travel, car sharing schemes, getting employees to sign up travel plans, incentive to switch to public transport, car parking policy etc. Each Airport should lead an Airport Transport Forum to implement the complete guidelines of government for the modal shift to be achieved successfully.

Rong-Chang Jou, David A. Hensher, Tzu-Lan Hsu (2011), This paper is on the study of ground access modes of Taoyuan International Airport, Taiwan after the Government of Taiwan introduced a mass rapid transit system connecting the important traffic hubs and Taoyuan High Speed Rail Station. A questionnaire survey was conducted in the Airport for a period of 9 days during week days and weekends in 2017. A total of 540 questionnaire were collected and analysed using mixed logit model. Results show that users have used more than two transport modes to complete the journey to Airport and self-rider cars and taxi being the favoured mode. Results are being tabulated with all trip characteristic and elasticity analysis.

D. Tsamboulas, A.P. Evmorfopoulos, P. Moraiti (2012), This paper is to study the Airport employee mode choice behaviour for the Athens International Airport. 805 questionnaires were distributed out of which 650 were completely filled travel time, travel cost and income. Results of analysis came up to be maximum of 64% travel made by private cars followed by bus line and company bus in combination with metro or suburban rail. Results came out to be the major factors affecting the employee mode choice are total cost of trip, total duration of trip and income of the travelers.

Md Mosabbir Pasha, Mark D. Hickman, and Carlo G. Prato (2020), The theme of the paper is to develop a mode choice model for passenger access to Brisbane Airport, Australia. Online survey was conducted to collect data from 1435 passengers. MNL and MXL Models were used for modal choice. Factors influencing the choice of mode are to be travel time, travel cost, number of transfers and luggage. 78.1% of passengers use private cars and authorities want to improve this percentage to 56% by 2031. SP surveys states that inertia and state dependency play an important role in Airport Mode Choice.

Hermann Orth, Oliver Frei, Ulrich Weidmann (2014), This paper studies the non-aeronautical activities like choice of mode by Air passengers for Zurich Airport, Switzerland. Theme of the study is to analyse the additional ground transport demand that can impact the overall public transport system. Private vehicle usage being the major mode chosen and the paper deals with study to shift the mode of choice to public transport. Data was collected from different sources like publicly available data, passenger count and capacity data. Conclusion derives the need for improvement in public transport system for better

accessibility.

Voula Psaraki, Costas Abacoumkin (2002), This paper is to study the capacity requirements for the access for forecast of new Athens International Airport, Greece. Passenger survey was carried out for the collection of data. Usage of taxi being the higher preference with 45.9% followed by 1.3% for public bus and 0.4 % & 0.1% for tourist bus & rental car respectively. Distance of travel being the major factor affecting to choose personal cars as the fair of travel in taxi increases with distance to Airport. Market share forecasting tool was developed for prediction of passenger's access mode choice in relocated airports. Out of which current demand characteristics of traffic, car occupancy and duration of parking gives out the forecast to estimate the parking facility requirements. Such a study on current traffic details and modal split forecasting tool helps in improvement in road and rail network, to operate new technology of high-speed vessels from the main port of Piraeus.

A. R. Mamdoohi, M. Saffarzade, A. Taherpour, and M. Yazdan Panah (2012), This paper is to study about the Airport user behaviour for the choice of mode for Imam Khomeini International Airport, Tehran, Iran. Face interview survey was conducted for 24 hours for a period of 2 weeks in the month of May and June 2011 and 2649 samples were obtained. Binary logit models were used to calibrate for public and private transport. Travel time, travel purpose, vehicle ownership and income were the factors effecting the mode choice. The study sample had 83.2% male and 43.6% used rental cars, 26.8% private cars, 20.6% metro, 3.7% and 5.3% used shuttle bus and shuttle van respectively. Conclusion goes with future scope of investigation in behavioural study of air passengers using different logit models.

Heng Zhoua, Jianhong Xiaa, Richard Normanb, Brett Hughesc, Gabi Nikolovac, Keone Kelobonyea, Kai Dua, Torbjorn Falkmerd (2019), This paper studies travel mode choice behaviour for four regional airports in Western Australia, Albany, Geraldton, Broome and Karratha Airports. Stated preference survey were carried out in these four Airports at departure lounge. Questionnaire were answered by 950 air passengers out of which 621 were business Air Passengers. Multinomial logit and nested logit were used for mode choice analysis and NLOGIT 5 software was used for the estimation of model parameters. Travel time, travel cost, frequency of service and seat comfort were the factors governing the mode choice. From the elasticities table, one percent increase in travel cost by car effects business passengers to switch to public transport bus or airline by 0.021 percent and one percent increase in airfare supports passengers to choose car or bus by adding 0.218 percent to 0.258 of business passengers.

Thomas Budda, Professor Stephen Isona and Dr Tim Ryley (2011), This paper studies the surface access management studies of 14 Airports in UK. Semi structured interviews were conducted. Major contribution of trips were from private cars which is the major being tackled in this study. Interview was conducted either in person or on phone call during July, October 2010 for about 45 minutes to 1 hour. Key factors affecting the passenger mode choice was ease of luggage carrying and journey time and the factors affecting the mode choice of Airport employees is their work shift which may be during off peak hours or in absence of public transport system. Conclusion is on the efforts to be made in improvement in share of journeys in public transport with the future scope in research.

Amal Jose, Sewa Ram (2019), This paper deals with the evaluation of reliability parameters to access six Indian Airports, International Airports of New Delhi, Mumbai, Kolkata, Chennai, Bangalore and Hyderabad. Airport data were collected from monthly air traffic reports of Airport Authority of India. Reliability parameters like Reliability index, Travel-time index, Buffer time index, Planning time index and free flow time were calculated. New Delhi Airport having the seamlessly high speed and reliable access to public transport and Hyderabad Airport being the most reliable airport too has a PTI (reliability index) of 1.67 and 1.79 for public and private transport respectively which means 1.67 times the desired travel time for a specified link in the private mode. Conclusion states that the land side accessibility problems faced by Indian Airports are because of irregular Government policies, increasing traffic and also the growth of automobile industry on the other side.

Gulsah Akar (2013), This paper deals with the passenger mode choice to access Port Columbus International Airport, Columbus, Ohio. Questionnaire survey was conducted in the Airport with 642 samples filled by individuals in April 2012. Binary logit model was used for

analysis. Survey results state that major contribution of travel was done by drop off with 86.9% and contribution from public transport being the least. Factors effecting the choice of mode being travel cost, travel time, luggage storage capacity, reliability and flexibility of departure time.

Caterina Malandri a, Luca Mantecchini a, Maria Nadia Postorino (2017), This paper studies the case study of Airport Ground Access Reliability and Resilience of transit networks in Italy. Theme of the paper is to switch the problems like congestion and shift the mode of travel to greener transport modes. Three different transit systems are modelled, Automated People mover, Airport Shuttle Bus and Bus line and system resilience is estimated with the proposed indices. Supply demand models are implemented using event based mesoscopic traffic simulator for both individual and transit transport systems. The study adds up the future prospect in improving the infrastructure of public transport by providing the guidelines on the same.

Md Mosabbir Pasha, Mark D. Hickman, Carlo G. Prato (2020), Aim of the paper is to develop a robust mode choice model for Brisbane Airport, Australia. Data collection was done through online survey for revealed and stated preferences with a sample size of 1435. Multinomial logit (MNL) and Mixed logit (MXL) was used to analyse the data. Travel time, travel cost, number of transfers and amount of luggage were to be the most affecting factors for choice of mode. Car and taxi are supposed to be more elastic as compared to bus, train, shuttle and uber. Future studies will help to switch to public transport with respect to reduced cost and time of travel for the journey made to Airport.

Dimitrios A. Tsamboulas, Anastasios Nikoleris (2008), This paper studies the willingness of airport users to pay for reduced time of travel for Athens International Airport. A passenger questionnaire survey was conducted at the departures at the Athens International Airport. Probit and linear regression model were used and a majority of 72% use the private mode of transport. Results came out to be passengers using public transport were willing to pay for reduced travel time.

Mei Ling Tama*, William H.K. Lamb and Hing Po Lo (2010), This paper aims to develop a ground access model split pattern for Hong Kong International Airport, China. Structural equation modelling was used to construct stratification latent variable to study the passenger choice of mode. A two-way model split survey was carried out in mid of 2004 and 2005 using questionnaire at Hong Kong International Airport. Results show that the travel time to be the primary factor and safety margin allowance is the critical factor affecting the choice of mode.

Major Findings Of The Literature Review

- Passenger survey (Questionnaire, interview or online survey) is to be conducted to arrive at the primary data of passenger mode choice behaviour.
- Key factors that affect the choice of mode being travel time, travel cost, car ownership, amount of luggage etc
- Several type of modelling like, Binary logit model, Structural equation modelling, Multinomial logit (MNL) and Mixed logit (MXL), nested logit etc were used to arrive at the Model split.
- Certain parameters like Reliability index, Travel-time index, Buffer time index, Planning time index and free flow time were calculated.
- Based on the analysis for present and future projected trends, guidelines were given to government and transport planners to improve the public transport system to minimize the congestion and pollution.

CONCLUSION

The trend of mode choice is universal all over globally. Air passengers tend to choose private mode due to many reasons like to save time, comfort, to carry luggage etc. The present trend must be changed to public transport for which transport planners has to improve the infrastructure of the same. The modal shift from private to public transport helps in reducing congestion in traffic and reducing pollution.

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