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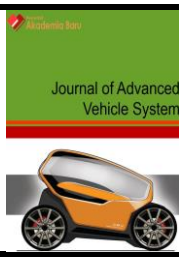

Factors Influencing Public Transport Use: A Study of Klang Valley Commuters' Information System Tools

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ABSTRACT

Mobility is a human need. The options available are from a wide array, however, the safety of a person varies with the choice of transportation. To reduce the safety risks of private vehicles, commuters should be encouraged to shift to public transport. Literature and observation show key segments citing reasons such as timing issues, connectivity, and unpredictability to continue commuting privately. This study in the Klang Valley, Malaysia explores the influencing factors and how information systems' tools can encourage a change in commuting mode. Through a questionnaire survey, it is found that timing and costs are the biggest factors influencing public transport use, therefore an information system tool that can provide this information based on the commuters' origin and destination will be able to influence their use more. The younger age group with lower earning capacity are most likely to use an app that can rank modes by costs. The older age group with higher earning capacity are most likely to use an app that can rank modes by timing and time taken.

Keywords:
Public transport; information system;
modal shift;

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1. Introduction

Mobility is not a choice, but rather a basic human need. In the Klang Valley, the public has the option to choose from a wide array of options to be mobile. Commuters here can opt for cars, motorcycles or public transportation such as trains, buses, taxis or ride hailer services such as Uber and Grab, depending on various factors mainly travel time, cost and availability.

However, the safety risk of a person varies with the choice of mobility. Quoting a statement by former Director-General of the Malaysian Institute of Road Safety Research (MIROS) the late Radin Umar Sohadi, Mustapha (2007) pointed out that riding a motorcycle is five times riskier compared to driving a car, 30 times riskier than taking a bus, and even 6,000 times riskier than travelling by aeroplane. Despite the clear and present danger coming from the use of individual private vehicles, especially motorcycles that killed 60% or more than 4,000 users each year on Malaysian roads, many

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members of the public in this area still choose to use motorcycles as a commuting option rather than public transportation.

To reduce the risk of commuting by private vehicle especially motorcycles to workplace, employees in the Klang Valley should be encouraged to shift to public mode of transport. The recent development in the Klang Valley, such as the government's move to legalise ride-hailing service (Uber and GrabCar), and the opening of the new Mass Rapid Transport (MRT) from Sungai Buloh to Kajang would definitely favour city commuters who choose a safer, more convenient, and greener mode. However, in spite of these positive developments, there are still key segments of population that refuse to change their mode of transport from private to public, citing a wide variety of reasons such as too slow, too far, connectivity issues, and unpredictable timing. This study aims to determine the reliability of information system tools used in displaying the connectivity and influencing the use of public transport in the Klang Valley.

Each year, in Malaysia 7,000 people die a year due to road crashes. Nearly two thirds are motorcyclists, whereas 2,000 other fatalities are car occupants. A majority of fatalities therefore are by road users in private vehicles. This accounts for approximately 500,000 reported road crashes each year which is accounted as the tip of the iceberg of the real situation including unreported crashes.

Based on the annual road crash and fatality figures, and 25 million registered vehicles supporting a population of 30 million in Malaysia, it goes to show that there is an over dependency on private vehicle in road transportation. This current landscape of over prominence of private vehicles as the main mode of transport in Malaysia means that exposure is extremely high and that as population increases, this mode of transportation is increasingly less sustainable.

Many countries with far more dense and larger population such as Tokyo (Japan) and New York (USA) have made moving large numbers of people much more efficient by utilizing public transportation. Malaysia as well has been trying to increase ridership of buses and the various types of trains available although the latent demand has not been able to be met satisfactorily. Public transport is safer, cheaper, and healthier; however, in spite of these known benefits people still refuse to use public transport in Malaysia as evidenced by the increasing number of registered vehicles, road crashes, and car sales each year.

The question such as connectivity, reliability and availability of public transport remains unanswered as to why in spite of many improvements, people are slow to adopt it as the main travel mode.

Population growth in the Klang Valley reinforce the need for high-quality public transportation options. As reported by Litman (2010), the growth in a metropolitan area's population shifts the composition of potential mass transit users away from transit-dependent users, who are generally low income or persons with disabilities, to discretionary riders, who tend to be more affluent than the captive riders. Moreover, demand for public transport services from higher income, discretionary riders is particularly sensitive to travel time, vehicle comfort, and other dimensions of service quality (Litman 2010). In fact, in making his case for the superiority of commuter rail over other public transport options, Kenworthy (2008) emphasizes that the superior service quality of rail is what accounts for its ability to attract patronage in relatively affluent cities more effectively than other transit options. Interestingly, and contrary to common misperception, Kenworthy (2008) also reports cities become more public transport-dependent and less auto-dependent as they grow wealthier. The findings of Kenworthy and Litman certainly reinforce the aforementioned claims made by Jakob, Mees and Dodson.

1.1 Commuters' Modal Shift To Public Transportation

Based on Practice Theory perspective, the way bus-, car-and cycle commutes have distinctive practices involves different social and material conditions than other forms of bus, car and cycle mobility respectively. The common habit and custom in Malaysia agrees with the Practice Theory. For example, there is a difference in practice between cycling for commute and cycling for recreation. Bus ridership for commute also differs with express (long distance) bus ridership. Likewise, use of car for commute is different from the use of car for specific trips (for example, to a hypermarket).

Thus, must be an examination or recognition of not only the value of land use and transport planning, but also the potential of different forms of intervention which allow the retiming and relocation of sites of practice that considers the influence of factors such as educational, leisure, shopping and healthcare practices on modal choice for commuting (Spurling et al., 2013). In the case of Malaysia, there exists a need to empirically examine the sequences of commuting. This is due to the fact that the custom and local habit of reluctance to use public transport when it comes to commuting need better and more in depth consideration.

Informed by early research designed to forecast demand through modelling travel behaviour (Ortúzar,1994) and assess the economic rationality of transport infrastructure investments, a foundational body of transport policy rests on an understanding of travel as a utility-maximizing behavior, with rational choice models (Gardner and Abraham, 2007) helping predict responses to particular policy interventions. Clearly, if such a policy intervention were to be formulated for Malaysian context, the demand forecast of public transport ridership must be researched hand in hand with travel behaviour. This modelling of travel habit, custom, and behaviour in terms of public transport ridership is the very foundation on which a policy can be formulated for Klang Valley. This is what is lacking currently as there is no study that bridges the quantitative aspects with the understanding of social behaviour.

In spite of this disadvantage in searching for an intervention, even by logic and rationality there are two major points that become prime influence on Malaysians' commuting travel behaviour. The first is the perceptions of and attitudes towards costs, the value of time, and transport modes. Malaysians generally have higher sensitivity towards costs compared to the value of time. Costs, in Malaysian perspective, are a rigid, elastic variable whereas culturally, time is considered a flexible variable. Transport mode of choice would be made based on the elasticity of the commuter, or on the value of time placed towards the time of arrival at work. Secondly, the physical environment and infrastructures are important considerations given that the Klang Valley development is organic and not uniform. Without proper infrastructure, a commuter may be influenced to forgo public transportation.

In the Klang Valley, the provision of infrastructure is easier to be implemented compared to other interventions on public transport commuting behaviour. Other perception-change or attitude-shift interventions may be challenging given the political-economic situation of the country. Interventions in infrastructure designed to remove choices, e.g. through road closure (Fujii etal.,2001), increased pricing of car parking (Thøgersen, 2009) or congestion (Shiftan and Golani, 2005) etc. can play a bigger role in Klang Valley. However, 'soft' interventions designed to influence or 'nudge' choices (Thaler and Sunstein, 2009) although more prevalent in developed countries especially in recent years that seek to 'voluntarily' (Cairns et al.,2008) change behaviour is not as easy given the culture of Malaysian political-economy. Although developed nations have moved towards social marketing aspects of encouraging public transport commuting that are seen to be much more politically palatable such as smarter choices (Barr and Prillwitz, 2014), sustainable travel town (Sloman et al., 2010), and Personalized Travel Planning initiatives (Bamberg etal., 2011), however the political agenda in

Malaysia is far from allowing these to happen. For this country, a different approach has to be used given how infrastructure improvements are tightly intertwined with local politics.

1.2 Commuting

Much of the commuting policy literature focusses on the promotion of public transport or active modes of walking and cycling (Khan et al., 2014; Schneider, 2013) or even motorcycling (Chen and Lai, 2011), with the exact method of 'promotion' dependent on which factors are seen as most influential on commuting behaviour. In Malaysia, there is very little to be observed in terms of promotion of public transport. Generally the promotion of such persuasions of modal shift only occur during the initial launch periods of a certain mode, for example the first phase of MRT operation in Klang Valley. Due to the lack of follow-up promotion past the initial 3- or 6-month period, commuting behaviour/change of commuting mode tends to drop and are not sustained throughout.

Generic understandings of attitudinal and situational influences on travel behaviour, as reviewed above, are transposed on to commuting and inform policy in most developed countries, but not in Malaysia. Here, often the authorities expect behaviour to change with little persuasion and based mostly upon loyalty to the governments' efforts. In spite of this method obviously not working for shift in commuting behaviour on public transport, the governing bodies do not initiate a change in persuasive methodology.

Policies of public transport often focus on costs and pricing (Azari et al., 2013), especially of parking (Van Malderen et al.,2012), and the quality of public transport provision (Hensher, 1998), with workplaces being seen as key sites for behaviour change initiatives (Kingham et al., 2001; Van Malderen et al., 2012). These variable are considered in Malaysia to make public transport more attractive, however it does not culminate into a policy that can provide a focus for all the different parties involved.

Numerous studies suggest that combining policies, preferably including both 'push' factors such as carpark pricing disincentives (Azari et al., 2013; Börjesson et al., 2012) and 'pull' factors such as the provision of free public transport for a set period (Abou-Zeid and Ben-Akiva, 2012; Abou-Zeid et al., 2012; De Witteetal., 2008; Thøgersen, 2009) is more effective than implementing single policies alone (Habibian and Kermanshah, 2013). However, getting these kinds of complementary policies to be formalised in Malaysia is highly challenging given how the Malaysia is a long way from implementing a whole-of-government approach towards solving national issues. If there were complementary policies such as these in the country, without a doubt it would catapult the country as the leading developed country at least in Southeast Asia.

When it comes to public transport use, housing and work locations are clearly relevant (Broberg and Sarjala, 2015; Delmelle and Delmelle, 2012; Frostetal., 1998; Shiftan and Barlach, 2002; Zhou, 2014), as are associated travel times (Shannon et al., 2006). Choice of residence is seen to interact with commuting distance and mode, (Plaut, 2006: 561), affecting both workers in dual earner households. This agrees with the Malaysian situation where decision towards using public transport is greatly affected by decision making based on the timing. Likewise, as many Malaysians are dual-income households, the number of public transport commuters greatly decreases especially when the public transport network is not comprehensive nor timely the way it currently is in the Klang Valley. Without any IT applications that can provide real time public transport information, commuting in the Klang Valley is seen as a hassle more than a convenience by the public.

1.3 Categorizing Citizen (IT) Applications by Data Source

Commonly the source of data for citizen apps are government data sources although some is based on user feeds. Some also provide a platform for users to provide information. The applications classified in User Feeds category are those based on user-provided information, or user feeds. The number of users using the application as well as the number of information feeds these users generate governs the success of these applications. Although the applications in this category may not use any government data source, the working of these applications might still be facilitated by an interface provided by a government agency. This characteristic per se is not likely to be useful for commuters who are all generally travelling at the same time.

Government Data applications in this category depend completely on open data from government agencies. The citizens mainly use these applications only as a source of information, as they provide an accessible platform for receiving updated information on events, projects, activities, etc. Currently, the schedule of public transportation in Klang Valley is made available directly through websites, and through 3rd party mobile apps. These apps and websites are not interactive enough to be widely used and are little more than digital copies of a paper schedule.

Hybrid applications, as many are, are applications start with the open data as their base source and then rely on the user information feeds to either complement the data or to update the data. This type of app is less useful for real-time Klang Valley public transport app due to the wide approximation of departure and arrival times of Malaysia's bus and rail although with the right interface and algorithm, it can be just as useful. One example where user feed is useful on a base of government data is navigation app Waze.

1.4 Goals of the Application

Apps may also have multiple goals in mind such as solving a problem, create awareness about a problem, or to aggregate opinion on a given problem. Citizen Opinion Seeking type of applications act as a discussion forum, providing citizens a platform to discuss their day-to-day issues. This type of app is not suitable for problem solving a commuter's problem in real-time. Problem Identification applications aim at identifying problems in local communities and conveying those problems to the appropriate government agency. While this is useful for problems based on infrastructure service, such as potholes or various issues easily overlooked by the authorities (such as illegal use of facilities), this type of app is not suitable to solve commuting issues on public transport. Problem Resolution applications aim at finding a resolution to a problem. This type of app may be useful for public transport commuting depending on the interface and variables available in the app. Creating Awareness applications aim at creating awareness about a particular social problem. This type of app is not suitable for solving commuting issues in real-time for public transportation.

1.5 App Developer Motivation

Understanding the motivation of developers is crucial for government agencies and organizations that want to encourage citizens to leverage open data. App developers are motivated by different incentives. Public agencies may use incentives to steer technology enthusiasts to design apps for a particular use such as solving public transport commuting issues.

The first is Prizes. Applications under this category are the ones that were developed through prize-based competitions. Organizations and government agencies want developers to come forward to develop applications that can solve specific problems for them. Thus, prizes can be used to get

developers to develop app that can provide seamless service of public transport commuting to increase ridership.

Second is Solving Specific Problems. The applications under this category are developed with the core motivation of solving a social problem. MIROS in recent years has been developing apps in this category. It is practical although may be costly and be limited by resource issues.

Third, Open-Data App Start-ups. The applications in this category are by those who envision developing apps as a profit-making business. While this is useful, it is not a fool-proof plan as far as public transport commuting goes as the public needs to be convinced that it needs this app, that they will download and pay for this app.

Fourth, Public Transportation or citizen apps. Citizen apps are now available which not only allow people to have easy access to public transportation schedules but also allow them to track the real-time location of their buses. Such rich information access has made public transportation easier to use and more reliable. This is where Malaysia should be heading towards as the country strives to make public transport commuting a norm and a seamless service from end to end.

Finally, Parking Finder. Citizen apps also tackle issues surrounding traffic and congestion. To find a suitable parking spot, the user is asked to first enter his expected arrival and departure times at a place. Based on this input, the application provides information about free, metered, and prohibited parking for the particular area for the user's duration of stay in that area. The application also provides an interactive map with green, blue, and red colour coding that corresponds to free, metered, and prohibited parking respectively. While this is interesting especially in providing parking service at public transport first mile/last mile, without a good government base map, sensors, and other infrastructure it is almost impossible to create the app without it being rendered useless in a short time.

2. Study Objective

To determine public awareness on public transport connectivity and reliability with and without information system tools;

2. To measure public readiness to use public transportation with and without information system tools;
3. To analyse the influence of technology (apps, website) in commuters' decision to use public transport.

The research questions that this study seeks to answer are finding the awareness level of the public-on-public transport information tool, and whether the use of information systems influence commuters to use public transportation. In terms of physical scope, the study is carried out in Kuala Lumpur and surrounding cities within the Klang Valley. It involves the modes of transportation based on first/last kilometre (such as buses, taxis, ride sharing, and e-hailing), and main mode. For the main mode of transport, public transport on road includes buses, whereas for rail it includes KTM Komuter, LRT, and MRT.

3. Methodology

3.1. Questionnaire Survey

A questionnaire was developed and distributed for survey mainly through WhatsApp application and other social media platforms targeting respondents residing in the Klang Valley. The respondents

were reminded only those within the Klang Valley parameters are eligible to answer. Besides, there was no token promised or offered to lure respondents; thus eliminating the possibility of getting the respondents who answered for the sake of getting the token. Nevertheless, this also came with a setback in terms of lack of motivation to participate in the survey.

The questionnaires were developed in two parts; the first part being statements that reflects the objectives of the research while the second part being the demographic background of the respondents. The second part also required respondents to fill the up the answer with information pertaining to the current mode of transportation, such as cost and travel distance.

Each of the question on Part 1 was designed with a statement to be measured based on 5-point Likert scale of 'agreement' level; from 'totally disagree', 'disagree', 'neutral', 'agree', and 'totally agree'. The data was collected for 24 weeks and was later analysed using various statistical techniques.

3.2. Method of Data Collection

To capture data surveyed, the team created an online-based GoogleForm which had all the questions developed for the questionnaire. Once this was completed and launched, the link to the questionnaire was distributed through social media channels made 'viral' through friends, friends of friends, and family members. No tokens were given out (in contrast to traditional methods of questionnaire survey) in the course of data collection period.

3.3 Statistical Analysis

One of the main objectives of this research intends to analyse the influence of technology (apps, website) in commuters' decision to use public transport and measure public readiness to use public transportation with and without information system tools. We used questions form the questionnaire that was devised in order to engage the level of preference (Likert scale) of users towards using the app and match it with gender, salary category or distance to commute category. The questions are as follows:

1. Does the app on public transportation information meet the needs of users?
2. Does the app on public transportation information encourage users to use public transport?
3. Does the app on public transportation information help users save time of travel to work?
4. Does the app on public transportation information help users save cost of travel to work?
5. Does the app on public transportation information help users in selecting the mode of transport to work?

The analysis for this study catered multivariate categorical data which looked into the association between the Likert scale level for each question and gender, salary category or distance to commute category. Thus, in analysing this variable, a Multiple correspondence analysis (MCA) was used in order to cluster or find a pattern relating the Likert scale from the questions, gender and salary category or distance to commute category.

MCA are methods for analysing observations on categorical variables. MCA is usually viewed as an extension of simple correspondence analysis (CA) to more than two (2) variables. CA analyses a 2-way contingency table; MCA and JCA (Joint Correspondence Analysis) analyse a multi-way table.

MCA is also a part of a family of multidimensional descriptive methods (e.g., clustering, factor analysis, and principal component analysis) revealing patterning in complex datasets when we

dispose more qualitative variables (ordinal, or nominal) in (Greenacre and Blasius 1994). As mention in Kalayci and Basaran [3], MCA is used to represent datasets as “clouds” of points in a multidimensional Euclidean space; this means that it is distinctive in describing the patterns geometrically by locating each category of analysis as a point in a low-dimensional space. The results are interpreted on the basis of the relative positions of the categories and their distribution along the dimensions; as categories become more similar in distribution, the closer (distance between points) they are represented in space [3] MCA can be a particularly powerful as it “uncovers” groupings of categories in the dimensional spaces, providing key insights on relationships between categories, without needing to meet assumptions requirements such as those required in other techniques widely used to analyse categorical data (e.g., Chi-square analysis, Fischer’s exact test, -statistics, and ratio test) [3].

The use of MCA is, thus, particularly relevant in studies where a large amount of qualitative data is collected [2,4]. Following Greenacre and Blasius [2], Kalayci and Basaran [3], MCA is a weighted PCA (Principal Correspondence Analysis) process applied to the indicatory matrix X, i.e. to the set of the J binary variables but with the chi-square- metric on row/column profiles, instead of the usual Euclidean metric. The chi-square metric is in fact a special case of the Mahalanobis metric used in Generalised Canonical Analysis [3]. The inner product of such a matrix, is called the Burt Table or Burt Matrix by which the result of the inner product of a design or indicator matrix, and the multiple correspondence analysis results are identical to the results would obtain for the column points from a simple correspondence analysis of the indicator or design matrix [5]. Thus, based on Kalayci and Basaran [3], the interpretation of MCA is given as follows:

a) MCA is best suited for exploratory research and is not appropriate for hypothesis testing and its correspondence graphs allow spotting the strongest relationships in a set n-way crosstabs.
b) MCA is very sensitive to outliers, which should be using as supplementary points or eliminated prior to using the technique.
c) The number of dimensions to be retained in the solution is based on dimensions with inertia (Eigenvalues) in Greenacre and Blasius [2] suggested an adjusted inertia which gives a better idea of the quality of the maps.
d) The distance between categories is based on a chi-square metric.
e) Categories, which are closer together, have higher chi-squares if analysed in a conventional cross-tabular format. The contributions, the test values and the squared cosines help in the interpretation of the results.
f) The interpretation in MCA is often based upon proximities between points in a low-dimensional map (i.e., two (2) or three (3) dimensions).

According to Aitchison and Greenacre [1] and Kalayci and Basaran [3], for the proximity between categories we need to distinguish two (2) cases. First, the proximity between levels of different nominal variables means that these levels tend to appear together in the observations. Second, the proximity between levels means that the groups of observations associated with these two (2) levels are themselves similar.

3.4. Notation

We use notation that is fairly standard in the literature on correspondence analysis (for example (Greenacre and Blasius 1994)). Let x1, . . . , xq be categorical variables on N observations that are active in the analysis. To simplify notation, but without loss of generality, we assume that xj is coded

with consecutive integers 1, . . . , nj . Let Z(j) be the N ⇥ nj binary indicator matrix associated with xj , Zih(j) =1 if and only if xij =h. Let

$$Z = (Z(1), Z(2), \ldots, Z(q))$$

be the N x J indicator matrix of the set of active x-variables, where J = n1 + · · · + nq.

We will be consistent in letting i index observations 1,...,N, j index variables 1,...,q, and h index categories 1,...,nj, or 1,...,J.

The J x J Burt matrix is defined as B = Z'Z, or B = Z'D(w)Z, where w is the weight for the analysis and D(w) is a J x J square matrix with the weights on the diagonal and 0 off diagonal. The diagonal block of B associated with variable xj is a diagonal matrix with the frequencies of xj on the diagonal. The off-diagonal block of B associated with variables xj and xk is the 2-way cross-tabulation of xj and xk.

In an analogous way, we define B*, the Burt matrix with more rows containing cross-tabulation from the supplementary variables. B* = Z*'Z, where Z* is the indicator matrix with more columns for the supplementary variables.

D(v), in general, represents a diagonal matrix with the elements of vector v on the diagonal and 0 off diagonal; 1 is a column vector of ones where length is defined by the context. The second heading should be regular, 10-point Times New Roman with the first letter of each word capitalized as shown above. The text should be set to single line spacing (1.0 pt) with justified paragraph.

4. Results and Discussion

This section discusses the results and findings of the study. This section is divided into 5 sub-section which explain the findings of each analysis (1-5), which is based on the level of preference (Likert scale) of users towards using the app.

Table 1
List of analysis based on the opinion on the public transportation app.

Opinion on PT App	Analysis
App on PT information meet the needs of users	1 (User Needs)
App on PT information encourage users to use public transport	2 (Encouragement)
App on PT information help users save time to work	3 (Time saving)
App on PT information help users to save cost to work	4 (Cost saving)
App on PT information affect users in selecting mode of transport to work	5 (Mode influence)

Note:
App: Software Application (mobile or desktop)
PT: Public Transportation

4.1. Analysis 1: Fulfilling the Users' Need

Figure 1 shows that Females with salary below RM3,000 per month have a neutral (3) opinion on the app's information on public transport in meeting their needs while men in general feels that that

the app's information on public transport cannot fulfil their needs (strongly disagree). On the other hand, Female and those who are commuting within 20km to 30km and more than 40km to work feels that the app's information on public transport cannot fulfil their needs (strongly disagree) (see Figure 2). However, in general those who commute to work within 2km to 5km find that the app on PT information can fulfil their needs (strongly agree).

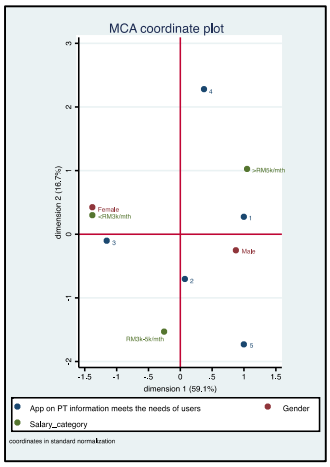

Fig.1. MCA plot on opinion of users regarding app on PT information meeting their needs based on gender and salary category

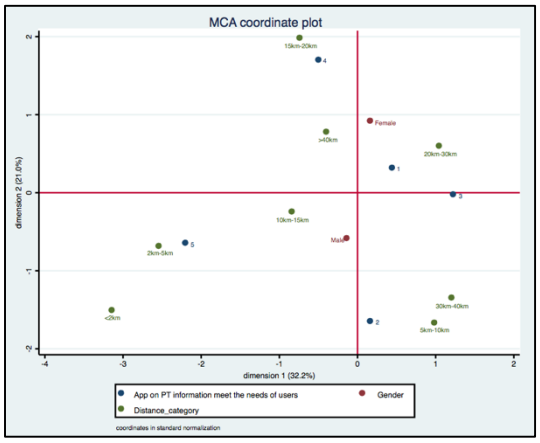

Fig.2. MCA plot on opinion of users regarding app on PT information meeting their needs based on gender and distance category

4.2. Analysis 2: Encouraging the Users

Figure 3 shows that Females and those who earn less than RM3,000 per month salary and more then RM5,000 per month, feels that the app on PT information do encourage them to use public transport. In terms of distance (see Figure 4), those staying within 15km to 20km from their work agrees that the app on PT information can encourage them to take the public transport to work while Male and those living more than 40km away from their work do not feel that the app on PT information can encourage them to use public transport (strongly disagree) (see Figure 4).

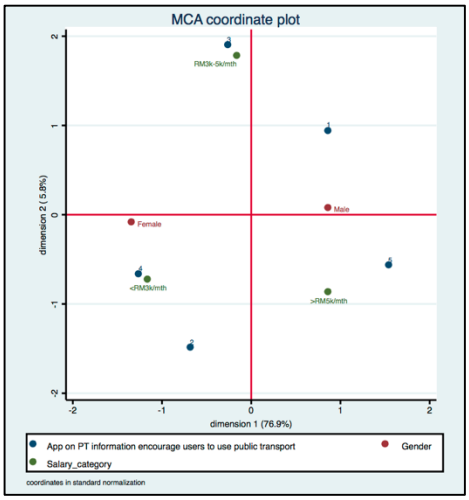

Fig.3. MCA plot on opinion of users regarding app on PT information encouraging them to use PT, based on gender and salary category

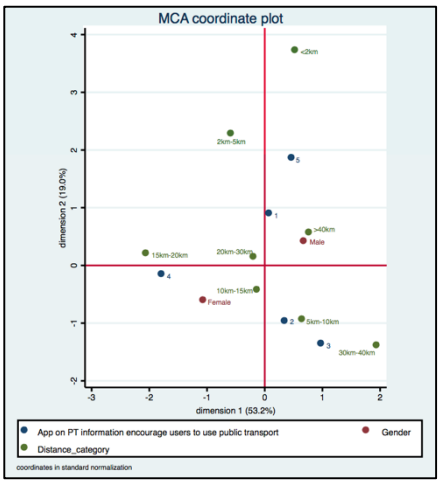

Fig.4. MCA plot on opinion of users regarding app on PT information encouraging them to use PT, based on gender and distance category

4.3. Analysis 3: Time Saving for User

In terms of saving time, Figure 5 shows that Males and those earned more than RM5,000 per month think that the app on PR information can save time to work (strongly agree). At the same time, those who earned salary of less than RM3,000 per month agree that the app on PT information can save time to work, while Females in general are in between neutral and towards agree in opinion that the app can save time to work.

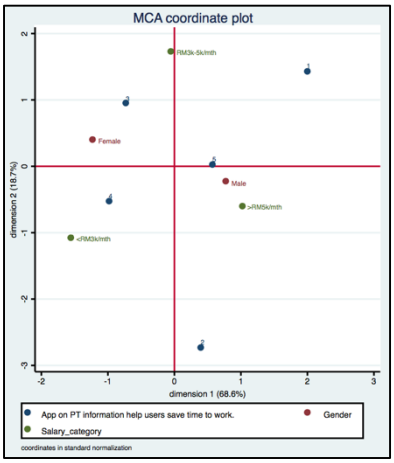

Fig. 5. MCA plot on opinion of users regarding app on PT information that could save time to work, based on gender and salary category

The analysis also shows that those staying 10km to 15km from their work strongly agree that the app on PT information help them save time to work while, those staying within 5km to 10km feels otherwise (see Figure 6). Similarly to the previous analysis (see Figure 5), Females in general, agree that the app can save time to work (agree).

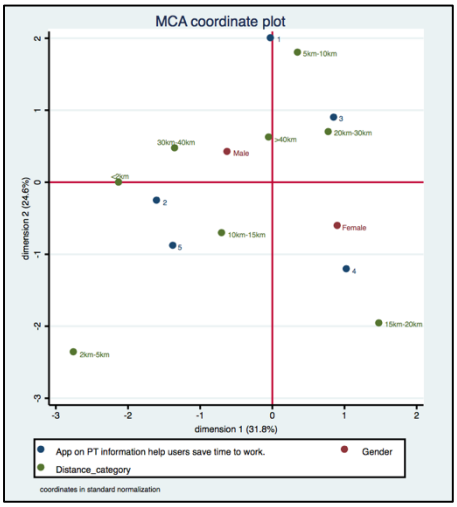

Fig. 6. MCA plot on opinion of users regarding app on PT information that could save time to work, based on gender and distance to work category

4.4. Analysis 4: Cost Saving for User

Figure 7 shows that Males and those earn more than RM5,000 per month think that the app on PT information could save cost to work (strongly agree). Moreover, Female and those earn less than RM3,000 per month also thinks that the app can save cost to work (agree).

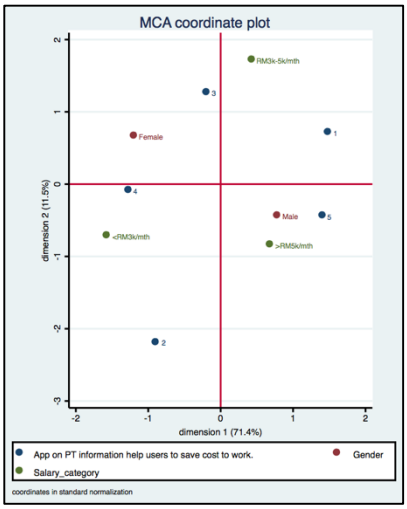

Fig.7. MCA plot on opinion of users regarding app on PT information that could save cost to work, based on gender and salary category

Meanwhile, Figure 8 shows that those staying more than 40km away from work thinks that app on PT information cannot make them save cost to work (strongly disagree), while Female in general and those staying between 2km to 5km to work, thinks that app on PT information can save their cost to work (agree, strongly agree).

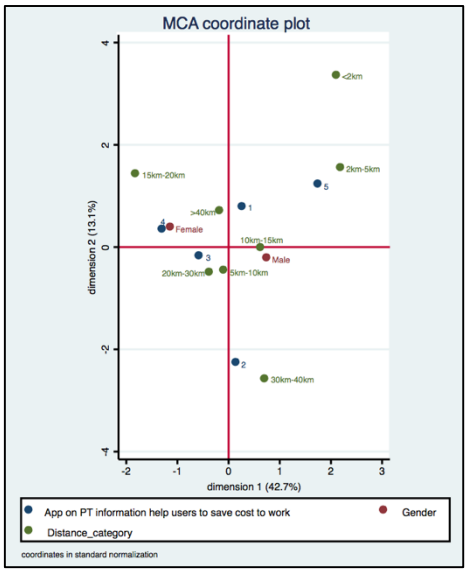

Fig.8. MCA plot on opinion of users regarding app on PT information that could save cost to work, based on gender and distance to work category

4.5. Analysis 5: Influence Users in Selecting Mode of Transport

In Figure 9, the plot shows that both Male and Female, and those earning less than RM3,000 per month strongly feels that the app on PT information can influence their selection of mode of transport. At the same time, Figure 10 shows that road users staying within 10km to 15km from their workplace thinks that the app on PT can influence their mode of choice (agree).

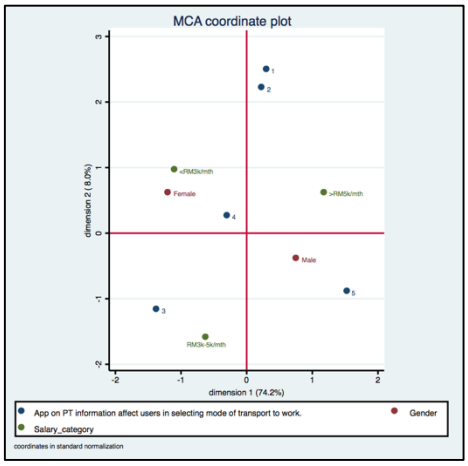

Fig.9. MCA plot on opinion of users regarding app on PT information that could influence user in selecting mode of transport, based on gender and salary category

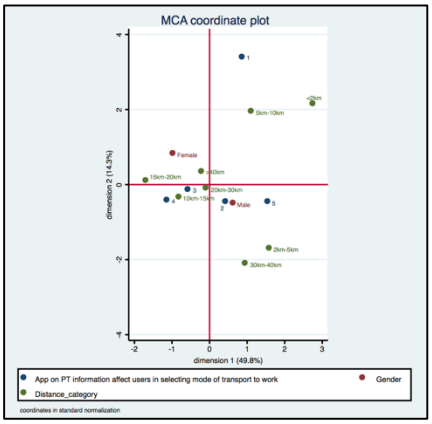

Fig.10. MCA plot on opinion of users regarding app on PT information that could influence user in selecting mode of transport, based on gender and distance category

4.6 Discussion

This study investigates the factors influencing public transport use on commuters' information system tools (apps) in Klang Valley. Generally, timing and costs are the biggest factors that decide whether a commuter uses a public transport or not. An information system tool that can provide these information based on their origin and destination will be able to influence their use more.

However, given that information system use are often skewed towards younger generation, therefore their lower earning capacity dictates that they would be the group most likely to use an app for commuting by public transport, and the variable most important to them would be costs. If there were an app that showed variations of routes with the prices, this demographic group would use public transport for commuting because there is an app for it, as well as using the app because they are using public transport for commuting.

The limitation of this study was more towards the data collection. By eschewing traditional methods of data collection, the team faced difficulties in obtaining good dataset. This method is practical for random sampling on an issue that affects large segments of population. However, for this issue in which only a selected group are affected, online data collection proved more challenging than usual.

5. Conclusions

The main conclusion of this study is that the public lays great importance on costs and timing in selecting public transport as a mode of transport. Therefore the use of an app for this purpose should show these two variables at the very least. Based on the study there are several recommendations:

- An app should be developed for public transport commuting that shows different routes and pricing, ticketing options with prices, and options to select cheapest route/ticket and fastest route/train;
- An app that places importance on costs should be developed for this purpose for lower and middle income groups because costs are most elastic to this demography;
- An app that can deliver real-time arrival/departures should be developed for middle to upper income groups because this demography places value on time more than other groups.

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References

[1] Aitchison, John, and Michael Greenacre. "Biplots of compositional data." *Journal of the Royal Statistical Society: Series C (Applied Statistics)* 51, no. 4 (2002): 375-392.
[2] Greenacre, Michael J., and Jörg Blasius. *Correspondence analysis in the social sciences: Recent developments and applications*. No. Sirsi) i9780121045708. 1994.
[3] Kalayci, Nurdan, and Murat Alper Basaran. "A combined approach using multiple correspondence analysis and log-linear models for student perception in quality in higher education." *Procedia Economics and Finance* 17 (2014): 55-62.
[4] Kohler, Ulrich, and Magdalena Luniak. "Data inspection using biplots." *The Stata Journal* 5, no. 2 (2005): 208-223.
[5] STATA, 2013. STATA Multivariate Statistics Reference Manual: Release 13Texas, USA.
[6] Mustapha, M. (2007). Miros: Menunggang motosikal paling bahaya. Utusan Malaysia, p. 1.