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Safety Indicator for Taxi Users in Urban Area

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Abstract— **Transportation service provided as social responsibility in many country including Malaysia should always be safe and perceived as safe by everyone. However, many studies had found that the increasing level of crime had cause the level of fear increase as well. Thus this had effected the ridership drop on almost all public transport usage especially taxi. Therefore it is the main intention of this paper to look at the different factors affecting the level of safety indication among taxi users in urban area. The paper provide an overview of the factors explaining on how different level of travel satisfaction through a quantitative research method where a personal administered survey was conducted among the taxi users who is living and commuting to the city center using taxi service. One of the significant findings shows that certain element such as driver attitude, age and technology indicate a significant roles as travel safety indicator. As this study only focus in urban area in Klang Valley, therefore the finding cannot be generalize to other area. Among the implication of the findings is that, future planner should take into consideration all factors that could possibly create a low signal of safety level among taxi users. This paper highlight the fear reduction model through a Malaysian empirical evidence which hold a high level of novelty where the application is suitable in Malaysian context urban travelers especially when reducing level of fear among taxi users is concern.**

Keywords— *Travel Safety, Safe, Taxi, Commuter Satisfaction, Public Transport*

1. Introduction

Understanding urban society and their mobility patterns and their connections with area characteristics, including land use, demographic information, and existing facilities, is a traditional topic for urban studies because it is important for the planning and management of urban facilities as well as transportation system planning [1]. It is being agreed by many researcher that taxis are one of the modes of transport that are often not included in government's planning of public transport provisions [2]. They furthered

highlighted that the usage of taxi in many countries has become the first choice for many trips especially for business, night time social activities, tourism, and for individuals with special transport (disability). In Malaysia, the same thing happen where most of the central attention were given to other public transport such as bus and rail services. Thus leaving the taxi services in a big dark. Evolution of technology with recent years, had boost up few taxi technology companies such as GrabCar and Uber services, which developed an e-hailing apps for taxi commuters. E-hailing helps users to easily access their private driver through this apps. The emergence of the e-hailing apps, had further worsen the travelling trip using taxi [3].Although the factors contributing to this remains an open question, but the possible reasons to this might be due to serious travel safety issue and fear of travel that experienced by majority of the society around the world especially when travelling using public transport is concerned. Several attempt have been made to identify the factors of deterrent for public transport usage but lack of research focus on the factors that lead to the situation especially on taxi commuters. Thus, it is the main intention of the paper to examine the factors that affect the level of fear among taxi users and to investigate the relationship that exist between the significant factors that affect the level of fear indication while travelling using taxi in urban area.

2. Current Scenario of Taxi Service And Travel Safety

People who live in today world are objectively much more secure than those who lived there in past centuries However, many social forces promote Western citizens' as high insecurity. Among the factors affecting them is the increasing crime level which make everyone a potential victim [4].

According to the news reported by [5] he mentioned that around 1427 drivers had been charged with a crime since 2011 years until 2016

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in Malaysia. Besides that, he also added that around 126 taxicabs were charged with sexual offence in the years 2015. In a recent study by [6] had highlighted that the same issues were faced in Britain where around thousands of criminal convictions among drivers who are still allowed to carry passengers around Britain. On top of that, there are at least 800 drivers with criminal convictions have successfully renewed their license since 2012. It is also agreed by [7] that the major criticism voiced by the public are centered around the cleanliness and general safety of the taxi vehicle they ride.

3.   Taxi Travel and Safety Review

Travel safety have become one of the considerable factor that influence on public transportation users. The fears of physical offence, crime risk, harassment and other unhuman behaviour have become factors influence the confident of users on taxi service.

4.   Hypothesis

There are five hypotheses being developed on the literature based on the independent variable used in the study.

4.1   Age

The research to date has tended to focus on demographic changes that are closely tied to changes in travel behavior rather than age [8]. So far, however, there has been little discussion about age and the relationship with the level of fear towards crime. An early study by [9] had demonstrated that there is no relationship between age and fear of crime. It seems that [9] understanding of the level of fear and age factors is questionable. Thus many previous researcher have challenged Ferraro and LaGrange claim on the ground that age can lead to different level of fear indication [10], [11],[12],[13],[14],[15].

Fear and age has become the central study by [11] when he defended the view by stating that the elderly people is the most afraid group compare to other group of age especially when fear of crime is concern. Unfortunately he also mentioned that there are many crime which the younger women will be fearful which include sexual assault, stranger attacks and rape. To determine the effects

of fear and age, [15], further claimed that different ages has different type of risk being a crime victim.

Thus, the following hypothesis is proposed:

H1: There is a relationship between age and travel safety among taxi commuter

4.2   Time

Time refer to the travel time for the passenger to use taxi whether day or night. The level of unsafe will be higher if someone travel after dark especially women due to personal reason [16]. A survey conducted by the British Crime Survey show that every eight women there will be one women will avoid the use of public transport after dark because she will fell unsafe.

Time has been always a key factor to determine the happen of a crime. According to [17] investigation on how the occurrence of violence because of the reinforce of masculinity in public transport in Nepal, she finds out that violence on the bus stop and road side usually happened on the office hours times which usually occur in morning or evening. Moreover, on her data collection most of the women stated that travelling using public transport such as bus, taxi and train during off peak hours has made the fell powerless, insecure and consider themselves as physically weak.

Thus, following hypothesis is proposed.

H2: There is a relationship between time and travel safety among taxi commuter.

4.3   Environment

Urban forms can be relatively easily measured; nevertheless, we should interpret cities beyond the spatial distributions of their physical environments and economic resources [18].

Environment refer to the travel environment while waiting at the cab station or a specific place. In cities most of the crime are concentrated by not in a homogenous way [19].There are some spot which is known as red zone because the risk of happening crime is higher. Mixed land, transport

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nodes and city centre are more criminogenic place than residential area [20]. According to [21] they came out with the theory which is the routine activity theory.

In the theory they stated that a motivated offender, a suitable target, absence of capable guardian towards crime and convergence in time and space are the elements that cause the happened of crime in any time at any place. Moreover, people who spend most of the time outdoor will increase their risk to become the victim of violent crime. Passenger who are waiting for public transport usually have high level of fear even though the crime rate are low.

Criminal activities increase because of the area that build "hot spot" concentration whereby undesirable environment conditions and social-economic conflict contribute to criminal behaviour [22]. According to [23] travelling pattern may differ in gender, therefore travel safety for women must be enhance since their travel pattern are much more different compare to men. Allocation and design of the infrastructure should be paying more attention because women usually have a lower self defends ability towards crime compare to men.

Thus, the following hypothesis is proposed

H3: There is a relationship between environment and travel safety among taxi commuter

4.4   Technology

It has been suggested that technological achievements which happen in recent years have once again change the travel patterns and urban structure to the forefront of a better understanding of usage of technology and its impact on the level of fear while travelling. It has conclusively been shown that mobile phone, social media check-ins, and taxi trajectories, provide abundant locations to form a new model of the people movement around the cities [24].

In this high-tech era, it has been demonstrated that technology had been seen as crucial factor on improving the travel safety indication. A survey from SPAD mentioned that, Malaysian are highly prefer e-booking apps and e-hailing service have a good perception rather than general hailing service majority of users felt e-booking apps have good level of security and safety level than general taxi service. Besides that, the report also highlighted that over 77% of e-booking apps users will continue use the service in the future [3].

In, another major study of crime and travel found that if people feel their personal security or property is threatened along their journey, or at the station or stop, they may choose to drive instead of using public transport [25]. This include taxi service. Thus making the taxi service, as a vital role to play in meeting the requirement of public transport user such as door to door service and tracking system to reduce fear feeling while using taxi service.

E hailing is a process that order a taxi service through using a mobile application. The application can provide the exact location of both driver and passenger, the passenger enable to tracking the exact location during the travel to ensure taxi drivers are going the right way [26].

In the most recent study by [27], they have highlight the usage of GPS devices in taxi. It is interesting to note that in their study they did not mention about the impact of the GPS usage on the users feeling of safe.

Thus the following hypothesis is proposed.

H4: There is a relationship between technology and travel safety among taxi commuter

4.5   Attitudes

It is being agreed that, driver behavior was a major issue for taxi users [28]. However, their discussion on driver behavior was purely focus on the usage of the meter. None of the discussion were made of the feeling of safety and the driver attitude. This created a huge gap for the study.

A definition of attitude from a psychological perspective, can be refer to an evaluation of esteem or disdain an individual holds towards some object of interest [7]. It is believed that attitudes can influence the results of individuals possessing imperfect responses that may be either positive or negative.

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A survey conducted by [3] revealed that the second highest factor affecting the taxi service satisfaction level is the driver's attitude. However, the research failed to highlight the details of the driver attitude on the matters. This create a gap for this study.

Thus, the following hypothesis is propose.

H5: There is a relationship between driver attitude and travel safety among taxi commuter2.4

5.   Methodology

This research proceed with the quantitative method as it can describe and explain the phenomena in numerical form [29].In the research our target population will be all of the individual living in Kuala Lumpur and depending on public transport usage. Sampling location in this research will be focusing in Kuala Lumpur. Hence, questionnaires prepared will only be distributed and tested on passenger who use taxi in Kuala Lumpur. Thus, the estimated respondents for this survey will be approximately 384 individuals because according to [30] when the target population is more than 1 million, it required 384 sample size.

A quota sampling techniques is chosen as sampling technique because it is easier to administer, fast to create and more precise especially when determining the respondents criteria. All data collected were analyzed through SPSS software with both descriptive and inferential analysis.

6.   Results and Discussion

6.1   Multiple Linear Regression Analysis

Multiple Regression is used to determine the relationship between dependent variable and independent variable and most importantly to predict dependent variable [31]. Moreover, multiple regression provides a clear exploration of interrelationship between a set of variables. The purpose of this analysis is to forecast outcome from one or several predictors.

6.2   Model Summary in Regression Analysis

Table 1.1: Model Summary of Regression Analysis

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.784[a]	.614	.609	1.98112

a.   Predictors: (Constant), Age, Time, Environment, Attitude, Technology
b. Dependent Variable: Travel Safety among Taxi Commuter

From the Table 1.1 the value of R and R^2 is provided so that the adjusted R^2 of the model can be found, it indicates how much of the total variation in dependent variable (travel safety among taxi commuter) and for independent variable (Age, Time, Environment, Attitude, Technology). The result was 0.614 with the R^2 of 0.609, which means the linear regression explain 61.4% of the variation on the data, 60.9% can be explained. Hence, this study assumed that first order linear auto-correction in multiple regression data is not exist. Furthermore, the R value represent the simple correlation and is 0.784 (the "R" Column), which show that there is a high degree of correlation between independent and dependent variable.

Table 1.2: Coefficients in Regression Analysis

Model		Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	T	Sig.
1	(Constant)	3.350	1.417		2.365	0.019
	Age	0.249	0.045	0.211	5.480	0.000
	Time	-0.074	0.042	-0.069	-1.784	0.075
	Envmt	-0.010	0.033	-0.010	-0.301	0.763
	Attitude	-0.032	0.034	-0.030	-0.932	0.352
	Technology	0.899	0.038	0.781	23.814	0.000

a. Dependent Variable: DV

Based on Table 1.2 the largest beta coefficient is 0.781, which is the technology. This mean that this variable makes the strongest unique variable that explain dependent variable, when the variance explained by other variables in the model is controlled for. The Beta value for Time variable

was the lowest (-0.690) show that it made a less unique contribution. There are two variable which the significant value is less than 0.05 namely age and technology. The results indicate that these two variables make a significant contribution to the prediction of dependent variable. The most interesting finding was that, for the variable of time, environment and attitude the significant value which is more than 0.05, it shows that these variables are not making a significant unique contribution to the prediction of dependent variable (feeling of fear) for taxi users in urban area.

6.3 ANOVA Analysis

Table 1.3: Result of ANOVA analysis

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	2361.370	5	472.274	120.330	.000^b
	Residual	1483.589	378	3.925		
	Total	3844.958	383			

a. Dependent Variable: Travel Safety among taxi commuter

b. Predictors: (Constant), Age, Time, Environment, Attitude, Technology

Based on Table 1.3, the significant value is 0.000 (p=.000), which means it is below the significant level of 0.05 (p<.05). It indicates that there is significant difference among the mean score on dependents variable and groups as determined by on-way ANOVA {F (4,195) =120.330, p=.000p}.

Below will be discuss on the multiple linear regression equation: the equation is showed as below:

$$\gamma = \alpha + B_1 X_1 + B_2 X_2 + B_3 X_3 + B_4 X_4 + B_5 X_5 + \varepsilon$$
(1.1)

$\gamma = \alpha + B_1$ (Age) $+ B_2$ (Time) $+ B_3$ (Environment) $+ B_4$ (Attitude) $+ B_5$ (Technology) $+ \varepsilon$

$= 3.350 + 0.249$ (Age) -0.074(Time) $- 0.010$ (Environment) $- 0.032$ (Attitude) $+ 0.899$ (Technology) $+1.417$

Where γ is equal to travel safety among taxi commuter (DV) and α is constant, B1-B5 is the indication of the regression coefficients computed by the model, X1 refer to age (IV), X2 refer to time (IV), X3 refer to environment (IV), X4 refer to

attitude (IV), X5= refer to technology and ε refer to the error which is not captures by the model.

The multiple regression equation above is known as estimation equation that shall use for predictions. Y as dependent variable, X as independent variable, as the error. Moreover, beta for age (0.249), beta for time (-0.074), beta for environment (-0.010), beta for attitude (-0.032), beta for technology (0.889) and lastly regression constant (3.350). From the model, prediction show the total dependent variable value changes as the independent variable value raise or fall.

6.4 Final Regression Model

Following is the final regression model which include the significant factors that affect the travel safety for taxi commuter. Where γ is equal to travel safety among taxi commuter (DV) and α is constant, B1-B5 is the indication of the regression coefficients computed by the model, X1 refer to age (IV), X5= refer to technology and ε refer to the error which is not captures by the model.

The novelty of the finding for this paper is the simulation of the regression model results and the application on the current scenario where level of fear were measure based on certain indicators of the significant independent variable.

$$\gamma = \alpha + B_1 X_1 + B_5 X_5 + \varepsilon$$
(1.2)

6.5 Regression Model Simulation

Following model will test on the two extremes condition, one is the condition where all taxi commuter indicates very satisfied with the current taxi service provided to them. Another condition will be test on the situation where all taxi commuter indicates " very dissatisfied" with the taxi service provided to them.

Thus using equation 1.2 , the simulation test was run where X1 will be treated as to very dissatisfied with the scale of 1 from the questionnaire. Only significant factor of age and technology were used in this equation.

$= 3.350 + 0.249$ (1) $+ 0.899$(1) $+ 1.417$
$= 5.915$

Based on the equation above, it is clear that the dependent variable will be explain by a total of 5.9% from the independent value. Therefore, a reduction in the level of satisfaction of current commuters will resulted in the 5.9% reduction on the level of safety indication.

Another simulation test was run where X1 refer to a very satisfied scale (5).

$$= 3.350 + 0.249(5) + 0.899(5) + 1.417$$
$$= 10.507$$

Based on the simulation above, the dependent variable will be affected by 10.5% if the respondent indicate a high level of satisfaction on the current service provided to them. This results also indicated that, when a respondent indicates a high satisfaction on the taxi service provision, the level of safety will increase by 10.5%.

Thus, from the results, the following hypothesis was supported:

H1: There is a significant relationship between age and travel safety among taxi commuter.

H5: There is a significant relationship between technology and travel safety among taxi commuter.

The research fail to reject the null hypothesis for the following:

H2: There is no significant relationship between time and travel safety among taxi commuter.

H3: There is no significant relationship between environment and travel safety among taxi commuter.

H4: There is no significant relationship between attitude and travel safety among taxi commuter.

7. Conclusion

Based on the regression model simulation, the formulation of safety indicator was established. Data from various independent variables collected

and analyse through this model to further investigate the impact towards the feeling of safety among taxi commuters. A simulation model was calibrate with the real time experience by current taxi users data to make it more realistic and better understanding of the real issues face. The simulation results shows that as the level of dissatisfaction increase, the level of fear increase as well thus reducing the level of safety indication. Usage of technology also had different effects on the level of safety indication. From this paper, it is clear that usage of technology as a new method of booking for a taxi usage will improved the level of safety indication. Although this study found different effect of age and level of safety indication, reducing the level of fear for all age is deem as important.

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