AN ANALYSIS OF WILLINGNESS TO USE PEDESTRIAN BRIDGE

(TR-002)

Khoo Hooi Ling[1*]

[1] Department OF Civil Engineering, Universiti Tunku Abdul Rahman, Kuala Lumpur, Malaysia
**e-mail : khoohl@utar.edu.my*

ABSTRACT

The very first pedestrian bridge with air-conditioned in Kuala Lumpur was opened on January 2012. It was built to provide a direct link between the famous shopping complexes in Bukit Bintang area. It is also well connected to the light rail transit (LRT) and monorail stations. It is anticipated that the bridge could provide safe and convenient walk for shoppers and to attract them to travel with public transport to the area, which is one of the busiest area in the city. The objective of this study is to investigate the travelers' willingness to use the pedestrian bridge. In addition, it is aimed to understand the underlying factors that contribute to the usage. A revealed preference questionnaire is prepared and a team of 5 students are sent to the site to interview the users. A total of 400 respondents are interviewed. Based on the survey, a binomial probit model is developed to find the encouraging factors for bridge usage. Results show that the respondents perceived satisfactory of the bridge. The major factors that encourage them to use the bridge are: mode shift, convenient provided by the bridge, existence of signboard for clearer directions, age and gender of respondents.

Keywords: pedestrian bridge, binary Probit model.

1. INTRODUCTION

Pedestrian bridge or footbridge is a bridge designed for pedestrians to cross busy roads safely and at the same time minimizing disruption to traffic. On the 28th January 2012, the first fully air-conditioned walkway was officiated by the Prime Minister [1]. This is the first bridge of its kind that is equipped with air-condition.

The bridge, names as Bukit Bintang-KLCC Bridge, provides direct linkage between Kuala Lumpur Convention Centre (KLCC) (or more famously known as Petronas Twin Tower) to Bukit Bintang area, which is the city's major retail and tourism spots. The bridge has a length of 1.173 km, width of 5 m, at a height of 535 m. It travels through the busy areas of Jalan Pinang, Jalan Perak, and Jalan Raja Chulan. In addition, it also connects several LRT/monorail stations. The bridge is built with the anticipation to provide convenient and safe access to the shopping areas which could attract more shoppers to use public transport rather than by car. This indirectly could reduce the traffic congestion in the region.

The objectives of the study are to investigate the public usage of the bridge and the potential mode shift from private car to public transport (rail or bus). It also aims to understand the influencing factors that encourage the bridge usage. A revealed preference survey study is carried out at the surroundings of the bridge. A binomial probit model is then developed to find the statistical significant factors of the bridge usage.

2. STUDY AREA

The bridge linkage and the locations where survey study are carried out are shown in Figure 1.

3. METHODOLOGY

In this section, the methodology on how the study is carried out is explained in details.

3.1. Revealed Preference Survey Study

A revealed preference survey study is designed and conducted in the study area. The excerpt of the survey questions is summarized in Table 1. The survey study is conducted from 15th July 2012 to 15th August 2012. A team of 5 students are sent to the site to interview the respondents. A total of 400 copies of answered survey forms are collected at the end of the survey period. The background of the respondents is shown in Table 2.

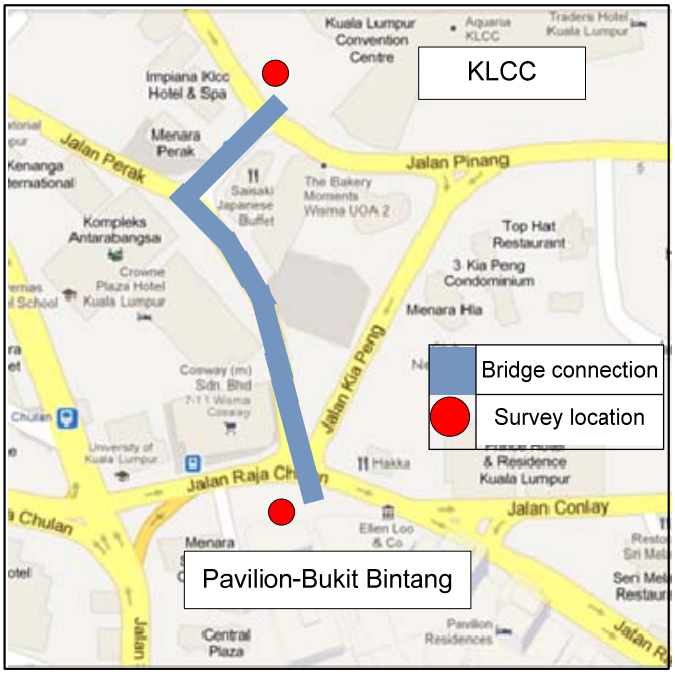

Figure 1. KLCC-Bukit Bintang pedestrian bridge linkage and survey locations

Table 1 Survey Questions

Part 1-Comments Rate how agree are you on the statement given (1-Strongly Disagree; 2- Disagree; 3-Neutral; 4-Agree; 5-Strongly agree) I feel comfortable using the bridge The bridge is well connected to shopping complexes The bridge is well connected to LRT/monorail stations The bridge is easily accessible The bridge brings convenience to me I feel secure walking on the bridge The bridge is clean and tidy The bridge is friendly to the senior citizen Part 2-Suggested Improvements More signage should be placed to show direction clearly To place more security guards A tavelator is necessary to reduce walking To allow hawkers on the bridge To improve connectivity to other shopping complex nearby Facility improvement for disabled/senior citizen
Socio-demographics Age: 18-25; 24-40; 41-55; >55 Gender: Male/Female Do you own a car? Yes/No How do you normally make your daily trips? Car/public Transport

Table 2 Respondent Background

Socio-demographics	Range	Percentage
Age	18-25	57.5
	26-40	31.8
	41-55	8
	>55	2.7
Gender	Male	49
	Female	51
Do you own a car?	Yes	46
	No	54
How do you normally make your daily trips?	Car	36
	Public transport	64

3.2. Binomial Probit Model

Discrete choice modelling approach is adopted in the study to describe travellers' choice. Binomial probit model is applied to describe the pedestrian bridge usage (0: not using; 1: using). The principle of probit models is that an individual is trying to maximize his or her utility, by choosing whether to use the bridge. The higher the utility is, the more likely that he/she will choose to use the bridge. Based on maximum likelihood estimation technique, discrete choice models capture the influence of attributes and characteristics on the decision makers' preferences [2].

The utility function of alternative *j* (i.e. to use or not to use), U_{ij} , for an observed individual *i* could be expressed as follows:

$$U_{ij} = V_{ij} + \varepsilon_{ij}, j = 1, 2, ..., J \quad (1)$$

for which the utility could be decomposed into two components, namely observed utility, V_{ij} and a stochastic element (as error term), ε_{ij} for *J* alternatives. For *n* variables (i.e. attributes), eqn. (1) could then be derived as follows:

$$U_{ij} = \boldsymbol{\beta}\mathbf{x} + \varepsilon_{ij} \quad (2)$$

where $\boldsymbol{\beta}$ is the vector of attributes that to be estimated and $\mathbf{x}$ is the vector of interested attributes for an individual *i*. Correspondingly, the observed data *y* of an individual *i* is such that:

$$y = \text{alternative } j \text{ if } U_{ij} > U_{iq} \ \forall \ q \neq j \quad (3)$$

A probit model focuses on the selection of whether to use the pedestrian bridge. The choice probability is expressed as follows:

$$P_{ij} = P\left(U_{ij} > U_{iq}\right), j \neq q \quad (4)$$

The probit model has no mathematical closed form. The probability could be estimated by using the Monte Carlo simulation.

In this study, the dependent variable is usage of the bridge (0: not using; 1: using). The independent variables are connectivity to shopping complexes and LRT/monorail stations, convenient, accessibility, clean, security, disabled-person friendliness, signboard existence, and respondents' background. All these variables are measured in a 5-scale Likert scale that explains the degree of agreement of the respondents towards the statements.

4. FINDINGS AND DISCUSSIONS

In this section, findings from the survey study and the bridge usage probit model are presented. Details explanation to the model obtained is presented as well.

4.1. Respondent Perception of The Bridge

Figure 2 shows the perception of respondents to the bridge usage. It could be seen that in average, respondents perceive that it is clean, comfort, secure, and convenient to use the bridge. In addition, they agree that the bridge is easy accesible and provides good connection to the shopping complex and LRT/monorail stations.

They were asked to rate one (1) most attractive feature that they prefer about the bridge. 35% of them agree that the bridge has good connectivity with LRT/monorail stations. 31% of the respondents show preference to the air-conditional provided in the bridge. 26.5% of them said that easy accessibility is important while about 7% of them said that the bridge is clean and tidy.

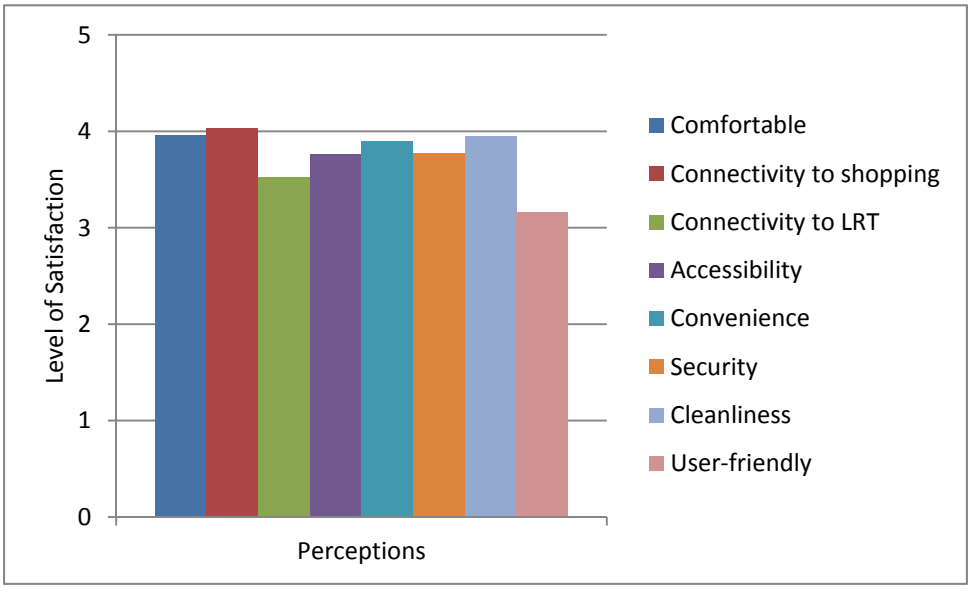

Figure 2. Respondents perception

4.2. KLCC-Bukit Bintang Bridge Usage Probit Model

Table 3 shows the binomial probit model developed to identify the influencing factors of KLCC-Bukit Bintang bridge usage. Among all the dependent variables listed in Table 1, only 3 variables are found to contribute to the bridge usage, namely mode shift, more directional signboard, and convenient. All dependent variables show positive sign, except gender. This means that the likelihood of using the bridge increases when the respondents perceive greater satisfaction to the dependent variables. For example, if more signages are in-placed to show clear directions of the bridge, it would encouarge more people to use it. In terms of mode shift, if more respondents travel to the study area by public transport, the chances of using the bridge to walk to the shopping complex nearby increases. In addition, respondents are more willing to use the bridge if they perceived that it is convenient to use it. The socio-demographic characteristics of the respondents could influence the willingess of using the bridge to some extent. It is found that senior and female respondents have higher preference to use the bridge. The connectivity to shopping complex variable shows a marginal contribution as its p-value is high. This indicates that this variable is less important and contribute marginally to the model.

Table 3 Binomial Probit Model for KLCC-Bukit Bintang Bridge Usage

Variable	Coefficient	t-statistic	p-value
Constant	-2.21	-4.12	0.0
Mode shift (0: No; 1: Yes)	0.46	1.995	0.046
More directional signboard (5-scale Likert scale)	0.15	1.662	0.097
Connectivity to Shopping Complex (5-scale Likert scale)	0.13	1.283	0.199
Convenient (5-scale Likert scale)	0.14	1.542	0.123
Age (0: 18-25; 1: 26-40; 3: 41-55; 4: >55)	0.45	3.999	0.001
Gender (0: Female; 1: Male)	-0.30	-1.681	0.092
p-value: 0.16			

4.3. Suggestions for Improvement

In the last section of survey, the respondents are asked to rate the improvements neccessary for the bridge. Figure 3 shows the weighted average of the suggested improvements. The most important improvement required is to build more disabled-person and senior citizen friendly facilities. This is relevant since the binomial probit model shows that senior citizen tend to use the bridge. The second improvement favored is

to improve the connectivity to other shopping complex nearby. This would provide more convenient to users. Third improvement suggested is to place more security guards at the surroundings of the bridge. Since it is a covered bridge, tighter security would prevent crime from happening. The fourth suggestion is to increase more signages which could show the directions clearly. Current signages are insufficient. The fifth one is to build travelator to reduce walking and last is to allow hawkers on the bridge. The respondents did not perceive that by allowing hawkers to sell things on the bridge is one type of covenient to them.

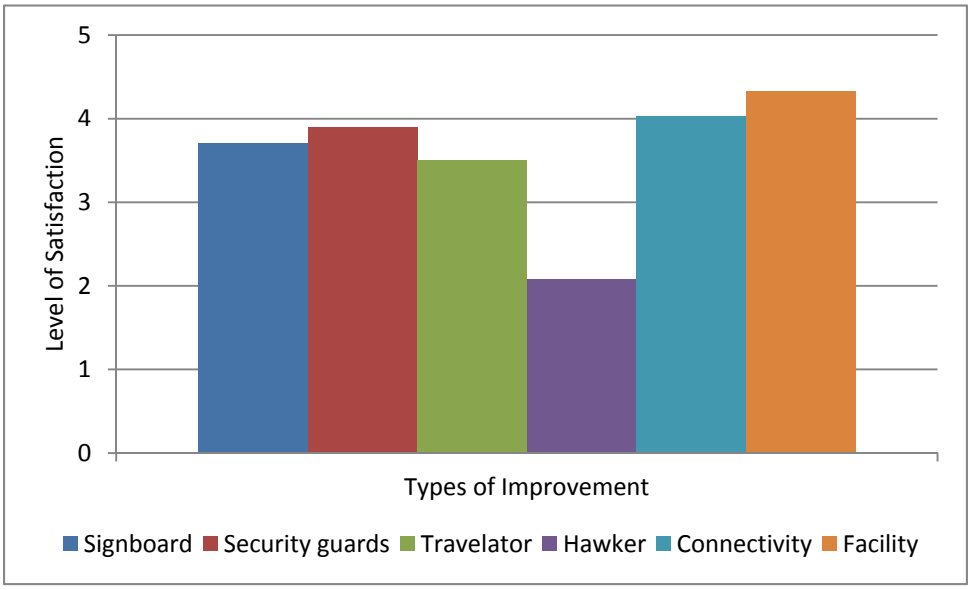

Figure 3. Suggested improvements

5. CONCLUSIONS

A revealed preference survey study was carried out to study the willingness of shoppers in using the KLCC-Bukit Bintang pedestrian bridge. A binomial probit model is developed to understand the factors that encourage the usage. It was found that, in general, the respondents perceive satisfactory towards the bridge. The contibuting factors are: mode shift from private vehicles, placing more signboards, convenient, connectivity to shopping complex, age, and gender of the respondents. It is suggested that more facilities friendly to the disabled-person and senior citizen is preferred. In addition, the security of the bridge needs to be tighten as well.

6. REFERENCES

[1] Bernama (2012) PM opens Bukit-Bintang KLCC pedestrian walkway. Retrieved August 20, 2012. The New Straits Times. http://www.nst.com.my/top-news/pm-opens-bukit-bintang-klcc-pedestrian-walkway-1.38338#

[2] Train, Kenneth E. (2003). Discrete Choice Methods with Simulation. United Kingdom: Cambridge University Press.