USER BENEFIT ANALYSIS OF MAIN PEDESTRIAN BRIDGES

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ABSTRACT

As a developing country, a smooth transportation system is one of the main factors that we should be concerned in attracting foreign investors, thus increasing the economic potential of our country. The traffic volume has increase year by year and one of the solutions for this issue is by increasing the number of lane for congested road network. However by doing so, it will give high risk for pedestrian to cross the road and the heavy traffic flow could also be contributed to more accidents involving pedestrians. Pedestrian bridge is one of the important structures to be constructed especially in urban areas where traffic volume is high. Unfortunately, the pedestrian bridge that has been built is not fully utilized by pedestrians and become a wastage. Pedestrians usually prefer to cross at-grade rather than choosing the bridge. Therefore, this study is set to identify the effectiveness of pedestrian bridges in Kuantan Town Centre and to analyze the miss opportunity factors by Cost Benefit Analysis approach. Two bridges located at Jalan Tun Ismail and Jalan Mahkota had been chosen and one collected for traffic volume, pedestrian volume and questionnaire analysis on users' opinion.

ABSTRAK

Sebagai sebuah negara yang membangun, sistem pengangkutan jalan yang lancar merupakan salah satu faktor utama untuk diberi perhatian dalam menarik pelabur asing sekaligus meningkatkan ekonomi negara kita. Peningkatan jumlah aliran trafik di negara ini meningkat tahun demi tahun dan penyelesaian terbaik untuk mengatasi masalah ini adalah dengan menambah bilangan lorong jalan. Walau bagaimanapun, penyelesaian ini akan memberi risiko yang tinggi untuk pejalan kaki menyeberangi jalan sekaligus akan menjejaskan aliran trafik disebabkan adanya kemalangan jalanraya yang melibatkan pejalan kaki. Namun begitu, jambatan pejalan kaki yang dibina oleh pihak kerajaan tidak digunakan sepenuhnya oleh pejalan kaki sehingga menjadikannya satu pembaziran. Pejalan kaki biasanya lebih suka untuk memilih cara atau jalan yang cepat dan bukannya memilih jalan yang lebih selamat untuk sampai ke destinasi yang dituju. Kajian ini bertujuan untuk mengenal pasti keberkesanan jambatan pejalan kaki di pusat bandar Kuantan dan menganalisis faktor-faktor yang mempengaruhi pengunaannya menggunakan pendekatan 'Cost Benefit Analysis'. Tiga kaedah yang berbeza telah digunakan untuk dua lokasi yang terletak di Jalan Tun Ismail dan Jalan Mahkota. Kaedah tersebut adalah pengumpulan data jumlah trafik dan jumlah pejalan kaki, soal selidik dan menganalisis data.

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CHAPTER 1

INTRODUCTION

1.1 Project Background

As a developing country, a smooth transportation system is one of the main factors that we should be concern in attracting foreign investor thus increasing the economy of our country. The traffic flow could be affected by the accidents that involving pedestrians. Pedestrians are also road users who contribute to the increase in road accidents statistic in this country apart from the drivers and motorcyclist.

Pedestrians usually prefer to choose a quick way to get to their destination rather than choosing safety way. These factors will bring up several problems and dangerous situation to other road users because of the attitude of pedestrian who has ignoring their safety when crossing the roads. Therefore, the facilities for pedestrians to cross the road safely and without disrupting others road users are very important. The best solution of this problem is to construct the pedestrian bridge with all the safety factors.

Nowadays, the pedestrian bridge is become one of the important structures to be construct especially in urban areas which has high traffic volume. This is also one of government's efforts in order to encourage local people to walk from one place to another place nearby and thus it will decrease the volume of traffic. The construction of pedestrian bridges cannot be considered as a waste if the usage and the objective to reduce the rate of accidents which involving pedestrians has achieved.

From the road accident statistic report by PDRM, on 2005, there are 162,491 road cases with 5,712 are died. The 711 numbers of deaths are involving pedestrians which is the second highest statistic after the motorcyclist. The highest percentage of injury based on behaviour is because of careless when their crossing the roads and the popular location where most of the deaths happened is in the middle of road. Therefore the alternative way to solve or reduce this problem is to construct pedestrian bridge. By doing this, it will not stopping the traffic flow especially during peak hour and at the same time we can reduced the number of pedestrians died. However, the objective will not achieved when pedestrian are not willing to use the pedestrian bridges even though it has been build nicely for pedestrians.

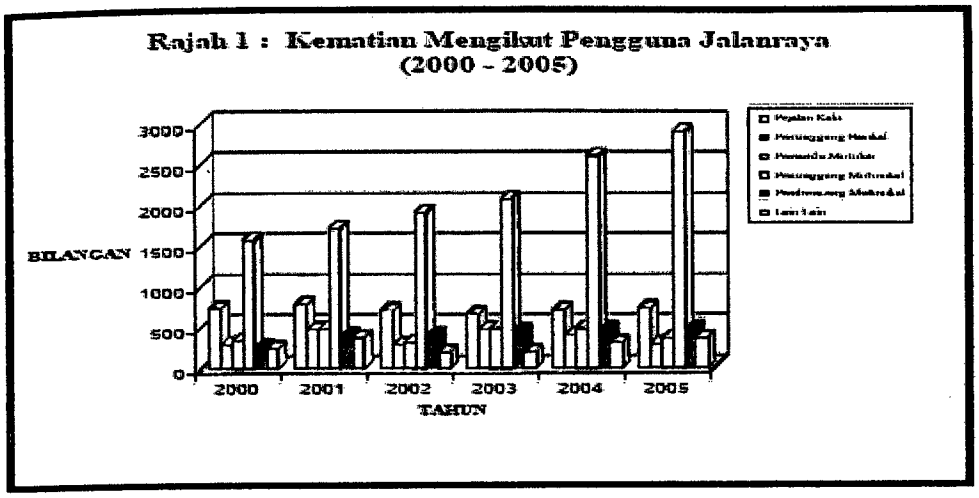

Figure 1.1 Road Accident Statistic Report

Behaviour	TYPE OF INJURY			Total
	Death	Critical	Light	
Walking/Playing	141	489	653	1,283
Sports	1	5	7	13
Handicap	0	13	7	20
Careless During Crossing	333	918	968	2,219
Drugs	3	2	0	5
Drunk	12	10	4	26
Not Using Facilities	12	24	31	67
Older/Crazy	31	20	24	75
JUMLAH	**533**	**1,481**	**1,694**	**3,708**

Figure 1.2 Injury Based on Behaviour

1.2 Problem Statement

Pedestrian bridge is one of the facilities that has been built to maximize the safety of road users especially pedestrians when crossing the roads. In addition, the construction of a pedestrian bridge will take time and require high costs, including maintenance costs. However, this pedestrian bridge is often overlooked and very minimal usage of pedestrians to cross the road by using that. They are willing to face the danger of an accident while crossing the road rather than using pedestrian bridge. The construction of pedestrian bridge will become unprofitable for local authorities if the objective is not achieved as pedestrians prefer to cross the roads which also cause traffic flow disruption.

1.3 Objectives

There are two objectives for this research as below:

1) To identify the effectiveness of pedestrian bridge utilization
2) To analyze the factors effecting pedestrian bridge usage based on CBA approach.

1.4 Scope of Works

This study will be conducted in the area of Kuantan town which has a lot of pedestrians and high traffic volume. The selected pedestrian bridges are at Jalan Tun Ismail (near Maybank) and Mahkota Street (near Teruntum Complex).

In addition, this study only focused on issues related to pedestrian bridges such as the factors that cause minimizes usage of pedestrian bridge. Some of the factors referred to pedestrian safety, the suitability of the location of pedestrian bridges and the effectiveness of pedestrian bridge utilization.

1.5 Expected Outcomes

From this research, the expected outcomes are:

1) To propose a few steps and effective correctives measure for Kuantan Municipal Council (MPK) in order to help the authorities take an action such as do a campaign to encourage people use the facilities provided.

2) To produce a systematic approach to increase the usage of pedestrian bridges.

1.6 Significant of Study

The study is very important in order to identify the direct as well indirect reason, which contributes to the utilization of pedestrian bridges by the pedestrian. The finding from this study shall be considered as a systematic approach to improve the effectiveness of using pedestrian bridges and more important is consequently reduce the number of road accidents which involve pedestrians.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Walking is the oldest and most basic form of transportation. Each of us does it every day as some part of every trip, whether walking to a bus stop or across a parking lot to our car. Regular walking is important both for human health and for the natural environment. Frequent exercise such as walking tends to reduce the chance of obesity and related medical problems. In contrast, using a car for short trips tends to contribute both to obesity and via vehicle emissions to climate change: internal combustion engines

are more inefficient and highly polluting during their first minutes of operation (engine cold start). General availability of public transportation encourages walking, as it will not, in most cases, take one directly to one's destination and it also can reduce the traffic volume furthermore the emissions from vehicle.

As the number of accidents involving pedestrians increased, many parties such as Public Works Department (JKR) and Road Transport Department (JPJ) are also taking action to help reduce the accident statistics. A priority should be given to road users like pedestrians who are vulnerable to the accident because they do not have specific protection as other consumers such as motorcyclist and drivers.

2.2 Pedestrian

According to Wikipedia, a pedestrian is a person traveling on foot, whether walking or running. In some communities, those traveling using roller skates or skateboards are also considered to be pedestrians. In modern times, the term mostly refers to someone walking on a road or footpath, but this was not the case historically. These are the example of the duties of pedestrians and nearby drivers according to Florida traffic's law by Florida Department of Transportation.

Pedestrian use of streets and highways

- Where sidewalks are provided, no pedestrian shall, unless required by other circumstances, walk along and upon the portion of a roadway paved for vehicular traffic.
- Where sidewalks are not provided, a pedestrian walking along and upon a highway shall, when practicable, walk only on the shoulder on the left side of the roadway in relation to the pedestrian's direction of travel, facing traffic which may approach from the opposite direction.

- No person upon roller skates, or riding in or by means of any coaster, toy vehicle, or similar device, may go upon any roadway except while crossing a street on a crosswalk; and, when so crossing, such person shall be granted all rights and shall be subject to all of the duties applicable to pedestrians.
- No pedestrian shall walk upon a limited access facility (freeway or interstate highway) or a ramp connecting a limited access facility to any other street or highway.

2.2.1 Pedestrian Characteristics

Virtually everyone is a pedestrian. As a group, they exhibit a wide range of needs. Pedestrians also vary greatly in age, height, physical ability, visual acuity, awareness of their surroundings and reaction time. According to pedestrian and bicycle facility planning and design manual by Vermont Agency of Transportation, a person's age, physical ability and cognitive capacity influence how they behave and react when walking showed as below: *(source: Adapted from Guide for the Planning, Design and Operation of Pedestrian Facilities (Draft), American Association of State Highway and Transportation Officials (AASHTO), 2001.)*

Table 2.1 Common Pedestrians Characteristics by Age Group

Age Group	Pedestrian Characteristics
0 to 4	• Learning to walk • Requires constant parents/adults supervision • Developing peripheral vision and depth perception
5 to 8	• Increasingly independent, but still requires supervision • Poor depth perception
9 to 13	• Sense of invulnerability • Poor judgment • Susceptible to "dart out" intersection type crashed
14 to 18	• Improved awareness of traffic environment • Poor judgment
19 to 40	• Active, fully aware of traffic environment
41 to 65	• Reflexes begin to slow
65 and above	• May cross streets with difficulty • May have poor sight • May have difficulty in hearing vehicles approaching from behind • High fatality rate if involved in a crash

A number of factors influence a person's decision whether to walk or drive is travel time and how long it will takes to reach at their destination. There are several factors that pedestrians choose not to walk as below *(Chau Chen Hung, 2007)*:

- Pavement surface is not in a good condition such as cracked, rough and slippery.
- Loss of part of the route.
- Lack of maintenance of footpaths such as garbage and cracked.
- The distance increasing because of barriers, fences and road layout.
- Lack of signs of ongoing indicator to the destination.
- Poor quality of lighting system
- Lack of rest and seating place.
- Speed of traffic
- Lack of continuous pedestrian's route.
- Lots of obstacles on footpaths including the placement of facilities inappropriate way.

2.2.2 Pedestrian Safety

Pedestrians are particularly vulnerable in the road environment because most other road users are moving significantly faster than pedestrians, and pedestrians have little or no bodily protection in the event of a collision. Pedestrians are also often difficult to see and their behaviors may be unpredictable. This can make it challenging for other road users to successfully factor pedestrians into the decisions they are constantly making as drivers and riders.

Pedestrian safety is for all ages. Unfortunately, in traffic incidents involving pedestrians and motorists, it is the pedestrian who suffers, often with tragic results. In many cases it is not the driver's fault. It is the responsibility of both driver and pedestrian to ensure each other's safety by following some simple rules. As a pedestrian:

- Cross at marked crosswalks or traffic lights, not in the middle of the block or between parked cars;
- Make sure drivers see you before you cross;

- Cross when traffic has come to a complete stop;
- At traffic light, cross at the beginning of a green light. Do not cross once the "Don't Walk" signal begins to flash or once the light has turned to yellow. Never cross on a red light;
- Watch for traffic turning at intersections or entering and leaving driveways;
- Wear bright or light-coloured clothing or reflective strips, when walking in dusk or darkness.

There are several types of pedestrian crossing that has been used worldwide in order to sustain pedestrian safety such as:

i) Pedestrian Traffic Signals

-Frequently used at locations with large numbers of pedestrians, to separate pedestrian and vehicles.

-Also installed at some mid-block locations where there are significant numbers of pedestrians (young, older or pedestrians with disabilities) wishing to cross.

-Scramble crossing will stop all vehicles and permit pedestrians to walk in all directions.

ii) Pedestrian Crossing (Zebra Crossings)

-Drivers must slow down and be prepared to stop when a pedestrian steps onto a marked crossing.

-Drivers must give way to any pedestrian on the crossing. Some crossings are difficult for you to see, so zigzag white lines are painted on the road to give drivers advance warning.

-Some drivers will not stop for pedestrians so wait until all vehicles have stopped before you start to cross.

iii) Raised Pedestrian Crossings

- Raised pedestrian crossings are placed at locations where there is a high level of pedestrian activity.

-They are raised to increase visibility of the crossings and pedestrians to approaching drivers.

-They also help to slow down the traffic.

iv) Children's Crossings

- Children's crossings are usually part-time crossings which operate before and after school hours, and at other times that may be agreed by the local council. Outside these times the area isn't a pedestrian crossing.

- When in use, red flags displaying he words CHILDREN CROSSING are used.

-Drivers must slow down and stop before the stop line when a pedestrian is on the crossing or waiting to cross – remain stopped until all pedestrians are off the crossing.

v) Shared Crossing

- Zebra crossings are sometimes used as children's crossings. When they are, the red flags will be shown, and the above rules apply.

-Otherwise they operate as a normal zebra crossing.

vi) Pelican Crossings

-The signals for pedestrians at pelican crossing are the same as those at normal mid-block pedestrian signals.

-The difference with pelican crossing is that when the DON'T WALK pedestrian symbol is flashing, drivers will see a flashing yellow light. This means, if there's no risk of a collision, a vehicle can be driven through the crossing.

vii) Pedestrian Fencing

-Pedestrian fencing is installed to stop pedestrians walking across heavily traffic roads. The fencing directs pedestrians to controlled crossing.

viii) Pedestrian Traffic Symbols

-Many traffic lights have pedestrians' signals to help you cross the road safely. Press the button and wait for the lights to change to the 'green walk' symbol before crossing.

-Make sure the vehicle stop before you start to cross, and do not go if vehicles are moving through the crossing.

ix) Pedestrian Refuge Islands

-Pedestrian refuge islands are not pedestrian crossing; they are installed on busy or wide roads to help pedestrians cross in two stages.

-Sometimes they are used with a pedestrian crossing, when a staged crossing is required.

2.3 Pedestrian Bridges

According to Wikipedia, since the early 1980s, several charities have developed manually footbridge designs that are sustainable for use in developing countries. The first charity to develop such standardized designs was Helvetas, located in Zurich, Switzerland. Designs that can be sustainably and efficiently used in developing countries are typically made available to the public gratis, such as the ones on the Bridges to Prosperity website. The number of bridges built using such wire rope technology in developing countries number over 6,000(versus a worldwide need of 500,000.

Pedestrian bridge is a structure that serves a link from one point to another point, which has a barrier or an obstacle between them. This pedestrian bridge is used by people to cross the river, roads, railways and others. However, generally in Malaysia, pedestrian bridge was constructed to cross the roads especially in urban areas where the road network are more complex.