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Research paper

Assessment of University Campus Cycling Facilities: the Students' Perceptions

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Abstract

Cycling can prevent environmental pollution, such as air pollution and noise pollution. The use of motorised mode of transportation in campus will be more exposed to dangers of pollution, such as carbon monoxide. This study aims to measure and identify factors that contribute to students' perceptions and satisfaction levels of cycling facilities. Factors that were studied can further improve the existing facilities. Efficiency and effectiveness can be observed in service quality or facilities provided by relevant parties. This study focuses on male and female students who always cycle in the National University of Malaysia (UKM) and involves the participation of students from Year 1 to Year 4. A total of 200 questionnaires were distributed to these students. From the Importance-Performance Analysis (IPA) factors, such as cycling lane good surface conditions (sidewalk), clean environment and willingness to cycle should be considered because these factors contribute to customer satisfaction.

Keywords: *Cycling; importance-performance analysis (IPA); students' perception; university campus.*

1. Introduction

According to [1], a bicycle is something that can be owned and is perfect for campus life. Cycling is a physical activity that requires energy from body movements. Cycling can help to improve a person's intelligence to think and help him in his daily activities with more energy. In addition, cycling can reduce a person's disease risk like heart disease and high blood pressure. This is because cycling makes blood circulation flow smoothly, and thus the heart will receive enough oxygen. A student who cycles can release his tension, and thus reduce the encountered problem.

In addition, cycling can also prevent environmental pollution, such as air pollution and noise pollution. The use of motorised mode of transportation in campus will expose more to pollution dangers, such as carbon monoxide which contributes to environmental pollution [2], [3]. The use of bicycles in university areas can reduce traffic congestion in campus.

Green transport is often practised as an active transport system which encourages students to walk or cycle in campus. With this active transport practice, the use of private vehicles on campus is reduced, and thus can be a strategy to reduce traffic congestion and pollution in campus. There are many students who live in residential colleges within the campus. Therefore, cycling is a suitable transportation which can be practised by those who stay in close distance. As a matter of interest, cycling does not create pollution nor wasted resources [4]. Also there are several factors that affect bicycle users and should be noted when preparing for cycling facilities, such as special routes, security for cyclists and the provision of lights at every cycling path to avoid crime incidence over cyclists. Cycling infrastructure that was previously developed in several campuses has showed that increase in supporting infrastructure, such as cycling paths, can be typically associated with increase in the number of bicycle users [5]. Among the successful universities which have encouraged students and staff to use active transport is the University of California, Berkeley, in the United States. As for travelling in campus 50% involves active transport, either by walking or a cycling trip, 20% use public transport and the remaining 30% use private vehicles. In Europe, the Netherlands has the world's most bicyclists, where 27% travelling in the country use bicycles, followed by Denmark by 18% and 10%, respectively, for Finland, Germany, Sweden and Belgium [6].

The aims of this study are to measure and identify factors that contribute to students' perceptions and satisfaction level of cycling facilities. Factors that were studied can further improve the existing facilities. Efficiency and effectiveness can be observed in a service quality or facilities provided by relevant parties. Student satisfaction is also an important element in determining whether the product or service quality provided by an organization is good or bad.

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2. Methodology

This study was conducted at the National University of Malaysia (UKM) main campus in Bangi, Selangor. About 35 km from Kuala Lumpur and it covers an area of 1,100 hectares [7]. The study focuses on both male and female students, involving students from Year 1 to Year 4. According to UKM's Student Management Division, there are about 13,896 undergraduate students.
The study methodology to obtain information and data is through a survey with questionnaires distributed to respondents. Prior to this study a pilot study was conducted to ensure that the study objectives and goals are achieved. This pilot study was used as a technique to test the content validity. A total of 30 questions were distributed in the pilot study.
For the study, 200 questionnaires were distributed among students. The next step in process was the separation of obtained data according to respective categories. Then, the user satisfaction level was measured by using the important-performance analysis (IPA), introduced by [8]. This analysis aims to examine the relation between service users and quality improvement priorities or known as quadrant analysis [11]. IPA has the main function to display information relating to factors that affect service satisfaction and loyalty, as well as service factors that need to be improved. Through this method, respondents were asked to rate the importance and satisfaction levels. Next the degree of importance and satisfaction values were analysed by using the Importance-Performance Chart. X-axis represents the satisfaction level while y-axis represents the interest level. IPA chart consists of four quadrants. Each quadrant has different elements and it is based on interest-performance measurement results, as shown in Figure 1.



Fig. 1: The original partition of the IPA grid in areas with distinct implications for product or service development (adapted from [8]).

Explanatory sentences for each quadrant [9];

I. "Keep up the good work" (high importance & high performance)
The factors that lie in this quadrant are considered as the supporting factors to passenger's satisfaction, so the management of the service should ensure that the performance that has been achieved will be maintained.

II. "Concentrate here" (high importance & low performance)
The factors that lie in this quadrant are considered as very important factors to passengers, but the current conditions are not satisfactory, so the management of the service need to allocate resources to improve its performance. The factors in this quadrant are the priority for improvement and enhancement.

III. "Low Priority" (low importance & low performance)
The factors that lie in this quadrant have a low level of satisfaction, but are considered not too important to passengers. The management of the service does not need to give fully priority to these factors.

IV. "Possible overkill" (low importance & high performance)
The factors that lie in this quadrant are considered no too important compared to other factors, so the management of the service should allocate resources related with these factors to other factors that have a higher priority to be handled, and still need improvement

3. Result and discussion

3.1. Characteristics and respondent's background

Based on the studies that were conducted, there were 200 respondents, consisting of 38.7% males and 61.3% females. There were 10 colleges involved in the survey, which were Kolej Pendeta Za'aba (KPZ), Kolej Ibrahim Ya'akub (KIY), Kolej Ungku Omar (KUO), Kolej Burhanuddin Helmi (KBH), Kolej Aminuddin Baki (KAB), Kolej Dato Onn (KDO), Kolej Tun Hussein Onn (THO), Kolej Keris Mas (KKM), Kolej Rahim Kajai (KRK), and Kolej Ibu Zain (KIZ). Statistics showed that the majority of respondents were from KPZ with a total of 18.7%, followed by KUO with a total of 11.3%. Then, for KKM and KRK both were 10.7%, while a total of 9.3% consisted of KIY, KAB and KIZ. Respondents from college Tun Hussein Onn was 8.7%. Finally, KBH and KDO showed 6.0% of respondents.
Then this survey was conducted at different available faculties in UKM, Bangi. Results showed that the majority of respondents were from the FST (25.3%). Next were FKAB students (21.3%), followed by faculty FTSM, FPEND and FSSK, which showed (11.3%) respondents, and FEP students (8.7%). Lastly, students from FUU and FPI, consisting 6.0% and 4.7%, respectively. The respondents were from Year 1 until Year 4. Year 2 respondents showed the most with a total of 34.0%. 26.7% of the respondents were from Year 1. Year 3 and Year 4 were 19.3% and 20%, respectively.

3.2. Importance performance analysis

Table 1 shows the results of the average satisfaction level calculation and priority in handling the factor. The calculation results that were related to the cycling infrastructure are displayed in form of IPA in Figure 2, based on the average value of measurement results and level of management priorities.

Matzler et al. [10] explained that IPA is based on respondent perceived importance of service attributes and attribute performance. Detail and rigorous IPA study are needed in order to obtain more reliable results [11]. In this study, there were two scales that were used to show the relation between performance and importance of cycling facilities. For the level of performance indication, the minimum value of the scale is "1", representing that the respondents are very dissatisfied while the maximum value is "5" which represents that the respondents were very satisfied with the provided facilities for cyclists. For level of importance indication, the minimum value of "1" represents that the attribute is not very important, while the value of "5" represents that the attribute is very important for respondents.

Table 1: Table of average performance and average importance

No	Attributes	Average Performance	Average Importance
1	A safe lane for riding a bike and cross the street	3.07	4.37
2	Topography appropriate	3.05	4.40
3	Easy to cycle (no conflict pedestrian)	3.21	4.17
4	Easy to through cycling paths (no roots or obstruction)	3.00	4.51
5	Continuation and extension cycle routes	3.06	4.49
6	Drainage design (no stagnant water on the route)	2.90	4.21
7	Parking space for bicycles	3.07	4.33
8	Lighting at night	2.99	4.42
9	A clean environment	3.21	4.53
10	Maintenance for plants	2.93	4.07
11	Willingness to cycle	3.37	4.42
	Average value	**3.08**	**4.35**

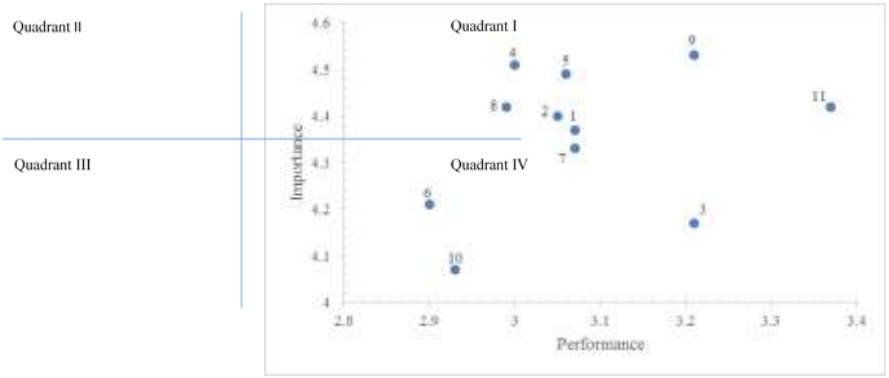


Fig. 2. Important Performance Analysis
*Note: Number of items refer to Table 1.

Figure 2 shows the relation between the provided cycling facilities performance in campus and its importance level towards respondents. The attributes will be categorised in four different quadrants based on their performance and importance towards the respondents. Quadrant 1 shows the attributes are important, satisfy customers and have done well in management. The variables included in this quadrant are a clean environment (Attribute9) and willingness to cycle (Attribute11). A clean environment is important because it is closely related to health and user's comfort. Clean and fresh air will help cyclists to clear their minds and enjoy the activity. Then, if the cycling practices are largely implemented, it can help to preserve the environment where cycling is much less carbon intensive as compared to other modes of transportation [12].

The results also showed that most of respondents already have the willingness to cycle. This is a good sign to implement cycling practices in the campus. Based on a study done by [5], reliability and accessibility are the main aspect factors that influence a student's willingness to cycle in campus. So, to give these respondents more encouragement, the management need to provide and improve more cycling facilities, such as bikeways, bicycle parking and consider safety aspects seriously. From Table 1 and Figure 2, it is concluded that Attributes 9 and 11 have high average performance and high average importance level. Based on a study done by [8], the attributes will lie in Quadrant 1, where the attributes are considered as supporting factors to customer satisfaction; thus, these attributes need to be maintained by the management [9].

Quadrant 2 shows factors are considered important by customers but are not fulfilled by the management. The variables included in this quadrant are a safe lane for cycling and crossing the street (Attribute 1), topography is appropriate (Attribute 2), easy to go through the cycling paths where there are no roots or other obstructions (Attribute 4), continuation and extension cycle routes (Attribute 5) and lighting at night (Attribute 8). The results showed that the attributes had a high importance level value for respondents, but the facilities provided is of low-level performance. This situation will lead the attributes to be categorised in Quadrant 2 [8]; thus, these attributes become the main priorities for the management to improve, as likely stated by [9].

The improvement that can be done is to increase or extend the bicycle lane in campus. Based on a study done by [5], as the bicycle lane facilities increases, then the number of cyclists' increase. This is important to avoid road accidents with cyclists. Other improvements include to increase road maintenance [13], including clearance of obstructions along the cycle lane and repair or maintain the road gradient so that it is not too steep. This is because a steep road will be uncomfortable to cyclists and will reduce their willingness to cycle. Moreover, the management need to increase other facilities, such as lighting along the road and provide clear signage to increase road safety besides increasing the awareness in campaigns to road users. To realise the mission to become a more bicycle-friendly campus, the management needs to inspect the planning, funding for infrastructure development while improving safety and enhancing convenience [5].

Quadrant 3 shows factors that are considered less important by customers and not fulfilled by the management. Variables included in this quadrant are drainage design, where there is no stagnant water on the route (Attribute 6), parking space for bicycles (Attribute 7) and maintenance for plants (Attribute 10). These show that the importance level and attribute performances are low. Major improvements are not needed for these attributes because they are less important and will not highly affect the respondents' willingness to cycle.
The drainage design needs to be considered because if there is too much stagnant water on road, and thus it will be very dangerous to cyclists if the road is slippery and tend to cause accidents. Parking space for bicycles may not be important at early stage, but as the number of cyclist increases, more parking space will be required to ensure bicycle safety from being stolen. Meanwhile, the plants maintenance may be not very important to respondent, but the management will still need to monitor and trim the plants regularly to avoid obstructing branches to cyclists. Overall, as attributes have low importance and performance, they will be fall in Quadrant 3 [8]; thus, the above attributes can be ignored [9].
Quadrant 4 shows factors that are considered less important by the respondents but are implemented in redundant by the management. The variables included in this quadrant are easy to cycle, which is no conflict to pedestrian (Attribute 3). In the current situation conflict between cyclists and pedestrian seldom occur. It shows that the facility performances are better than the facility importance to users. Then, Martilla and James [8] explained that this attribute must be located at Quadrant 4; thus, for redundantly implemented attributes made by the management, it is better for the company to firstly prioritise allocation for its resources [9].

4. Conclusion

As a conclusion, this study is to assess the student satisfaction level and the importance of cycling facilities in UKM. To further enhance the satisfaction level, the management of cycling facilities should provide lanes for bicycles in campus. In addition, the lighting at night also needs improvement. This is to ensure the cyclists' safety. We can get many benefits from cycling, such as reduce in environ-mental pollution, traffic congestion and so on. Furthermore, an increase in the number of bicycles will also affect students' perceptions against cycling facilities.

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