

Investigating Walking Satisfaction Through The Pedestrian Bridge User's Appraisal in Surabaya

A Wiyono¹, A R Pattisinai*¹, F R Widayanti¹

¹Department of Civil Engineering, Faculty of Engineering, Universitas Negeri Surabaya, Indonesia, 60231

Abstract. Walking is essential to access public transportation. Previously, investigating walking satisfaction was done by the tangible scheme. But now the pedestrian is not only seen as people who use these facilities daily. Through the pedestrian bridge user's appraisal, we can understand which factors are more (or less) important and significant. The elements discussed in this study are walking satisfaction elements, namely safety, security, convenience, continuity, comfort, system coherence, and attractiveness. To explore this, we surveyed Basuki Rahmad Street, Surabaya, Indonesia (N=120). The method using is Importance - Performance Analysis (IPA) which is a measure of the level of service satisfaction that enters the quadrants on the Importance Performance Matrix map. In this method, it is necessary to measure the suitability level to find out how much the user feels satisfied with the performance of pedestrian bridges. We find that the most factor that the user unsatisfied is B2 which is lighting in the night, followed by D1 (hands holder on Pedestrian Bridge that is easy to reach and not rust) and D5 (Building which can reduce vibration when the vehicle is speeding above it).

1. Introduction

Walking is an important mode of transport in developing countries.[1] However, inadequate pedestrian infrastructure has compelled people to switch to other transport modes. Not only pedestrian infrastructure has continued to be underrated in common transportation planning and policy development exceptionally in South East Asia [2], [3], but also needs of pedestrians have persisted to be the least concern of the public, particularly in developing contexts.

Moreover, more than one-fifth of those who die on the road every year, instead of driving a car, motorcycle or even a bicycle, but they are pedestrians. Even though frequent pedestrian deaths and injuries in many locations increase every year, pedestrian safety still does not get proper attention[4]–[6]. Pedestrians are not interested in using the pedestrian bridge when they crossing the road because of discomfort dan does not feel safe. On the other hand, the location of the public transportation shelter is always not far from the pedestrian bridge. In spite walking is essential to access public transportation, the knowledge of user' behavior can help to understand their needs. It is expected that creating pedestrian bridge environments based on what they need is an essential point for the success of walking satisfaction. [7][5][8][9]. The satisfaction of pedestrian bridges users is important because appeasing walking experienced by pedestrians is more probable to be preferred again another time, and continued as an established behavior [10].

The infrastructure of pedestrian bridges stimulates a specific pattern of travel that, despite the fact created for and by humans, circumscribe a variety of synergy that is responsive to existing environmental transformation and interactions. Walking on a pedestrian bridge is a particular experience of moving through an environment, where material, bodily, and elemental forces converge [11]. In Surabaya, pedestrian bridges have long been present in the middle of the citizen activities,

especially in the Central Business District such as Basuki Rahmad Street that has three pedestrian bridges along this street. Nevertheless, these bridges already exist, this bridge is not always being a pedestrian choice. There is a prohibition on crossing directly along the street because it is dangerous, it is also not considered by the pedestrian.

Previously, investigating walking satisfaction was done by the tangible scheme. But now the pedestrian is not only seen as people who use these facilities daily. Through the pedestrian bridge user's appraisal, we can understand which factors are more (or less) important and significant. The elements discussed in this study are walking satisfaction elements, namely safety, security, convenience, continuity, comfort, system coherence, and attractiveness. Pedestrian comfort means to move without restriction and less disturbing things due to the interactions with another user and motionless barrier in the pedestrian bridge. [12][13][14]. Hence, pedestrian features could intensify not only the appearance of a street and add an inducement for people to approach around pedestrian bridges [15].

For these aims, exploring the walking satisfaction through the pedestrian bridge user's appraisal is very important. The use of the Importance - Performance Analysis (IPA) method is to measure the level of service satisfaction that enters the quadrants on the Importance Performance Matrix map. In this method, it is necessary to measure the suitability level to find out how much the customer feels satisfied with the performance of pedestrian bridges.

2. Method

2.1 Data collection and sampling design

The purpose of this study is to investigate the user satisfaction about the facilities of a pedestrian bridge by using variables. The data obtained is then processed using quadrant analysis and descriptive analysis by the percentage of each research variable to be studied. Data collection was carried out by distributing questionnaires to 120 respondents. In this study, the sampling of the study was a random sampling method. The method is considered appropriate to be used in research whose the number of population is unknown (unstable).

Table 1. Research measurement sampling scale

Place	Side	Respondent	User (N=120)
Gramedia	Left	8	22
	Right	14	
Ranch market	Left	7	25
	Right	18	
Tunjungan plaza	Left	24	73
	Right	49	

2.2 Importance - performance analysis (IPA)

The use of the Importance - Performance Analysis method is to measure the level of service satisfaction that enters the quadrants on the Importance Performance Matrix map. In this method, it is necessary to measure the suitability level to find out how much the customer is satisfied with the company's performance, and how much the service provider understands what the customer wants for the service they provide.

This research was conducted to analyze consumer satisfaction with the facilities of the Pedestrian Bridge facility located on Jalan Jendral Basuki Rahmat. The results of the analysis were obtained from questionnaire data distributed to pedestrian bridge users along the road section. the questionnaire contained pedestrian bridge service performance indicators which were then assessed by pedestrian bridge users. from this analysis, we will get several indicators that affect the satisfaction of pedestrian bridge users that are not yet well available, the ones that can be improved so that they can improve the services of the pedestrian bridge. The indicators used have shown down below.

Table 2. Importance performance analysis indicators

No	Code	PEQI indicators
1	A1- A2	Safety
2	B1- B2	Security
3	C1	Convenience
4	D1- D9	Comfort
5	E1	System coherence
6	F1	Attractiveness

3. Result and discussion

Penelitian ini dilakukan untuk menganalisis kepuasan pengguna dengan fasilitas JPO yang berlokasi di Jalan Jendral Basuki Rahmat. Hasil analisis diperoleh dari data kuesioner yang dibagikan kepada pengguna JPO di sepanjang ruas jalan. Kuesioner berisi indikator kinerja layanan JPO yang kemudian dinilai oleh pengguna JPO. Dari analisis ini, kita akan mendapatkan beberapa indikator yang memengaruhi kepuasan pengguna JPO yang belum tersedia dengan baik, yang dapat diperbaiki sehingga dapat meningkatkan layanan JPO.

3.1 Analysis of the level of satisfaction of pedestrian bridge users

This research was conducted at three Pedestrian Bridge points located along the Basuki Rahmat street section which is the business center of the city of Surabaya. There are three pedestrian bridges: Gramedia, Ranch Market, and Tunjungan Plaza Area. The results of the analysis of the three Pedestrian Bridges are as follows:

3.1.1 Analysis of the level of satisfaction of gramedia pedestrian bridge

In Gramedia Pedestrian Bridge, the majority of travel activities are from 35% residential and 60 % office inside of the district. Because of the location itself in the middle of the Central Business District (CBD), this pedestrian bridges likely used by the employees. Based on the IPA matrix of figure 1, it shown that indicators that are considered important for Pedestrian Bridge users but are not in line with the expectations of Pedestrian Bridge users at Gramedia are indicators 4 (B2) and 6 (D1), which is lighting at night and hands holder on Pedestrian Bridge that is easy to reach the user and not rust.

Table 3. Importance performance analysis of gramedia pedestrian bridge

No	Code	Performace	Importance	X	Y	Tki
1	A1	126	134	4,20	4,47	94,030
2	A2	126	134	4,20	4,47	94,030
3	B1	112	128	3,73	4,27	87,500
4	B2	108	133	3,60	4,43	81,203
5	C1	113	127	3,77	4,23	88,976
6	D1	115	132	3,83	4,40	87,970
7	D2	117	133	3,90	4,43	87,970
8	D3	104	129	3,47	4,30	80,620
9	D4	120	131	4,00	4,37	91,603
10	D5	120	135	4,00	4,50	8,889
11	D6	120	128	4,00	4,27	93,750
12	D7	118	130	3,93	4,33	90,769
13	D8	119	128	3,97	4,27	92,969
14	D9	116	126	3,87	4,20	92,063
15	E1	124	131	4,13	4,37	94,656
16	F1	117	127	3,90	4,23	92,126

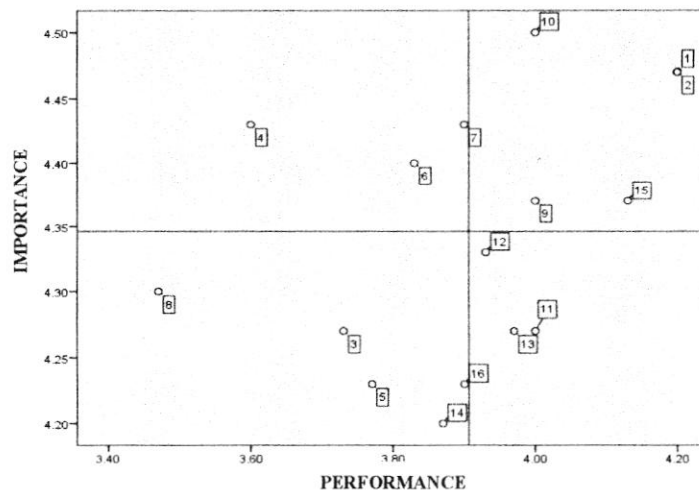


Figure 1. IPA matrix of gramedia pedestrian bridge

3.1.2 Analysis of the level of satisfaction of ranch market pedestrian bridge

4. Based on questionnaires to 25 pedestrian respondents on Ranch Market Pedestrian Bridge, 40% of respondents (10 respondents) pedestrians had the purpose of eating, shopping, and meeting. This pedestrian bridge is equipped by lift, so the handycapes could access it. The matrix in figure two shows that there are five indicators that are felt to be less than optimal for JPO users. These indicators are:

1. Indicator 4 (B2) Lighting at night
2. Indicator 8 (D3) Billboards that not interfere with the user's view to see the situation down
3. Indicator 9 (D4) Size of the appropriate guardrail
4. Indicator 10 (D5) Building which can reduce vibration when the vehicle is speeding above it

5.

6. Table 4. Importance performance analysis of ranch market pedestrian bridge

No	Code	Performace	Importance	X	Y	Tki
1	A1	115	142	3,83	4,73	80,986
2	A2	118	137	3,93	4,57	86,131
3	B1	125	134	4,17	4,47	93,284
4	B2	99	140	3,30	4,67	70,714
5	C1	124	142	4,13	4,73	87,324
6	D1	115	138	3,83	4,60	83,333
7	D2	113	138	3,77	4,60	81,884
8	D3	102	140	3,40	4,67	72,857
9	D4	112	140	3,73	4,67	80,000
10	D5	110	140	3,67	4,67	78,571
11	D6	120	134	4,00	4,67	89,552
12	D7	110	137	3,67	4,47	80,292
13	D8	117	138	3,90	4,57	84,783
14	D9	115	133	3,83	4,60	86,466
15	E1	118	136	3,93	4,43	86,765
16	F1	117	132	3,90	4,53	88,636
					4,40	

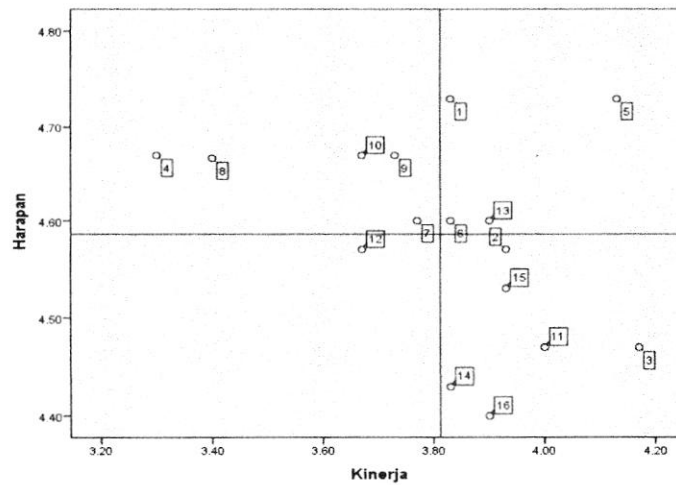


Figure 2. IPA matrix of ranch market pedestrian bridge

7.

8. 3.1.3 Analysis of the level of satisfaction of tunjungan plaza pedestrian bridge

9. Pedestrians who walk from Tunjungan Plaza often stop to enjoying eating and drinking activities. The tenant and vendors who provides the fresh food always give the attraction to pedestrian. The matrix in figure three shows that there are three indicators that are felt to be less than optimal for Ranch Market Pedestrian Bridge Users. These indicators are:

1. Indicator 4 (B2) Lighting at night
2. Indicator 6 (D1) hands holder on Pedestrian Bridge that are easy to reach and not rust
3. Indicator 10 (D5) Building which can reduce vibration when the vehicle is speeding above it

10.

11.

12. Table 5. Importance performance analysis of tunjungan plaza pedestrian bridge

No	Code	Performace	Importance	X	Y	Tki
1	A1	369	412	4,10	4,58	89,563
2	A2	371	399	4,12	4,43	92,982
3	B1	347	388	3,86	4,31	89,433
4	B2	309	402	3,43	4,47	76,866
5	C1	360	393	4,00	4,37	91,603
6	D1	348	402	3,87	4,47	86,567
7	D2	352	401	3,91	4,46	87,781
8	D3	312	391	3,47	4,34	79,795
9	D4	352	405	3,91	4,50	86,914
10	D5	350	411	3,89	4,57	85,567
11	D6	363	389	4,03	4,32	93,750
12	D7	350	397	3,89	4,41	90,769
13	D8	360	394	4,00	4,38	92,969
14	D9	352	389	3,91	4,32	90,488
15	E1	374	396	4,16	4,40	94,444
16	F1	349	383	3,88	4,26	91,123

13.

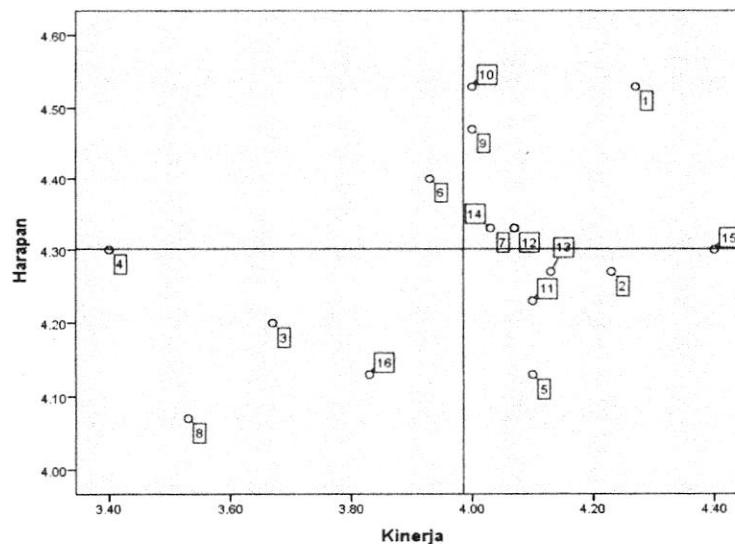


Figure 3. *IPA matrix of tunjungan plaza pedestrian bridge*

14.

Based on the results of the quadrant analysis it is known that the indicators needed by JPO users but the condition of the field facilities have not been met is lighting the lights at night. This is supported also based on the results of a condition survey in the field which shows that the lighting parameters are present but not optimal, and based on the interview results it is known that these conditions occur mainly at night.

4. Conclusion

The elements discussed in this study are walking satisfaction elements, namely safety, security, convenience, continuity, comfort, system coherence, and attractiveness. To explore this, we surveyed Basuki Rahmad Street, Surabaya, Indonesia (N=120). The method using is Importance - Performance Analysis (IPA) which is a measure of the level of service satisfaction that enters the quadrants on the Importance Performance Matrix map. In this method, it is necessary to measure the suitability level to find out how much the user feels satisfied with the performance of pedestrian bridges. We find that the most factor that the user unsatisfied is B2 which is lighting in the night, followed by D1 (hands holder on Pedestrian Bridge that is easy to reach and not rust) and D5 (Building which can reduce vibration when the vehicle is speeding above it).

5. References

- [1] W. Dong, X. Cao, X. Wu, and Y. Dong, "Landscape and Urban Planning Examining pedestrian satisfaction in gated and open communities: An integration of gradient boosting decision trees and impact-asymmetry analysis," *Landsc. Urban Plan.*, vol. 185, no. February, pp. 246–257, 2019.
- [2] I. Mateo-babiano, "Pedestrian 's needs matters : Examining Manila ' s walking environment," vol. 45, pp. 107–115, 2016.
- [3] I. Mateo-babiano, H. Tang, S. Conejos, and E. H. W. Chan, "A63 Is an Active City a Healthier City for the Elderly? Examining Hong Kong ' s Active Transport Planning and SOT-14 Active Travel & Health," *J. Transp. Heal.*, vol. 3, no. 2, pp. S42–S43, 2016.
- [4] S. Lakhotia, S. Lassarre, K. R. Rao, and G. Tiwari, "Pedestrian accessibility and safety around bus stops in Delhi," *IATSS Res.*, 2019.
- [5] G. Yannis, J. Golias, and E. Papadimitriou, "Modeling Crossing Behavior and Accident Risk of Pedestrians," no. November, pp. 634–644, 2007.
- [6] W. E. M. P. E, N. Coppola, and Y. Golombek, "Research in Transportation Business & Management Urban clear zones , street trees , and road safety," *Res. Transp. Bus. Manag.*, no. August, pp. 1–8, 2018.
- [7] S. Kim, S. Park, and J. Seung, "Meso- or micro-scale? Environmental factors influencing

- pedestrian satisfaction,” *Transp. Res. PART D*, vol. 30, pp. 10–20, 2014.
- [8] J. Golias, G. Yannis, E. Papadimitriou, S. Lassarre, and A. Banos, “MODELLING CROSSING BEHAVIOR AND ACCIDENT RISK Crossing behavior model,” no. June, 2004.
 - [9] D. Pešić, N. Milutinovic, and M. Maslac, “Pedestrian behaviours : Validation of the Serbian version of the pedestrian behaviour scale,” 2016.
 - [10] P. Iamtrakul and J. Zhang, “MEASURING PEDESTRIANS ’ SATISFACTION OF URBAN ENVIRONMENT UNDER TRANSIT ORIENTED DEVELOPMENT (TOD): A CASE STUDY OF BANGKOK,” vol. 16, no. 2, pp. 125–134, 2015.
 - [11] K. Barry, “Geoforum More-than-human entanglements of walking on a pedestrian bridge,” *Geoforum*, no. November 2017, pp. 0–1, 2018.
 - [12] E. M. Cepolina, F. Menichini, and P. Gonzalez, “Level of service of pedestrian facilities : Modelling human comfort perception in the evaluation of pedestrian behaviour patterns,” *Transp. Res. Part F Psychol. Behav.*, vol. 58, pp. 365–381, 2018.
 - [13] M. Appel, N. Krisch, J. Stein, and S. Weber, “Smartphone zombies! Pedestrians’ distracted walking as a function of their fear of missing out,” *J. Environ. Psychol.*, 2019.
 - [14] R. Planning, “Climate-Sensitive Pavement Modelling for Pedestrian Ways,” vol. 169, pp. 408–415, 2016.
 - [15] A. Radisya, S. Zhao, and X. Mi, “Quantifying the relationship between visitor satisfaction and perceived accessibility to pedestrian spaces on festival days,” *Front. Archit. Res.*, vol. 4, no. 4, pp. 285–295, 2015.



CERTIFICATE OF APPRECIATION

AWARDED TO

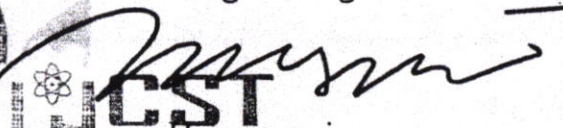
Agus Wiyono

as PRESENTER in

International Conference
on Science and Technology

October 17-19th, 2019 – Surabaya, Indonesia

Chairman of Organizing Committee


IJCST
Husni

19770722 200312 1 006

