

# Analysis of Factors Affecting the Use of Bicycle Rental for Tourism in Surakarta

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**Keywords:** Bicycle Rental, Tourism.

**Abstract:** Cultural diversity is a rich asset for individuals and communities. Protection, promotion and maintenance of cultural diversity are essential requirements for sustainable development for the benefit of present and future generations. Surakarta is one of the cities in Indonesia that has many cultural heritage. Surakarta is also known as green city with green transportation as one of policies. Sustainable development strategies can not forget the culture: the strategy should be culturally sensitive as well as take advantage of the dynamic interaction between cultures. To that end, the city of Surakarta plans the introduction of cultural tourist areas to visitors by offering a choice of environmentally friendly mode of transportation in the form of bike rental to get around in the cultural tourism area. Sampling technique using non-random sampling technique to 100 respondents of visitor attractions Surakarta Palace, Vastenburg Fortress, and Pura Mangkunegaran. Questionnaires were given by interview. The method of analysis used is factor analysis method principal component analysis (PCA). Based on the analysis of 22 variables formed 8 new factors that influence the visitors to use bicycle rental in the cultural tourism area of Surakarta City that is operational bicycle rental, bicycle rental user safety, supporting conditions, bicycle facilities, affordability and cost, bicycle rental system, and clarity of rental fee bike.

## 1 INTRODUCTION

The Indonesia is a nation that has a high level of cultural diversity. Culture in Indonesia is very influential on the development of time from time to time and changes in natural conditions in Indonesia (Melina, 2016). The Convention on Protection and Promotion of the Diversity of Cultural Expression of UNESCO 2005 in its definition says cultural diversity is a rich asset for individuals and communities (UNESCO, 2005). Protection, promotion and maintenance of cultural diversity are essential requirements for sustainable development for the benefit of present and future generations. In achieving sustainable development, the United Nations has set 17 sustainable development objectives by 2015. The 11th objective is sustainable cities and communities and the 13th objective is climate change

Surakarta is one of the cities in Indonesia that has a cultural heritage and also as green city. One of the policies in green city of Surakarta is green transportation. As a green city that has many cultures, Surakarta city is faced to preserve and maintain the

culture also develops green city. This is in line with the United Nations sustainable development objective of making cities more inclusive, safe and sustainable and taking important steps to fight climate change and its impact.

Previous research on bikes as environmentally friendly transportation with bikes sharing concept has been done (Bachand-Marleau, J., 2012; Lee B H Y, 2012; El-Geneidy A. M., 2012), (Tajuddin, 2012; Musyafir, 2012; Wunas S., 2012; Hamzah B., 2012), (Faghih-Imani A., 2014; Eluru N., 2014; El-Geneidy A M., 2014; Rabbat M., 2014; Haq U., 2014), and (Yanyong G., 2016; Zhou J., 2016; Wu Y., 2016; Li Z., 2016). This research uses the same method of (Fatma I., 2013; Ambar, 2013; Saino, 2013) that is the factor analysis method Principal Component Analysis. The research variables are taken from (Bachand-Marleau, J., 2012; Lee B H Y, 2012; El-Geneidy A. M., 2012), (Tajuddin, 2012; Musyafir, 2012; Wunas S., 2012; Hamzah B., 2012), (Faghih-Imani A., 2014; Eluru N., 2014; El-Geneidy A M., 2014; Rabbat M., 2014; Haq U., 2014), and (Yanyong G., 2016; Zhou J., 2016; Wu Y., 2016; Li Z., 2016)

total 22 variables (Sari P T M, 2018) that have been adjusted to the condition of Surakarta City.

Sustainable development strategies cannot forget the culture: they should be culturally sensitive as well as take advantage of the dynamic interaction between cultures. To that end, the city of Surakarta plans the introduction of cultural tourist areas to visitors by offering a choice of environmentally friendly mode of transportation in the form of bike sharing to get around in the cultural tourism area. Therefore, this study is to aim the factors that influence the visitors to use bike sharing in tourist area of Surakarta city culture.

## 2 THEORETICAL BASE

Region is a space that is a geographical unity and all elements related to it whose limits and systems are determined based on functional aspects and have certain characteristics or specific or special (Anonym, 1992). So, in other words the area is a place that is limited by functional aspects. Vastenburg Fortress, Kasunan Surakarta, and Pura Mangkunegaran have similar functions as cultural sights, where they show evidence of the history of the city of Surakarta.

Sharing a bike or bike sharing is a bicycle rental system that principally uses bicycles in turn and together with a rental system managed by a particular operator. This concept has been developed in various parts of the world starting from the 1960's (Bachand-Marleau, J., 2012; Lee B H Y, 2012; El-Geneidy A. M., 2012). Bike sharing has four generations in its operational and logistical development: The White Bicycle System, the Coin Deposit Systems, the IT-based system, and the fourth generation is the generation used up to now with smartcard and smartphone systems. In Indonesia bike sharing has been developed in the city of Bandung with the name Boleh (Bike on Street Everyone Happy) and Obike. Bike sharing in Bandung is a collaboration of Banopolis (transport consultant) and the city government of Bandung. Boleh and Obike are already using modern IT-based systems and applications. Boleh uses smartcards and Obike uses smartphone apps in lending transactions (Yolanda F, 2017), (Pikiran rakyat, 2017).

Factor analysis is a statistical technique primarily used to reduce or summarize data from multiple variables that are converted into a few variables, e.g. from 15 variables that are long changed to 4 or 5 new variables called factors and still contain some big information contained in the original variable (Pikiran rakyat, 2017). In the factor analysis there are

no independent and dependent variables, the factor analysis process itself tries to find the relationship between a number of variables that are mutually dependent with others so that one or more sets of variables may be less than the initial number. There are two types of factor analysis namely principal component analysis and common factor analysis.

## 3 RESEARCH

This research was conducted in the Surakarta cultural tourism area of Palace, Vastenburg Fortress, and Pura Mangkunegaran, as seen in Figure 1. Primary data obtained from the results of questionnaires spread to 100 respondents covering three tourist sites. Questionnaire consists of 2 pieces of form. Form 1 contains questions about the characteristics of respondents and form 2 contains the factors that influence visitors using bike sharing in a cultural tourism area. There are 22 variables in this research which can be seen in table 1 below (Supranto J., 2004). The method of analysis used is factor analysis method principal component analysis (PCA).

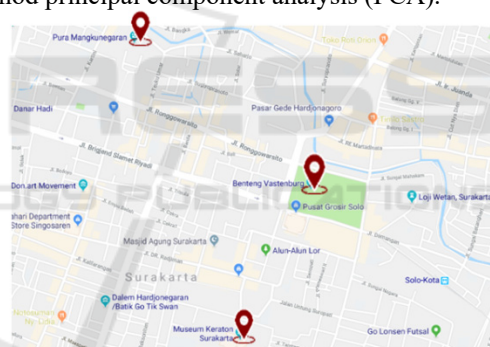


Figure 1 Location Research Map.

Table 1. Research Variables.

Variable	Symbol
Weather conditions determine decisions for cycling	X1
High air pollution conditions reduce cycling interest	X2
Topographic bike lanes are conveniently skipped (not wavy)	X3
Distance determines the decision to bike	X4
Adequate bike lane capacity or not jammed between cyclists	X5
The presence of a barrier (in the form of markers and nails) with other modes for cycling safety	X6
The special lane availability for cycling	X7
The presence of signs for cyclists	X8
Map / route of bicycle paths availability in the tourist destination	X9
Cycling place availability close to the destination	X10
The bicycle has basket	X11
Bicycle equipped with bicycle rack facility (2 persons capacity)	X12
Sophisticated bicycles such as electric bicycles are available	X13
The availability of sufficient bikes at the place where the rental bikes stop	X14
Affordable cost for bike sharing	X15
Bicycle rental fee is obviously in accordance with the length of bicycle lending (multiples of 30 minutes)	X16
The duration of flexible bike lending	X17
Bicycle rental operator availability (customer service)	X18
Easy instructions for using bike sharing	X19
Convenience in bike lending transactions	X20
Bike sharing using application-based systems on smartphones	X21
Bike sharing using manual system with direct payment	X22

## 4 RESULT AND DISCUSSION

The first step in factor analysis is to form a correlation matrix and then perform testing determinant of correlation matrix obtained determinant value of 0.002 where the value is close to 0 so it is stated that

the inter-related variables. The value of Kaiser Meyer Olkin Measure of Sampling finds 0.682 greater than 0.5 means that the variables are sufficient and appropriate to be analysed using factor analysis. In Bartlett's test of sphericity, the value of chi-square 558,907 and significant value = 0,000 < 0,005 then the hypothesis that the variables are not correlated is rejected, it means that the variables are correlated and appropriate to be analysed using factor analysis. Next, testing the value of MSA seen from diagonal anti-image correlation matrix. The result of MSA value analysis from 22 variables has MSA value more than 0,5 thus the whole variable is declared valid and proper so it can be continued with factor analysis calculation.

**Article I.** The second step is determining number of factors. Factor is a new variable or formation variable. The number of factors is determined from the value of the eigen value of each variable. The Total Variance Explained shows the contribution of a factor component. There are two kinds of analysis of variance explanation: Initial Eigenvalue shows the factors that are formed. The total column shows the eigenvalue value. The determination of factor number is obtained from eigenvalues value more than 1 (one) and Extraction Sums of Squared Loadings shows the number of variants obtained.

**Article II.** The third step is Factors Rotation. The factor matrix rotation is done so that no overlapping variable occurs in explaining the factor. Rotation method used is orthogonal rotation with varimax procedure. The following Table 3 after the rotation.

Table 3 show the results formed eight new factors with new factor name.

From the results of research the eight new factors can explain 66.448% variants of 22 variables that affect visitors using a bicycle rental in the area of cultural tourism. This means that 8 new factors are able to represent the previous 22 variables (Sari P T M, 2018). The results of this study support (Tajuddin, 2012; Musyafir, 2012; Wunas S., 2012; Hamzah B., 2012) which states that the convenience of cycling, safety and safety of cycling, and infrastructure facilities are factors that affect people to use bicycles. Similarly, research (Faghieh-Imani A., 2017; Hampshire R., 2017; Marla L., 2017; Eluru N., 2017) which states that bicycle facilities is an influential factor for bicycle rental users. The above research also supports the research of (Bachand-Marleau, J., 2012; Lee B H Y, 2012; El-Geneidy A. M., 2012) which states that the location of a shelter / station

affects the willingness to cycling in research over these factors including supporting conditions. Similarly, (Yanyong G., 2016; Zhou J., 2016; Wu Y., 2016; Li Z., 2016) stating that the cost and ease of access to borrow and restore the bike into a factor that affects the public using a bicycle. This study gained new factors that have not existed in previous studies. The factor is rental bike sharing system. There are two types of rental bike sharing systems that are obtained include the system manually with direct payments and rental systems using applications with certain payment systems.

## 5 CONCLUSIONS

Based on the results of research and discussion of 22 variables formed 8 new factors that influence visitors to use bicycle rental in the cultural tourism area of Surakarta City include the operation of the bicycle rental, the safety of bicycle rental users, supporting conditions, bicycle facilities, affordability and cost, bicycle rental system, and the clarity of the cost of bicycle rental.

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## REFERENCES

- Melina 2016 Cultural Role in Human Development of Indonesia *World of Science* 2(4)
- UNESCO 2005 *Convention on the Protection and Promotion: Diversity of Cultural Expressions*
- Bachand-Marleau J, Lee B H Y, El-Geneidy A M 2012 Better understanding of factors influencing likelihood of using shared bicycle systems and frequency of use *Transportation Research Record: Journal of the Transportation Research Board* 2314 66-71.
- Tajuddin, Musyafir, Wunas S and Hamzah B 2012 Bicycle As Eco Friendly Alternative Transportation Mode (Case Study: Cbd Panakukang Makassar City *Journal of Hassanudin University*
- Faghih-Imani A, Eluru N, El-Geneidy A M, Rabbat M, Haq U 2014 How land-use and urban form impact bicycle-sharing system (BIXI) in Montreal *Journal of Transport Geography*. 41 406-314
- Yanyong G, Zhou J, Wu Y, Li Z 2016 *Identifying the factors affecting bike-sharing usage and degree of*

- satisfaction in Ningbo, China* (China: Shanghai University of finance and Economic)
- Fatma I, Ambar and Saino 2013 Analysis of Factors Affecting Consumer Decisions To Use Train Services *Comuter Journal University of Surabaya*
- Sari P T M 2018 *Analysis of Factors Affecting Visitors Using Bike Sharing in Culture Tourism City of Surakarta* Thesis (Surakarta: Sebelas Maret University)
- Anonym *Undang-Undang Republik Indonesia Nomor 24 Tahun 1992 tentang Penataan Ruang*
- Yolanda F 2017 *Bandung City Government to prepare New Bike Sharing concept* Online <http://nasional.republika.co.id/berita/nasional/daerah/16/02/16/o2my4p370-pemkot-bandung-siapkan-bike-sharing-berkonsep-baru>
- Pikiran rakyat 2017 *Now oBike Comes in Bandung* Online <http://www.pikiran-rakyat.com/bandung-raya/2017/12/20/kini-obike-hadir-di-bandung-416274>
- Supranto J 2004 *Multivariate Analysis: Meaning and Interpretation* (Jakarta: Rineka Cipta)
- Faghih-Imani A, Hampshire R, Marla L, Eluru N 2017 An empirical analysis of bike sharing usage and rebalancing: Evidence from Barcelona and Seville *Transportation Research Part A: Policy and Practice* 97 177-191

**APPENDIX**

**Table 2.** Factor Matrix after Rotation.

	Component							
	1	2	3	4	5	6	7	8
x20	<b>.808</b>	.167	.035	.066	.006	-.008	.064	.052
x19	<b>.756</b>	.146	.149	.045	.082	-.024	.035	.015
x14	<b>.625</b>	-.111	.096	.269	.200	.167	-.034	.071
x8	.128	<b>.799</b>	.058	.060	.024	-.046	.097	.034
x9	.099	<b>.714</b>	.114	-.055	.220	.195	-.263	.029
x7	.429	<b>.468</b>	-.022	.356	.106	-.223	.148	-.168
x2	.065	-.064	<b>.745</b>	.046	-.074	-.101	.157	.315
x1	.102	-.502	<b>.595</b>	-.004	.192	.129	-.190	-.195
x6	.115	.328	<b>.548</b>	.208	.053	.328	.183	-.160
x10	.068	.288	<b>.513</b>	.391	.074	.033	-.275	.014
x18	.387	.159	<b>.511</b>	-.252	.273	.246	.001	-.160
x17	.191	.209	<b>.440</b>	.275	.158	-.333	-.183	-.082
x3	.107	.190	.042	<b>.671</b>	.002	.402	-.267	.227
x5	.217	-.128	.105	<b>.664</b>	.144	.099	.145	-.018
x13	-.006	.367	.072	<b>.485</b>	-.266	-.167	.207	-.165
x11	.052	-.028	.112	.114	<b>.842</b>	.117	-.065	-.095
x12	.142	.220	.022	-.031	<b>.725</b>	-.027	.084	.272
x4	.007	.016	.015	.201	.261	<b>.784</b>	.200	-.081
x15	.531	-.044	.118	-.009	-.246	<b>.561</b>	-.132	.087
x22	.103	.053	.072	.014	-.008	.121	<b>.801</b>	.099
x16	.123	.051	.099	-.030	.070	-.004	.062	<b>.816</b>
x21	.132	.076	<b>.302</b>	-.146	-.066	.019	-.503	-.537

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization. <sup>a</sup>

a. Rotation converged in 12 iterations.

Table 3 show the results formed eight new factors with new factor name.

Table 3. New Factor.

Variabel	Symbol	New Factor	Symbol	Variant Value
1. Convenience in bike lending transactions	X20	Bike Sharing Operational	F1	19,660
2. Easy instructions for using bike sharing	X19			
3. The availability of sufficient bikes at the place where the rental bikes stop	X14			
4. The presence of signs for cyclists	X8			
5. Map / route of bicycle paths availability in the tourist destination	X9	Bike Sharing User Safety	F2	9,526
6. The special lane availability for cycling	X7			
7. High air pollution conditions reduce cycling interest	X2			
8. Weather conditions for cycling	X1			
9. The presence of a barrier (in the form of markers and nails) with other modes for cycling safety	X6			
10. Cycling place availability close to the destination	X10	Supporting Conditions	F3	8,341
11. Bicycle rental operator availability (customer service)	X18			
12. The duration of flexible bike lending	X17			
13. Bike sharing using application-based systems on smartphones	X21			
14. Topographic bike lanes are conveniently skipped (not wavy)	X3	Comfort Cycling	F4	6,861
15. Adequate bike lane capacity or not jammed between cyclists	X5			
16. Sophisticated bicycles such as electric bicycles are available	X13			
17. The bicycle has basket	X11	Bicycle Facility	F5	6,425
18. Bicycle equipped with bicycle rack facility (2 persons capacity)	X12			
19. Distance determines the decision to bike	X4	Affordability Distance and Cost	F6	5,998
20. Affordable cost for bike sharing	X15			
21. Bike sharing using manual system with direct payment	X22	Bicycle Rental System	F7	4,985
22. Bicycle rental fee is obviously in accordance with the length of bicycle lending (multiples of 30 minutes)	X16			