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Model Movement Pedestrian Satisfaction in Manado Using Structural Equation Modeling

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ABSTRACT

This study aims to determine the satisfaction model of pedestrian movement in the area of pedestrian lanes in Manado city. Data used from the survey of pedestrian traffic with the sampling method is simple random sampling and analysis techniques used are Structural Equation Modeling (SEM). Results of the study showed that the model approach to SEM satisfaction pedestrian movement is a model that fit with the chi - square of 170.503 and a p-value of 0.348, and RMSEA of 0.020. The management aspect, technical aspects of transport and facilities, and service quality affects pedestrian satisfaction. The management aspect of provide the greatest immediate effect on pedestrian satisfaction, and backed by service quality. Indicators of assurance, performance, durability, availability, attention and tangible, reliability and aesthetics are the dominant shaper in modeling pedestrian satisfaction.

KEYWORDS: *SEM, sidewalks, pedestrian satisfaction, service quality, management aspects, technical aspects*

1. INTRODUCTION

Walking is a basic human activity that is often overlooked when planning for transport and has been seen as a form of second-class travel [1]. Walking is a mode of transportation that does not require costly than that anyway by walking can prevent and reduce the risk of osteoporosis and make the body more energetic. In addition, also runs one good cardio workout to lose weight [2].

Transportation is a key element forming the town associated with many things, among other economic activities, human health, and even the environment. Knowingly or not, the effect on the quality of the environment in general outdoor activities underlying the creation of pedestrian areas in urban areas [3]. Transportation planning that has been made more in favor of motorists as evidenced by the many recommendations highway widening, construction of highways, flyovers, underpasses and so on. While the provision of facilities for pedestrians such as sidewalks, crossing place, shade trees, lighting and other street furniture is still very less attention [4].

Walking is a pollution-free transport media and affordable for all segments of society [5]. The existence of a pedestrian at a certain level will result in sharp conflict with the flow of vehicles, which in turn resulted in problem traffic and the high rate of accidents [5].

Lack of adequate pedestrian facilities, particularly walking and crossing facilities, greatly affect the life safety of pedestrians [6][7]. Proved that 65% of road accidents involving pedestrian deaths of which 35% are children [3]. So that the movement of pedestrian and vehicle traffic characteristics and need to be studied to obtain a draft planning can minimize the conflict between pedestrians and motor vehicles, increase safety, comfort, smooth running walk and to minimize traffic problems [8][9].

Noting that described above, it is necessary to study the movement of pedestrians in the city of Manado, as part of efforts to increase attention to pedestrians as well as structuring a good pedestrian infrastructure making Manado City Ecotourism Model approach to Structural Equation Modeling (SEM).

2. METHODOLOGY

The data will be analyzed in this study are primary data from a survey of pedestrian traffic are taken directly by giving the questionnaire questions via questionnaire to respondents in 9 points pedestrian area in the city of Manado. The sampling method to be used is probability sampling using simple random sampling and analysis techniques used are Structural Equation Modeling (SEM) [10][11].

SEM is a set of statistical methods that allow testing of a relatively complex set of relationships simultaneously [12][13]. Complex relationships can be constructed from one or multiple dependent variables by

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one or more independent variables. Each of the dependent and independent variables can take the form factors (constructs are constructed from several indicators). These variables form a single variable that is observed or measured directly in a study. The input data used in the modeling SEM is the covariance matrix of the data sample, which is then used to generate an estimate of the covariance matrix of the population [14][15]

Modeling SEM basically consists of the measurement models and structural models [16][17]. Measurement models aimed at confirming the dimensions that are developed on a factor, while the structural model of the structure of relationships that make up or explain the causality between factors [18][19]. SEM models is based on the conceptual framework of the management aspects (X1), technical transport facilities aspects (X2), service quality (Y1) and pedestrian satisfaction (Y2) taken from the literature. The conceptual framework is presented as follows:

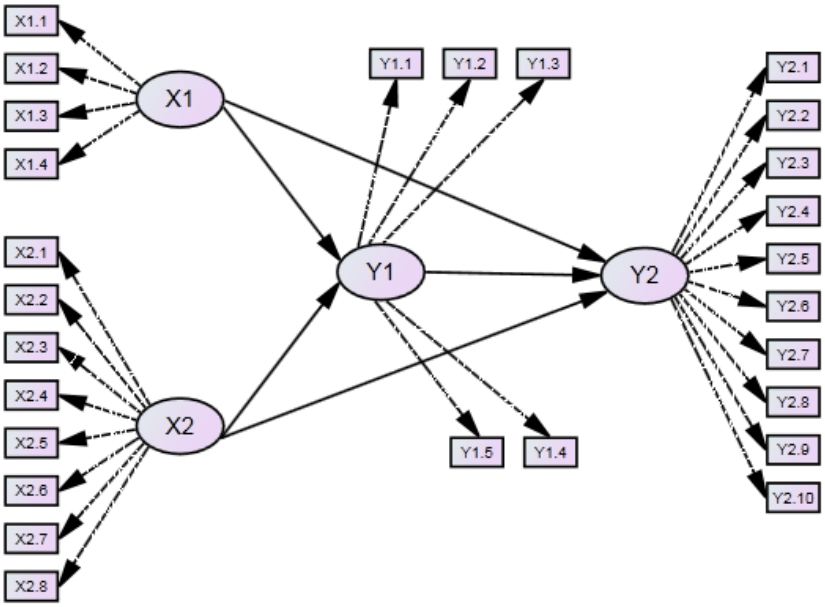

Figure 1: Conceptual Framework Pedestrian Satisfaction

3. RESULTS AND DISCUSSION

Validity test is done using confirmatory factor analysis on each of the latent variables namely management aspects (X1), technical transport facilities aspects (X2), service quality (Y1) and pedestrian satisfaction (Y2). Reliability test used composite reliability with a minimum cut-off value is 0.7. More results are presented in the following table.

Table 1: Test Validity and Reliability Indicators On Latent Variables

Laten variable	Indicators	Loading (λ)	p-value	variance error	p-value	Composite-Reliability (C-R) [14]
Management Aspects(X1)	Performance(X1.1)	0.702	.000	.172	.000	0.753
	Collateral(X1.2)	0.734	.000	.217	.000	
	Ease(X1.3)	0.590	.000	.249	.000	
	Responsiveness(X1.4)	0.600	.000	.357	.000	
Technical Transportation Facilities Aspects(X2)	Performance (X2.1)	0.757	.000	.278	.000	0.901
	Aesthetics(X2.2)	0.798	.000	.196	.000	
	Ease(X2.3)	0.743	.000	.222	.000	
	Reliability(X2.4)	0.567	.000	.486	.000	
	Endurance(X2.5)	0.926	.000	.076	.000	
	Frequency(X2.6)	0.623	.000	.370	.000	
	comfort(X2.7)	0.518	.000	.363	.000	
	availability(X2.8)	0.859	.000	.111	.000	
Service Quality(Y1)	reliability(Y1.1)	0.539	.000	.353	.000	0.822
	Responsiveness(Y1.2)	0.562	.000	.180	.000	
	LevelAssurancecertainty(Y1.3)	0.716	.000	.218	.000	
	attention(Y1.4)	0.822	.000	.139	.000	
	Tangible (Y1.5)	0.800	.000	.148	.000	
Pedestrians Satisfaction(Y2)	Assurance(Y2.1)	0.701	.000	.300	.000	0.896
	Responsiveness(Y2.2)	0.618	.000	.292	.000	
	Performance (Y2.3)	0.751	.000	.203	.000	
	Aesthetics(Y2.4)	0.712	.000	.387	.000	
	ease(Y2.5)	0.672	.000	.263	.000	
	reliability(Y2.6)	0.728	.000	.179	.000	
	durability(Y2.7)	0.663	.000	.189	.000	
	frequency(Y2.8)	0.606	.000	.357	.000	
	comfort(Y2.9)	0.639	.000	.148	.000	
	availability(Y2.10)	0.706	.000	.162	.000	

Table 1, shows all the indicators of each latent variables has a value of loading factor above 0.5 with a p-value less than $\alpha = 0.05$, then the indicator is valid and significant. Furthermore, it also gives the value of the error variance p-value less than 0.05 and CR values above the cut-off value of 0.7 so it can be said to be reliable. Management aspects which include indicators of performance (0.702), collateral (0.734), ease (0.590), responsiveness (0.600). The technical transportation facilities aspects include indicators of performance (0.757), aesthetics (0.798), ease (0.743), reliability (0.567), endurance (0.926), frequency (0.623), comfort (0.518) and availability (0.859), then service quality indicators of reliability (0.539), responsiveness (0.562), level assurance certainty (0.716), attention (0.822), tangible (0.800). The pedestrians satisfaction with indicator assurance (0.701), responsiveness (0.618), performance (0.751), aesthetics (0.712), ease (0672), reliability (0.728), durability (0.663), frequency (0.606), comfort (0.639) and availability (0.706)

Having tested the validity and reliability of each latent variable, some of the prerequisites that must be met in structural modeling is a multivariate normal assumption, assuming the absence of multicollinearity or singularity and outliers. Normality of the data is one of the requirements in the modeling of structural equation modeling (SEM). Multivariate CR value of 1.653 and this value lies between 1.96 to 1.96, so that it can be said that the data berditribusi multivariate normal. Singularities can be seen through the determinant of covariance matrix. Results of the study provide the value of Determinant of the sample covariance matrix for 0381, so that it can be said that there is no singularity problem in the data. Multicolinearity occur if there is a latent exogenous variables more than one and there is a correlation. The value of the correlation between the latent variables management aspects (X1) with the technical transport facilities aspects (X2) of 0.067 with $p = 0.582$ is greater than the significance level $\alpha = 0.05$, it can be said not occur multicolinearity. Outlier is an observation that appears with extreme values are uniariate and multivariate Mahalanobis value greater than Chi-square table or value p1 <0.001 observation outlier said. In this study there is no data with the value p1 smaller than 0001, it can be said not occur outlier.

Having tested the validity and reliability on all latent variables are valid and reliable results, the data is multivariate normal, did not happen and does not happen multicolinearityoutlier, then the latent variables can be continued in the form of path diagram analysis presented as follows:

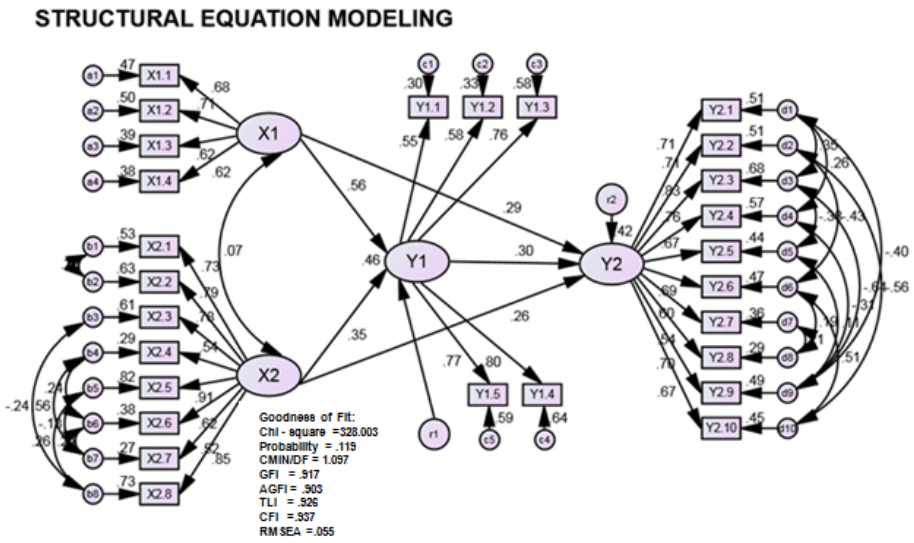

Figure 2. The relationship between latent variables exogenous to endogenous

The test results over the complete model with AMOS complete program can be seen in the following table :

Table 2. Results Goodness of Fit ModelMovement Pedestrian Satisfaction

Criterion	Cut – Off Value	Calculate	Information
Chi – Square	Diharapkan kecil	170.503	χ2 with df = 164 is 194.883 Good
Significance Probability	≥ 0,05	0,348	Good
RMSEA	≤ 0,08	0,020	Good
GFI	≥ 0,90	0,916	Good
AGFI	≥ 0,90	0,872	Marginal
CMIN/DF	≤ 2,00	1,040	Good
TLI	≥ 0,95	0,991	Good
CFI	≥ 0,95	0,993	Good

Based on the table above, shows that 7 (seven) criteria used to judge the worth / absence of a model turned out to proclaim good. It can be said that the model is acceptable, which means there is a match between the model with data.

Of the appropriate model, it can be interpreted each path coefficient. The coefficients of these pathways is hypothesized in this study, which can be presented in the following structural equation:

$$Y1 = 0.563\ X1 + 0.346\ X2$$

$$Y2 = 0.287\ X1 + 0.262\ X2 + 0.303\ Y1$$

dimana:

X1 :management aspects
X2 :technical transport facilities aspects
Y1 :service quality
Y2 :pedestrian satisfaction

Testing the path coefficients in Figure 2 and equation above in detail is presented in the following table

Table 3: Testing PathsCoefficient ModelMovement Pedestrian Satisfaction

Variables	Coeficient	C.R.	Prob.	Information
management aspects (X1)→service quality (Y1)	0,563	3.601	0.000	Significant
technical transport facilities aspects (X2)→service quality (Y1)	0,346	2.839	0.005	Significant
managementaspects (X1)→ Kepuasan pejalan kaki (Y2.)	0,287	2.012	0.044	Significant
technical transport facilities aspects (X2)→pedestrian satisfaction (Y2)	0,262	2.347	0.019	Significant
service quality (Y1)→pedestrian satisfaction (Y2)	0,303	2.011	0.044	Significant

Based on Table 3 , the interpretation of each path coefficient is as follows:

- Management aspects (X1) positive and significant impact on the service quality (Y1). This can be seen from the path marked positive coefficient of 0.563 with a value of C.R. amounted to 3.601 and obtained a significance probability (p) of 0.000 greater than the significance level was set at 0.05. Thus management aspects (X1) Directly affect service quality (Y1) of 0.563, which means that every increase in the management aspects (X1) It will raise the service quality (Y1) of 0.563.
- Technical transport facilities aspects (X2) Positive and significant impact on the quality of service (Y1.). This can be seen from the path marked positive coefficient of 0.346 with a value of C.R. at 2.839 and obtained a significance probability (p) of 0.05 which is smaller than the significance level which was set at 0.05. Thus the Technical transport facilities aspects (X2)directly affect service quality (Y1) of 0.346, which means that every increase in Technical transport facilities aspects (X2)it will raise the service quality (Y1) of 0.346.
- Management aspects (X1)positive and significant effect to the pedestrian satisfaction (Y2). This is evident from the marked positive path coefficient of 0,287 with a value of C.R. amounted to 2.012 and obtained a significance probability (p) of 0.044 which is smaller than the specified significance level of 0.05. Thus Management aspects (X1)influence directly on the pedestrian satisfaction (Y2) amounted to 0.287, which means that every increase in the management aspects (X1) It will raise pedestrian satisfaction (Y2) amounted to 0.287.
- Technical transport facilities aspects (X2) positive and significant effect to the pedestrian satisfaction (Y2). This can be seen from the path marked positive coefficient of 0.262 with a value of C.R. amounted to 2.347 and obtained a significance probability (p) of 0.019 which is smaller than the significance level) were set at 0.05. Thus the technical transport facilities aspects (X2) influence directly on pedestrian satisfaction (Y2) of 0.262, which means that every increase in technical transport facilities aspects (X2)it will raise pedestrian satisfaction (Y2) of 0.262.
- Service quality (Y1) positive and significant effect to the pedestrian satisfaction (Y2). This is evident from the marked positive path coefficient of 0.303 with a value of C.R. amounted to 2.011 and obtained a significance probability (p) of 0.044 which is smaller than the specified significance level of 0.05. Thus the service quality (Y1) influence directly on the pedestrian satisfaction (Y2) amounted to 0.303, which means that every increase in service quality (Y1) it will raise pedestrian satisfaction (Y2) amounted to 0.303.

Direct effect, indirect effectand total effectin modeling SEM seems to important. For that will be discussed in detail each of these influences. Direct relationship occurs between latent variables exogenous (management aspect (X1), technical transport facilities aspects (X2)) with a latent variable endogenous intervening (service quality (Y1)) and the latent variables endogenous (pedestrian satisfaction (Y2)) .

The following table presents the direct result of the direct relationship that occurs between variables - exogenous and endogenous latent variables :

Table 4: Direct Effect ModelMovement Pedestrian Satisfaction

Direct Effect		**Intervening Variables**	**Endogenous Variables**
		service quality (Y1)	pedestrian satisfaction (Y2)
Exogenous Variables	management aspect (X1)	0.563	0.287
	technical transport facilities aspects (X2)	0.346	0.262
Intervening Variables	service quality (Y1)		0.303

From the table above, can be explained much influence directly of the latent exogenous variables to endogenous latent variables. Management aspects (X1) provide the greatest immediate effect on the service quality (Y1), and subsequently technical transport facilities aspects (X2) on pedestrian satisfaction (Y2).

The indirect effect that occurs between exogenous and endogenous latent variables are presented in the following table .

Table 5:Indirect Effect Model Movement Pedestrian Satisfaction

Indirect Effect		**Intervening Variables**	**Endogenous Variables**
		service quality (Y1)	pedestrian satisfaction (Y2)
Variabel Eksogen	management aspect (X1)		0.170
	technical transport facilities aspects (X2)		0.105
Intervening Variables	service quality (Y1)		

From the table above, can be explained much influence indirectly (indirect effects) of a latent variable exogenous to the endogenous latent variables . The service quality (Y1) provide the greatest immediate effect on management aspects (X1) to the satisfaction pedestrians (Y2).

The net effect occurring between exogenous and endogenous latent variables are presented in the following table .

Table 6:TotalEffect ModelMovement Pedestrian Satisfaction

Total Effect		**Intervening Variables**	**Endogenous Variables**
		service quality (Y1)	pedestrian satisfaction (Y2)
Variabel Eksogen	management aspect (X1)	0.563	0.287
	technical transport facilities aspects (X2)	0.346	0.262
Intervening Variables	service quality (Y1)		0.303

From the table above, can be explained much total effects of the latent exogenous variables to endogenous latent variables. Themanagement aspects (X1) gives the largest total effect on the service quality (Y1), and further provides the largest total effect on pedestrian satisfaction (Y2).

4. CONCLUSION

The results showed that the movement pedestrian satisfaction path model in the city of Manado is the model fit. Indicators assurance and performance is forming dominant, management aspects, indicators durability and availability are forming dominant on the technical transport facilities aspects, further attention and intangibles are forming dominant on service quality, as well as indicators of reliability and aesthetics are forming dominant on the pedestrians satisfaction. The management aspects of the greatest influence on the service quality, and the service quality is not the greatest immediate effect on the management aspects of the pedestrians satisfaction.

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