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Analysis Of Trip Attraction In Shopping Center Suzaya Mall Bireuen Based On Demographic Characteristic

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Abstract

Trip attraction refers to the number of trip movements toward a specific location per unit of time. This concept is directly related to determining the total trips generated by particular land uses. The establishment of Suzuya Mall by the government has significantly increased private and public vehicle traffic in Bireuen City, leading to frequent road congestion. During peak movement periods, vehicles often stop or park along the road near Suzuya Mall, reducing overall road capacity. This study examines three key aspects: the characteristics of visitors to Suzuya Mall, the factors influencing trip attraction in this land use area, and the development of a trip attraction model for Suzuya Mall in Bireuen City. The research methodology incorporated questionnaire data collection and SPSS-based data processing. Analysis was conducted using multiple linear regression through SPSS 25 software, with model validation assessed through multicollinearity values, correlation coefficients (R), determination coefficients (R^2), heteroscedasticity tests, significance values, and P-P plot graphs. The study yielded a comprehensive trip attraction model for all vehicle types: $Y = 61.157 + 0.123(X_1) + 2.75(X_2) - 0.716(X_3) + 0.195(X_5)$, where X_1 represents age, X_2 denotes income, X_3 indicates distance, and X_5 reflects mileage. The model achieved a determination coefficient value of 0.964, demonstrating strong explanatory power for trip attraction patterns in the Suzuya Mall area.

Keywords: *Modeling; movement attraction*

1. INTRODUCTION

Bireuen City has experienced growing land use demands annually, leading Kota Baru to emerge as a significant attraction center for surrounding areas. The development of commercial zones and tourist attractions in Kota Baru has transformed land use patterns, creating employment opportunities that surpass those available in neighboring

regions. This urban growth has fundamentally altered the area's socio-economic dynamics.

Trip attraction , defined as the number of movements toward a specific location within a given time period, plays a crucial role in understanding trip generation patterns for different land uses. The establishment of Suzuya Mall by local authorities has significantly increased both private and public vehicle traffic within Bireuen City, resulting in recurrent traffic congestion. During peak hours, the accumulation of parked and stopping vehicles near Suzuya Mall substantially reduces road capacity, creating persistent transportation challenges.

Analysis of trip patterns to Suzuya Mall's commercial zone reveals the necessity for strategic transportation planning. Understanding community trip characteristics, particularly their transportation mode choices, provides essential data for developing solutions to reduce vehicle dependency. This foundational knowledge enables authorities to implement targeted measures that can alleviate traffic pressure on the mall's surrounding infrastructure.

Suzuya Mall shopping center serves as its primary attraction, drawing substantial visitor numbers that contribute to chronic congestion problems. This persistent issue necessitates comprehensive study to develop an accurate trip attraction model for the area. Such a model would quantify trip generation rates from Suzuya Mall's operations, providing crucial data for evidence-based transportation planning in Bireuen City's commercial district.

2. METHOD

Research Implementation

The research was conducted through systematic stages beginning with preparation where the research problem was formulated and objectives were established, followed by method determination. Data collection involved gathering both primary and secondary data with surveyor assistance, using shift rotations to prevent fatigue-related recording errors. The classification stage organized primary survey data into predetermined time intervals to quantify vehicle movement patterns. Analysis employed multiple linear

regression through SPSS software, which was selected for its capacity to handle large datasets and built-in statistical tools.

Research Location

The study focused on Jalan Malikussaleh in Simpang Empat, Kecamatan Kota Juang, Bireuen Regency, Aceh 2425.

Data Collection Methods

This study utilized two data types: primary data collected through direct interviews and vehicle counts, and secondary data obtained from relevant agencies, literature, and analyzed through Excel and SPSS applications. Primary data collection specifically recorded transportation modes including motorcycles and light vehicles entering Suzuya Mall, supplemented by visitor questionnaires. Secondary data included land area measurements, tenant numbers, distances, durations, and costs.

Research Timeline

Field surveys were conducted over six consecutive days from Monday to Sunday, operating daily from 09:00 to 22:00 WIB. Questionnaire distribution and attraction surveys ran continuously throughout this period, while vehicle movement surveys were conducted hourly.

Analytical Framework

The analysis proceeded according to field survey results, examining three key aspects: trip attraction patterns, visitor characteristics, and Suzuya Mall's attraction model. The linear regression analysis incorporated these visitor characteristics variables:

Y1: Vehicle count (dependent variable)

X1: Age

X2:Income

X3: Distance

X4: Travel time

X5: Costs

Statistical Analysis Process

The multiple linear regression analysis followed four key stages: First, correlation analysis identified relationships between independent variables and travel attraction; Second, regression modeling established relationships between vehicle movement and influencing factors; Third, statistical validation included coefficient determination (R^2) and significance testing (F-test); Finally, verified the model met BLUE criteria through normality, multicollinearity, and heteroscedasticity assessments.

3. RESULTS AND DISCUSSION

General Description

The trip attraction modeling study was conducted at Suzuya Mall in central Bireuen City, selected for its significance as a primary shopping destination. Researchers conducted surveys over seven consecutive days (Monday through Sunday) using direct interview questionnaires with 100 randomly selected mall visitors. Bireuen City's geographical coordinates span 4°54'-5°21' North Latitude and 96°20'-97°21' East Longitude, covering 1,796.31 km² (179,631 Ha) which represents 3.13% of Aceh Province's total area of 57,365.57 km².

Figure 1. Research Location Map

Factors Affecting Trip Attraction

The typical visitor to Suzuya Mall is predominantly a 30-year-old female civil servant with a bachelor's degree, earning approximately IDR 3 million monthly. These visitors typically trip 10 km to reach the mall (a 10-minute trip costing IDR 20,000), making 1-2 weekly visits that last about one hour each. Shopping is their primary activity, with the mall's infrastructure quality being the key attraction factor. This visitor profile highlights the mall's appeal to young, educated working professionals seeking convenient shopping experiences, with accessibility and facility quality being major determinants of visit frequency and duration.

Vehicle Attraction Patterns

The study analyzed motorized and light vehicle movements at Suzuya Mall during 12-hour observation windows (09.00-22.00 WIB). While survey data recorded trip volumes in SKR/12-hour units, the analysis used average daily SKR values. Peak visitation hours showed significant variation and were excluded from regression modeling. The peak movement patterns are shown below:

Table 1. Peak Hour Vehicle Movement at Suzuya Mall Bireuen

Day	Time	PCE/hour	Total PCE/hour
Monday	19:00–20:00	145	530
Tuesday	20:00–21:00	135	646
Wednesday	19:00–20:00	105	612
Thursday	20:00–21:00	200	986
Friday	17:00–18:00	170	944
Saturday	16:00–17:00	120	546
Sunday	20:00–21:00	200	1214

Source: Research

Trip Attraction Model

The modeling approach developed regression equations between dependent variables (vehicle attraction) and independent variables (visitor characteristics). The model analyzed motorcycle and light vehicle attraction against five factors: age (X1),Income (X2), distance (X3), travel time (X4), and Costs (X5). Complete dataset for this analysis is provided in supplementary tables.

Regression Analysis

Regression testing is conducted to establish a functional relationship between two or more variables or to determine the influence of an independent variable (x) on a dependent variable (y). The objective is to develop the best possible model to explain trip attraction, which can feasibly be used to estimate movement attraction to Suzuya Mall. Several assumptions are considered in this process, as outlined below:

- Using all variables, namely age (x1), income (x2), distance (x3), travel time (x4), and costs (x5).
- Variables that vary the correlation of age (x1), income (x2), distance (x3), and costs (x5).
- Variables that vary the correlation of income (x2), distance (x3), and costs (x5).
- Variables that vary the correlation of age (x1),Income (x2), and travel time (x3).
- Variables that vary the correlation of travel time (x3) and costs (x5).

Correlation Analysis

Independent variables that are estimated to affect the formation are analyzed for their relationship with the dependent variables, as well as with each other. The relationship among these variables is indicated by a correlation coefficient.

Table 2. Correlation Values Between trip attraction and Independent Variables

	Y	**X1**	**X2**	**X3**	**X4**	**X4**
Y	1	-0.549**	0.062	-0.936**	-0.910**	-0.761**
X1		1	0.207*	0.734**	0.579**	0.648**
X2			1	0.046	0.044	0.073
X3				1	0.930**	0.904**
X4					1	0.883**
X5						1

Source: Research

Correlation testing measures the strength and direction of the relationship between variables, with the correlation coefficient (r) ranging from -1 to 1. A value of 0 indicates no correlation, while values approaching ±1 signify stronger relationships—1 for perfect positive correlation and -1 for perfect negative correlation.

Regression Analysis and Statistical Testing Results

Five regression models were developed to analyze factors influencing trip attraction to Suzuya Mall. These models progressively examined different combinations of predictor variables including age (X_1), income (X_2), travel time (X_3), distance (X_4), and cost (X_5). The following equations represent the complete set of models tested in this study:

Table 3. Regression Model Equations for trip attraction Analysis

Model	Regression Equation
1	$Y = 62.698 + 0.097X_1 + 3.467X_2 - 0.601X_3 - 0.101X_4 + 0.218X_5$
2	$Y = 61.157 + 0.123X_1 + 2.75X_2 - 0.716X_3 + 0.195X_5$
3	$Y = 62.801 + 6.697X_2 - 0.603X_3 + 0.181X_5$
4	$Y = 61.782 + 0.113X_1 + 4.180X_2 - 0.510X_3$
5	$Y = 62.771 + 0.122X_1 - 0.516X_3$

Source: Research

Model 6 was tested as a variation to verify statistical assumptions using a combination of variables X_3 and X_5. he statistical validity of these models was assessed through comprehensive testing of regression assumptions and significance measures. Below are the detailed results of the coefficient analysis, goodness-of-fit tests, and diagnostic checks that verify the robustness of each model specification:

Table 4. Comprehensive Regression Results and Diagnostic Tests

Test Type	Method Criteria	Model 1	Model 2	Model 3	Model 4	Model 5
Determination Coeff.	R^2 0-1 (Higher better)	0.972	0.964	0.925	0.921	0.918
F-Test	ANOVA Sig. < 0.05	660.772 (0.000)	638.563 (0.000)	392.344 (0.000)	541.731 (0.000)	530.687 (0.000)
T-Test	tstatistic and tcount > 2.278	X1: 8.230 X3: -20.111	X1: 10.236 X3: -30.939	X2: 3.256 X3: -20.554	X1: 6.386 X3: -26.701	X1: 7.016 X3: -26.984
Multicollinearity	VIF < 5	X3: 15.224 X5: 5.950	X3: 7.119 X5: 5.546	X3: 5.496 X5: 5.513	X3: 2.226	X3: 2.170
Normality	Kolmogorov-Smirnov Asymp. Sig. > 0.05	0.337	0.292	0.140	0.607	0.773
Heteroscedasticity	Glejser Sig. > 0.05	X1: 0.008	X1: 0.358	X2: 0.010	X1: 0.405	X1:

	X3: 0.000	X3: 0.214	X3: 0.359	X3: 0.587	0.879 X3: 0.908

Source: Research

The analysis of trip attraction models to Suzuya Mall revealed several key findings. The determination coefficient (R^2) analysis showed that all five models had strong explanatory power, with the first model ($Y = 62.698 + 0.097X_1 + 3.467X_2 - 0.601X_3 - 0.101X_4 + 0.218X_5$) demonstrating the highest R^2 value of 0.972, indicating it explains 97.2% of the variance in the dependent variable. All models proved statistically significant in the F-test ($p = 0.000$), confirming the overall validity of the regression equations.

T-test results revealed that Travel Time (X_3) consistently showed significant influence across all models ($p = 0.000$), while other variables like Age (X_1) and Income (X_2) showed varying levels of significance. Multicollinearity testing using VIF indicated potential issues in Models 1-3, particularly for Travel Time (X_3) and Cost (X_5), with VIF values exceeding 5 in some cases. However, Models 4 and 5 showed no multicollinearity concerns.

The Kolmogorov-Smirnov normality test confirmed all models met the normality assumption (Asymp. Sig. > 0.05), with values ranging from 0.140 to 0.773. Heteroscedasticity testing using the Glejser method revealed that while Model 1 showed some evidence of heteroscedasticity for Age (X_1) and Travel Time (X_3), Models 2 through 5 all met the homoscedasticity assumption (Sig. > 0.05 for all variables). A sixth model ($Y = 64.666 - 0.607X_3 + 0.187X_5$) was included in some diagnostic tests but not in the primary analysis, and it similarly met normality and heteroscedasticity assumptions.

This comprehensive analysis confirms the robustness of the primary models while identifying specific variables that require careful interpretation due to multicollinearity concerns in some model specifications. The first model emerges as particularly strong in terms of explanatory power while maintaining acceptable statistical assumptions.

Best Fit Model

Model selection is based on conclusions drawn from the results of various previously tested models, including both regression analysis and classical assumption tests. From the analyses described above, the best model produced is as follows:

$$Y = 61.157 + 0.123(X1) + 2.75(X2) - 0.716(X3) + 0.195(X5)$$

This model is considered the best among the tested models because it satisfies all stages of the classical assumption tests. The model calculates vehicle movement attraction by incorporating both constant and independent variable values.

The constant value in the model is 61.157. If variable X1 (age) increases by one unit, the movement attraction will increase by 0.123. For variable X2 (total income), an increase of one unit results in an increase in movement attraction by 2.75. If variable X3 (travel time) increases by one unit, the movement attraction will decrease by 0.716. Meanwhile, if variable X5 (Costs) increases by one unit, the movement attraction will decrease by 0.195.

This analysis of Suzuya Mall indicates that the factors influencing vehicle-based movement attraction to Suzuya Mall in Bireuen City are age,Income, travel time, and Costs.

The modeling results obtained yield a predicted value of 62.707, while the total average trip travel is 65.142. Based on these results, the number of trips attracted by Suzuya Mall in Bireuen City closely aligns with the predicted values generated by the movement attraction model, falling within the 5% error margin between actual trip attraction and model-predicted trip attraction.

The analysis shows that the regression model is appropriate for estimating the number of trip attractions to Suzuya Mall in Bireuen City. The accuracy level of the model is relatively close to the survey results, leading to the conclusion that there is a strong relationship between age,Income, travel time, and Costs with movement attraction.

4. CONCLUSION

The typical visitor to Suzuya Mall is a 30-year-old female civil servant with a bachelor's degree, earning IDR 3 million monthly. These visitors travel an average of 10 km to reach the mall, typically visiting 1-2 times weekly for about an hour per visit, primarily for shopping purposes. The available infrastructure is deemed satisfactory.

Regression analysis identified four key factors influencing travel attraction: age (X1),Income (X2), distance traveled (X3), and Costs (X5). These variables collectively explain 96.4% of trip attraction variation ($R^2 = 0.964$), demonstrating their strong predictive power for visitor behavior.

The optimal model for predicting vehicle-based visits is expressed by the equation $Y = 61.157 + 0.123(X1) + 2.75(X2) - 0.716(X3) + 0.195(X5)$

Suggestions

Similar research can be conducted in areas with different types of land use, such as office districts, educational institutions, airports, hotels, department stores, and others. Further studies on movement attraction models to Suzuya Mall Bireuen should be conducted using different analytical methods to compare and validate the findings of this study. This research can be expanded or developed by incorporating future projections or applied in transportation planning, such as designing more efficient routes and access networks for mall visitors.

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