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ANALYSIS OF INFLUENCING FACTORS IN THE HANDLING OF REGENCY ROAD SEGMENTS IN TAPIN REGENCY

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ABSTRACT

Transportation involves the movement of goods or people from one place to another, which can be optimized with adequate infrastructure and facilities. A key component of efficient transportation infrastructure is well-connected roads with effective access. The local government's role in organizing, maintaining, and developing road networks needs to be balanced with technical capabilities, management, and financing while emphasizing good governance principles. This research aims to determine the factors and indicators that affect decision-making in road handling. The result of this research provides insights into the factors influencing road handling and can be used to improve road management in the region. Smart-PLS data analysis method and SWOT analysis were applied to find the dominant and significant indicators including road type, traffic volume, road condition, and population. Based on data analysis using Smart-PLS conducted on stakeholders that are involved in road management in Kabupaten Tapin, several conclusions can be drawn. Firstly, among the 54 influencing indicators in road management, 44 relevant indicators were identified, consisting of 38 reflective and 6 formative indicators, effectively measuring factors influencing road management. Secondly, a SWOT analysis was employed to select 24 significant indicators dominating the field, including factors such as road material, traffic flow, urban road conditions, traffic volume, road accessibility, citizen involvement in development planning, and road condition metrics like cracks, potholes, and pavement conditions. Thirdly, out of the 15 exogenous or independent variables, 12 reflective and 3 formative variables were identified. All 12 reflective variables were deemed valid, relevant, and reliable in influencing road management in Kabupaten Tapin.

Keywords: Kabupaten Tapin, Transportation, Road Management, Smart-PLS analysis.

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1. INTRODUCTION

Transportation pertains to the transfer of people or goods between different locations, a process that can be improved through proper infrastructure and facilities. The responsibilities of the local government in coordinating, upkeeping, and expanding road systems must strike a balance between technical expertise, effective administration, and financial resources, all while prioritizing principles of good governance. A well-connected road network facilitates the movement of vehicles and goods from origin to destination, aligning with economic principles from production areas to consumer regions. This interconnected road system forms a crucial connectivity framework. Efficient management of these roads involves classifying them according to their hierarchy [1].

Local roads serve as crucial links in transportation networks, often vital in connecting rural and urban communities. Road limitations can result in reduced access to essential services for communities, affecting education facilities, healthcare centers, food access, shopping locations, and other economic necessities. Infrastructure availability, especially well-maintained roads, is crucial in sustaining the aforementioned elements. As time passes, roads experience deterioration and usage, requiring regular maintenance to guarantee their ongoing safety and convenience for users [2].

The local government, particularly the Public Works and Spatial Planning Agency in Tapin Regency, plays a vital role in road management policy decisions. Understanding the factors and stakeholder perceptions influencing road management processes in Tapin Regency is crucial. Therefore, prioritizing road segments should ideally consider non-technical aspects within the medium-term regional development plan and regional strategic plan. The process of compiling the list of road segments to be addressed broadly falls under the jurisdiction of the Highways Division of the Public Works and Spatial Planning Agency in Tapin Regency. The decision-making process involves approval from higher-ranking officials, up to the regional leader, legislative bodies, and department heads.

Various factors have been put forward by previous research on what are the indicators and variables that contribute to the handling of roads in the region. The aspects and criteria that have been put forward by several researchers can still be said have relevance to describe the indicators that will be compiled. Some studies have suggested in the form of benefits, costs, policies, traffic issues, economics, structural road damage, land use and other criteria that cover both technical and non-technical aspects.

This research aims to explore and understand the factors that shape road management policies and decision-making in Tapin Regency. Additionally, it seeks to identify significant indicators that profoundly impact the management of roads in this region. Lastly, the study endeavors to categorize the diverse variables and indicators utilized in the management of roads within Tapin Regency, providing valuable insights for future road management strategies in the region.

2. Method/Materials

2.1. Partial Least Square - Structural Equation Model (PLS-SEM)

Structural Equation Modeling or SEM is the second generation of multivariate analysis techniques that allow researchers to link complex variables both recursively and non-recursively to obtain a comprehensive description of the entire model. SEM can test simultaneously:

1. Structural model which is the relationship between independent and dependent constructs.
2. The measurement model is the relationship (loading value) between indicators and constructs (latent).

2.1.1. Types of SEM Analysis Techniques

SEM analysis can generally be divided into Variance Based SEM (VB-SM) and Covariance Based SEM (CB-SEM). The PLS-SEM approach has unique interactive algorithm characteristics so that it can be applied in reflective and formative measurement models so that it can be concluded that PLS-SEM is a complement to CB-SEM [3].

PLS model consists of 2 elements, namely the first structural model or commonly called the inner model, namely the relationship between variables and the second is the measurement model or outer model that describes the relationship between indicators and variables. PLS-SEM works efficiently with few samples and complex models and can be used almost without assumptions. PLS-SEM can be used in extensive research situations. With PLS-SEM, researchers also benefit from efficient parameter estimation which makes this method statistically stronger than other methods.

2.1.2. PLS-SEM Analysis Technique

Model evaluation encompasses two key components:

1. Outer model assessment, which involves checking item reliability, internal consistency, average variance extracted, and discriminant validity;
2. Inner model evaluation, focusing on the significance of relationships between constructs through path coefficients obtained from bootstrapping or resampling methods.

This assessment is summarized in Table 1 [3], [4]. SEM analysis categorically involves Variance Based SEM (VB-SEM) and Covariance Based SEM (CB-SEM). PLS-SEM, distinguished by its unique interactive algorithm, accommodates reflective and formative measurement models, serving as a complement to CB-SEM.

Table 1. PLS-SEM Model Assessment Criteria

No	Criterion	Explanation
		Evaluation of Reflective Measurement Models
1	Loading Factor	The value should be > 0.7
2	Composite reliability	The value should be > 0.6
3	Average Variance Extracted (AVE)	Must be more > 0.5
4	Validity of discriminants	The square value of AVE must be > the correlation value between latent variables
5	Cross loading	Another measure of discriminant validity, it is expected that each block has a higher value for each latent variable measured compared to indicators for other variables
		Evaluation of Formative Measurement Models
1	Significance of weight value	The estimated value for formative measurements must be significant. The level of value significance is determined by bootstrapping
2	Multicolorarity	The VIF value indicates a symptom of multicolorarity
		Structural Model Evaluation
1	R2 for endogenous variables	An R2 value indicates that the model is good, moderate, or weak
2	Estimation of path coefficients	The estimated value for the path relationship must be significant, the value can be obtained by a bootstrapping procedure that also produces a T-value
3	F2 for effect size	The value of f2 can be identified whether the predictor of the variable has a weak, medium or large influence on the structural level
4	Relevance of predictions (Q2 and q2)	A Q2 value of more than 0 proves that the model has predictive relevance, whereas a Q2 value of less than 0 proves that the model lacks predictive relevance.

Source: Hair et al., 2011; Radam et al. 2018

2.2. Reliability Test

Once the suitability of the model is tested and validity is measured, another evaluation that must be done is the assessment of uni-dimensionality and reliability. Reliability is a measure of the internal consistency of indicators that indicates the degree to which each indicator indicates a general construct, in other words how specific things help each other explain a general phenomenon. The limit value used to assess an acceptable level of reliability is 0.70, although that number is not a standard measure meaning that if the research is exploratory then values below 0.70 are still acceptable as long as they are accompanied by empirical reasons seen in the exploration process. For testing exogenous variables, reliability testing is carried out by composite reliability values test, Cronbach's Alpha value test, and average variance extracted (AVE) value test [5].

2.3. Stakeholder Analysis with Power Versus Interest Grid

One of the commonly used stakeholder mapping techniques is power versus interest grid. The strength of each stakeholder or stakeholder needs to be analyzed to see the extent to which road handling policies are implemented. The strengths and interests of each stakeholder are different in having influential power in policy due to position-based power and credibility as leaders or experts. While stakeholder interest in a particular policy or project can be measured by the level of participation or activity.

After mapping the strengths and interests of each stakeholder, the steps taken are to determine the interventions and steps that need to be taken on stakeholders that have been successfully mapped. A description of the interventions made to stakeholders whose strengths and interests have been identified can be seen from the illustration as shown in Fig. 1 [6].

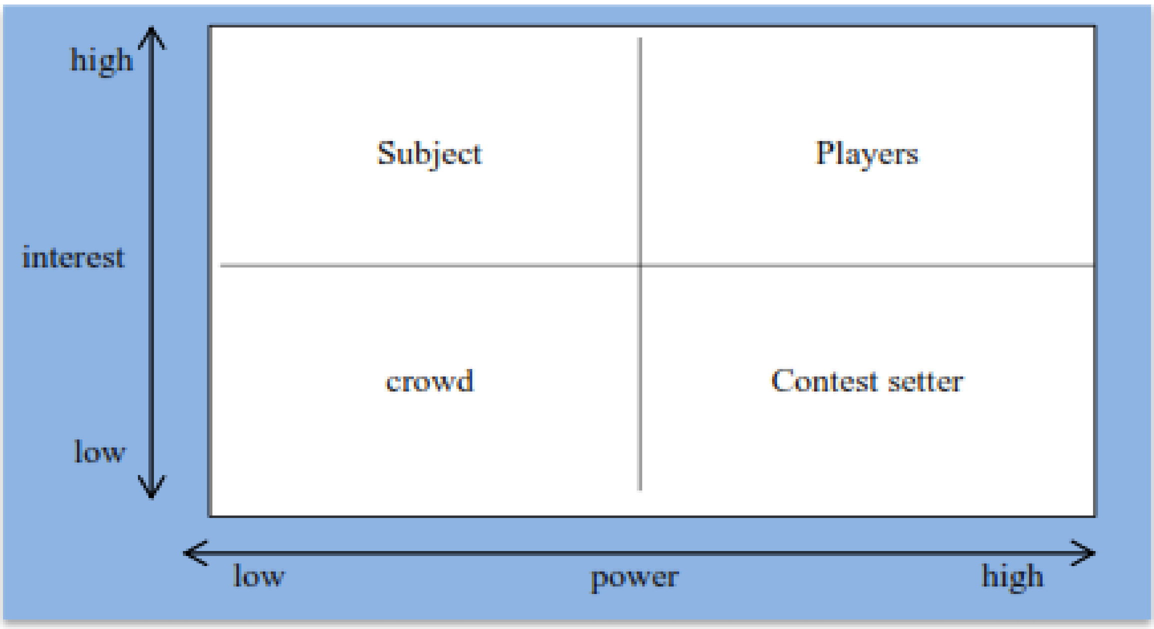

Figure 1. Power vs Grid Diagram

2.4. SWOT Analysis

SWOT analysis is an analysis of the internal or external conditions of an organization which will then be applied as a basis for designing strategies and work programs. Internal analysis includes an assessment of strengths and weaknesses. Meanwhile, external analysis includes elements of opportunities and challenges.

SWOT analysis is part of the planning process. The main thing to emphasize is that in the planning process, the institution or organization needs to assess the current status and shadows that affect the process of achieving the goals of the mechanism [7].

2.5. Research Location and Data Collection

This research was conduct within the scope of Tapin Regency for several road segments which are included in the regency roads. This research was conducted from September 2020 to June 2021.

Primary data was collected by direct survey through distributing questionnaires to respondents. The sampling technique used was non-probability sampling with the accidental sampling method to obtain the desired quantitative data. Respondents in this study were stakeholders related either directly or indirectly to road handling in Tapin Regency. Respondents were selected as many as 125 people consisting of the PUPR Office, Transportation Office, *Bappelitbangda*, Contractors, and Consultants. The questionnaire was designed on a multilevel scale, where respondents selected from very important to very unimportant using a Likert scale of road handling indicators in Tapin Regency.

2.6. Research Method

The method used in this research is the descriptive method. The method of processing the data obtained from the questionnaire proceeds as follows:

1. Primary and secondary data collection. Primary data was collected from distributing questionnaires to parties related to road handling while secondary data was obtained from the Tapin Regency PUPR Office's Bina Marga Division.
2. Primary data from aspects and indicators obtained from the questionnaire were grouped based on occupation and education.
3. The data obtained is processed in a Microsoft Excel worksheet and then exported with a csv file extension so that it can be processed by Smart PLS software.
4. Arrange the latent variables that have been determined in the questionnaire along with the indicators by organizing the direction of the arrow in the Smart PLS software.
5. Classify the types of indicators to separate which indicators are reflective and which are formative.
6. Test the reflective model.
7. Perform PLS algorithm calculations on the software.
8. Checking the outer loading or factor loading generated. Values that are not qualified or invalid will be deleted.
9. Checking the Cronbach's Alpha, Composite Reliability and Average Variance Extracted values.
10. Assessing the cross-loading value by checking the correlation value between the indicator and the variable. The correlation value of the indicator forming with its own variable must be greater than the forming indicator with other variables.
11. Test the model or variable indicators that are formative variables

12. Checking the p-value with bootstrapping determines variable significance in the model. A value close to 0 indicates a strong relationship between the variable and the model.
13. Checking the VIF value to see multicollinearity symptoms.
14. Perform SWOT analysis on indicators that meet the test values.

3. Results

3.1. Stakeholder Analysis

Stakeholder mapping techniques is using power versus interest grid. From the grid technique as previously described, respondents can be grouped as follows:

1. Crowds are stakeholders who have the power to influence policies that are insignificant and also have low importance. Those included in this stakeholder are stakeholders outside the scope of the PUPR Office such as Bappelitbangda and the Transportation Office
2. Context setters, namely stakeholders who have power but low interest in road handling policies, namely fields outside road handling policy makers such as the Secretariat, the Field of Copyright, the Field of Water Resources, the Field of Construction Services and the Field of Spatial Planning
3. Subject is stakeholders who have interests but with little power, namely Consultants and Contractors
4. Players are stakeholders with high strength and interest in road handling policies, namely the Highways Sector.

The power versus interest diagram within the scope or framework of this research can be described in the diagram as shown in Fig. 2.

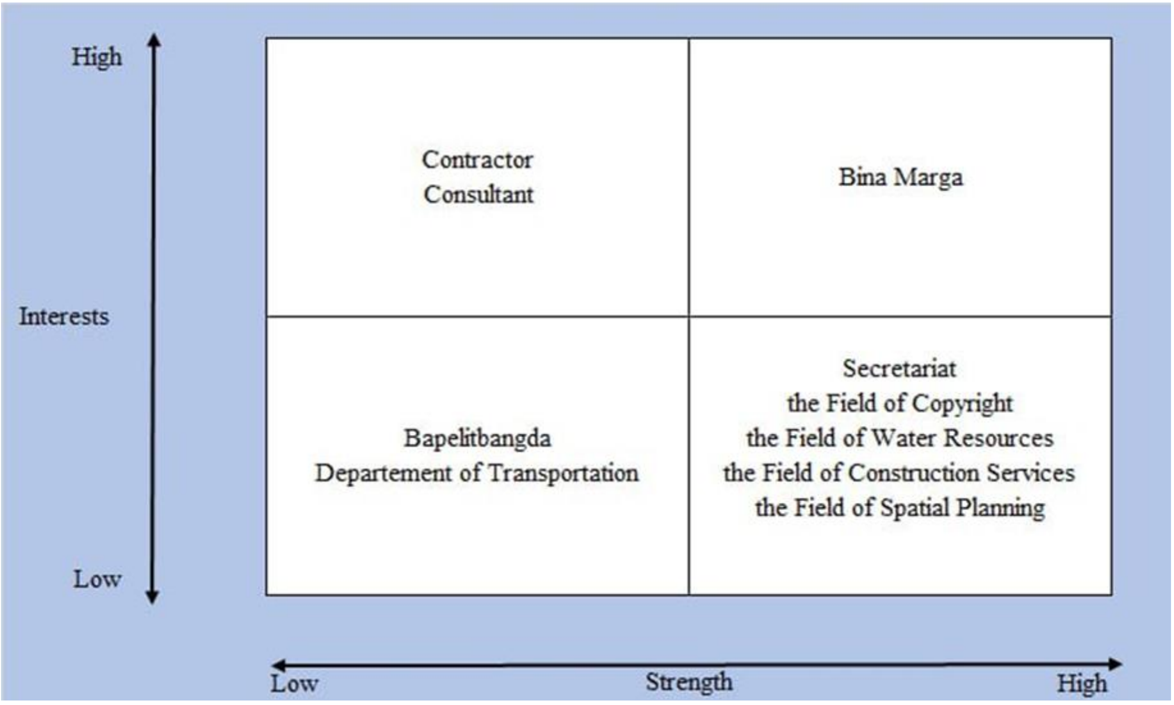

Figure 2. Power vs Grid Stakeholders in PUPR Office of Tapin District

3.1 Determination of Types of Reflective and Formative Relationships

In this study there are two types of variables used, namely edogenous variables and exogenous variables. Endogenous variables are factors that affect road handling policies (Y). While exogenous variables are variables whose value is not influenced or determined by other variables in road handling.

After determining the indicators, the next step is construct measurement. In analysis using Smart-PLS software, measurements of constructs are divided into reflective indicators or formative indicators. The exogenous variables in this study were measured with 54 indicators and have been identified into two parts, namely reflective indicators totaling 43 indicators (Table 2) and formative indicators totaling 11 indicators (Table 3).

Table 2. Research Reflective Indicators (continue)

No	Aspects/Variables	Indicator (Reflective)	Code
1	Road conditions	the presence or number of potholes on the road	KJ1
2		percentage of road damage (percentage of heavy, light, moderate, and good damage)	KJ2
3		percentage of patch area per road segment	KJ3
4	Types of Road Cracks	fine cracks	JRJ1
5		crocodile crack	JRJ2
6		cracks on the roadside	JRJ3
7	Road Surface Type	asphalt road	JPJ1
8		concrete roads	JPJ2
9		dirt/gravel roads	JPJ3
10		Impenetrable roads	JPJ4
11	Roadside Damage	road shoulder condition	KSJ1
12		Side channel condition	KSJ2
13		pavement condition	KSJ3
14	Types of Supported Facilities	health facilities (hospitals, health centers, etc.)	JSD1
15		educational facilities (schools, *pesantren*, etc.)	JSD2
16		agriculture, plantations, fisheries,	JSD3
17		tourism	JSD4
18		office, residential and market areas	JSD5
19	Spatial Planning and Road Functions	arterial roads	TRJ1
20		collector road	TRJ2
21		Local roads	TRJ3
22		neighborhood street	TRJ4
23		Population	TRJ5
24	Access to a city or neighborhood	High access	AKK1
25		Mileage to the city	AKK2
26		Ease of reaching the residence	AKK3
27	Cost	Cost of Investment / Net Present Value	BY1
28		Operating Costs	BY2
29		Environmental costs	BY3
30		Cost of carrying out the work	BY4
31	Traffic Volume	light vehicle volume	VLL1
32		volume of heavy vehicles	VLL2
33		Bus volume	VLL3
34		motorcycle volume	VLL4
35	Traffic Performance	high traffic saturation rate (DS)	KLL1

36		low speed	KLL2
37		poor ITP score	KLL3
38	Traffic Criteria	degree of traffic saturation	KRL1
39		Traffic flow or volume	KRL2
40		Road Capacity	KRL3
41	Regional Development	Streets around urban activity centers	PW1
42		Streets around the suburbs	PW2
43		Roads for the development of the territory	PW3

Table 3. Research Formative Indicators

No	Aspects/Variables	Indicator (Formative)	Code
1	Policy Type	*Musrembang*	JK1
2		district priorities / PUPR programs	JK2
3		Legislative proposals	JK3
4	Road Benefits	Ease of access to a place	MJ1
5		improved relations between regions	MJ2
6		smooth traffic	MJ3
7		Potential for Regional Development	MJ4
8		Regional Transport Development	MJ5
9		Travel time savings	MJ6
10	Intermodal Integration	Direct path to terminal	KAM1
11		Roads that facilitate intermodal switching	KAM2

The relationship between constituent indicators and variables is referred to as Outer Model, while the relationship between exogenous variables and endogenous variables is referred to as Inner Model. Outer model those with reflective indicators are evaluated by Cronbach's Alpha, Composite Reliability and Cross loading. While Outer Model with formative indicators evaluated with due regard to the significance of the value weight with p-value and multi-colliality with evaluation Variance Inflation Factor (VIF).

3.3. Evaluation of Reflective Models on Smart-PLS

Once the indicators are identified, the next step is to enter the data into the Smart-PLS software. Data disseminated through respondents created with Likert scale assessments are entered into Microsoft Excel or other data processing software and then saved with by extensions comma-delimited or csv file types.

The subsequent phase involves creating a path diagram that depicts the intended model. Indicators from Table 2 and Table 3 are utilized, distinguishing between reflective and formative indicators for compilation. This research has a model form as reflective variables in blue, formative variables in green, while endogenous variables in purple and indicators are left in default (yellow). When the software has finished doing the calculation, the loading factor value will be shown. The outer loading value in question is the value listed on the arrow between the indicator and its exogenous variable. The outer loading results on the first run can be seen in Fig. 3.

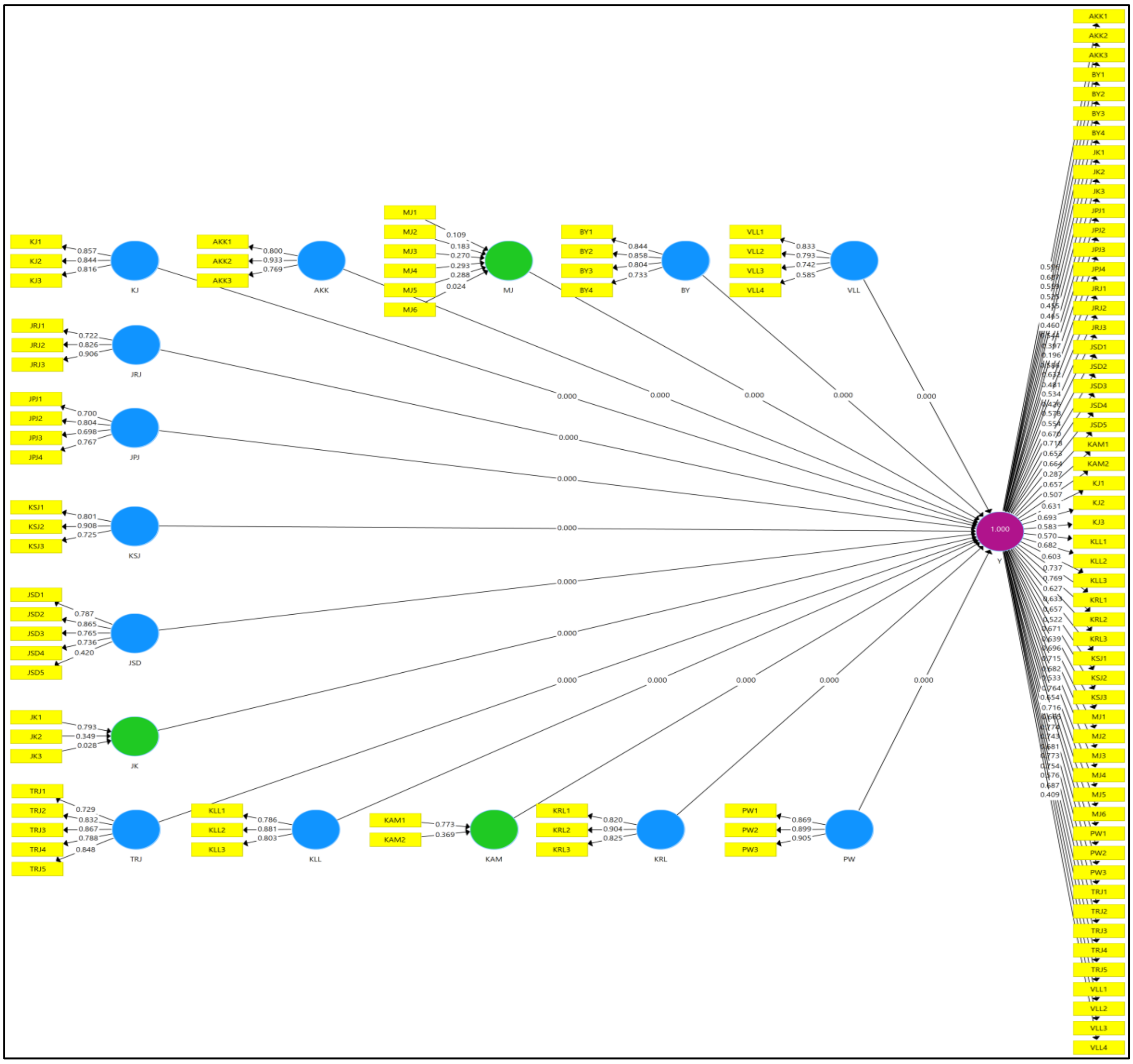

Figure 3. PLS Algorithm First Running Results Model

Indicators that do not meet are corrected one by one until they meet the specified conditions and then the PLS algorithm calculation is carried out again so that an outer loading value is obtained that matches the requirements or is greater than 0.7. The results of the last model and the outer loading values in reflective testing can be seen in Fig. 4.

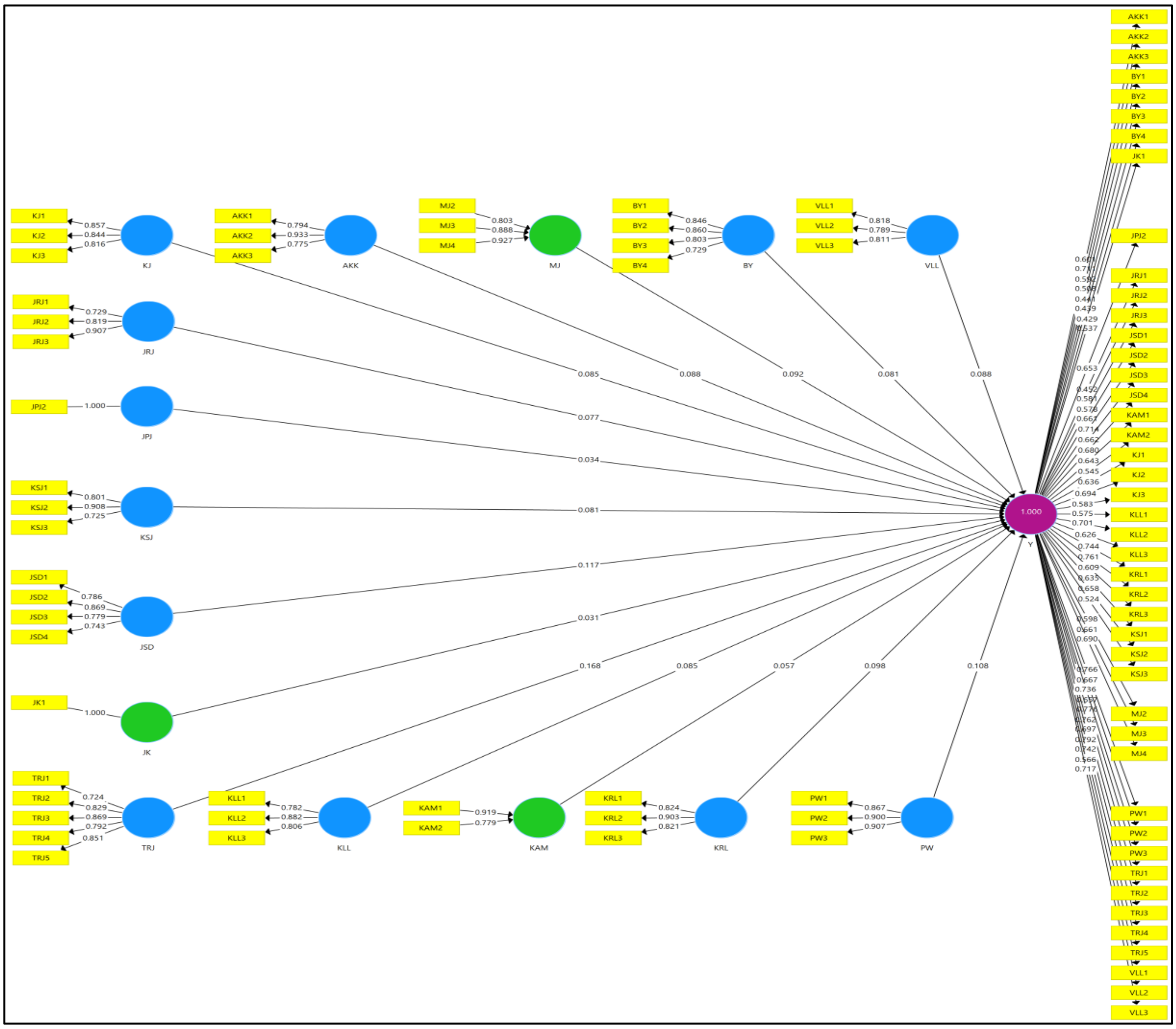

Figure 4. Final Model After Correction of Reflective Indicators

Based on Fig. 4, it is found from 43 reflective indicators, there are 38 indicators that are ideal or the correlation value between the indicator. The variables are good because the value is greater than 0.7, meaning that the indicator is valid as a measure of its construct. The indicators that do not meet as many as 5 indicators are JPJ1 (asphalt road surface type), JPJ3 (dirt / gravel road surface type), JPJ4 (impenetrable road), JSD5 (office, residential and market areas), and VLL4 (motorcycle volume).

After that, we do reliability test by testing composite reliability value of all reflective exogenous variables each has a value greater than 0.7, meaning that the variable used is reliable or very satisfactory and suitable for use as a construct gauge. The final result of reflective model testing is obtained the final model and values Composite Reliability as shown in Fig. 5 and Table 4.

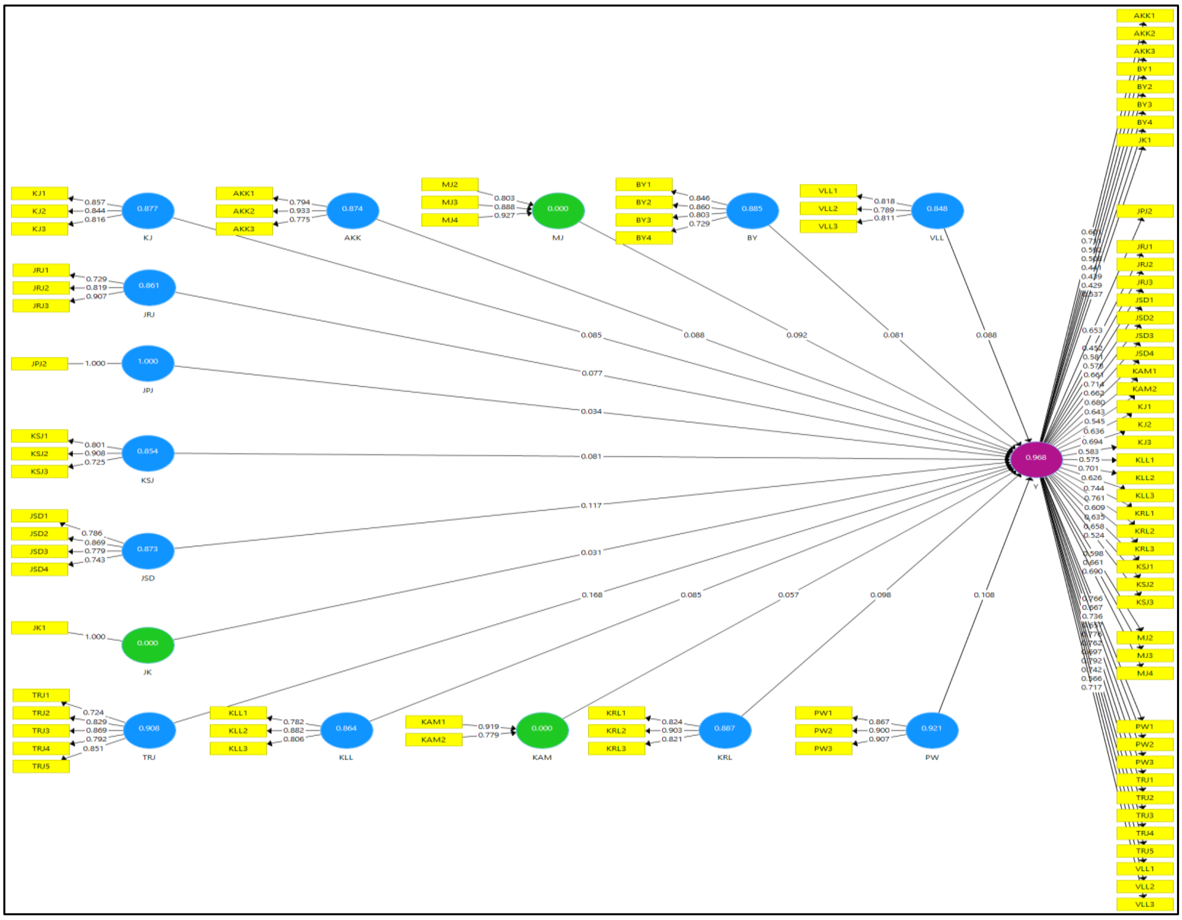

Figure 5. Model with Composite Reliability Value

Table 4. Composite Reliability Test Results Values

No	Exogenous variables	Code	Composite Reliability
1	Access to a city or neighborhood	AKK	0.874
2	Cost	BY	0.885
3	Road Surface Type	JPJ	1
4	Types of Road Cracks	JRJ	0.861
5	Types of Supported Facilities	JSD	0.873
6	Road Conditions	KJ	0.877
7	Traffic Performance	KLL	0.864
8	Traffic Criteria	KRL	0.887
9	Roadside Damage	KSJ	0.854
10	Regional Development	PW	0.921
11	Spatial Planning and Road Functions	TRJ	0.908
12	Traffic Volume	VLL	0.848

Other reliability measurements are made by evaluating *Cronbach's Alpha* values. The last model of the test obtained values as seen in Fig. 6 and Table 5.

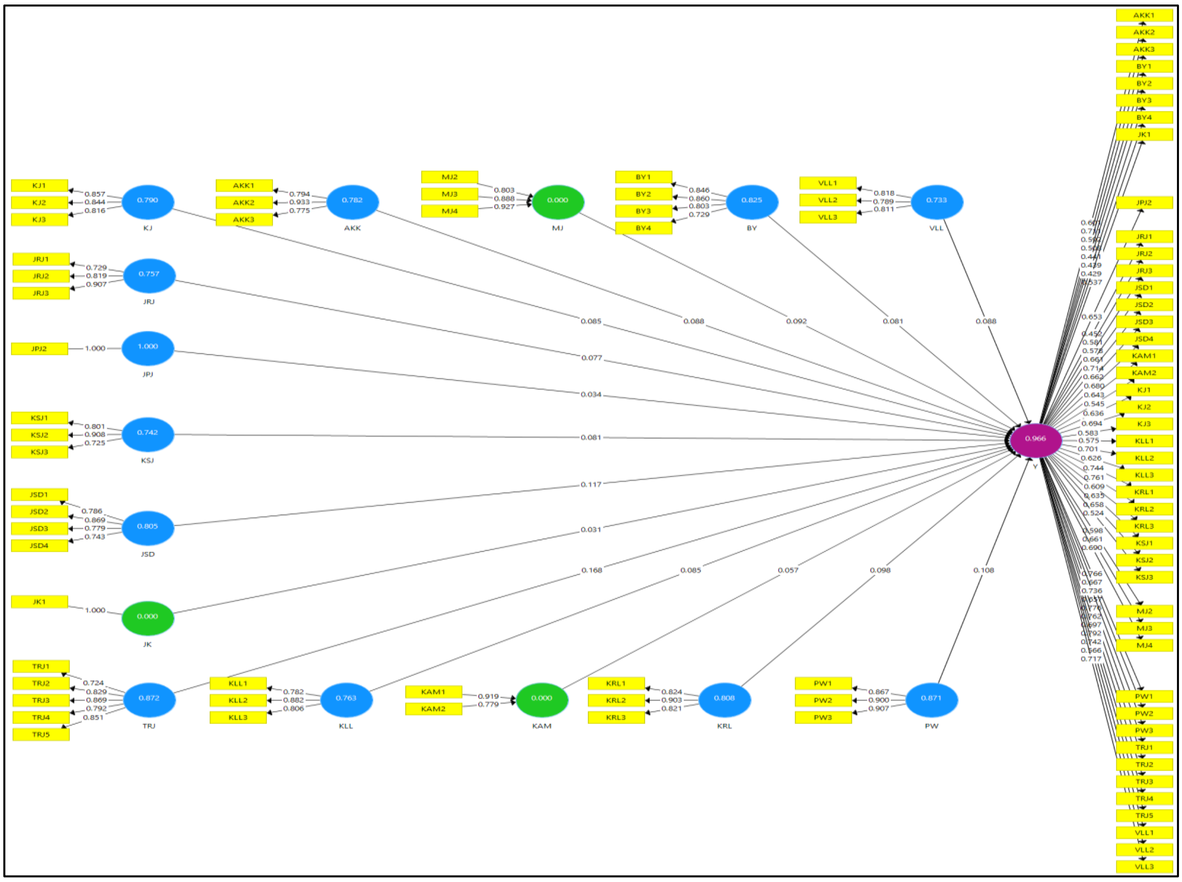

Figure 6. Model with Cronbach's Alpha Value

Table 5. Cronbach's Alpha Values on Exogenous Variables

No	Exogenous variables	Code	Cronbach's Alpha
1	Access to a city or neighborhood	AKK	0.782
2	Cost	BY	0.825
3	Road Surface Type	JPJ	1
4	Types of Road Cracks	JRJ	0.757
5	Types of Supported Facilities	JSD	0.805
6	Road Conditions	KJ	0.79
7	Traffic Performance	KLL	0.763
8	Traffic Criteria	KRL	0.808
9	Roadside Damage	KSJ	0.742
10	Regional Development	PW	0.871
11	Spatial Planning and Road Functions	TRJ	0.872
12	Traffic Volume	VLL	0.733

Cronbach's alpha value and composite reliability were obtained shown that all met the requirements of more than 0.7. It shown that the exogenous variables specified in this study are reliable or the data are reliable.

The next test is to find the amount of AVE value. Testing with this AVE value is carried out to test whether the construct that has been formed is valid or invalid. The result of AVE value test as seen on Fig. 7 and Table 6.

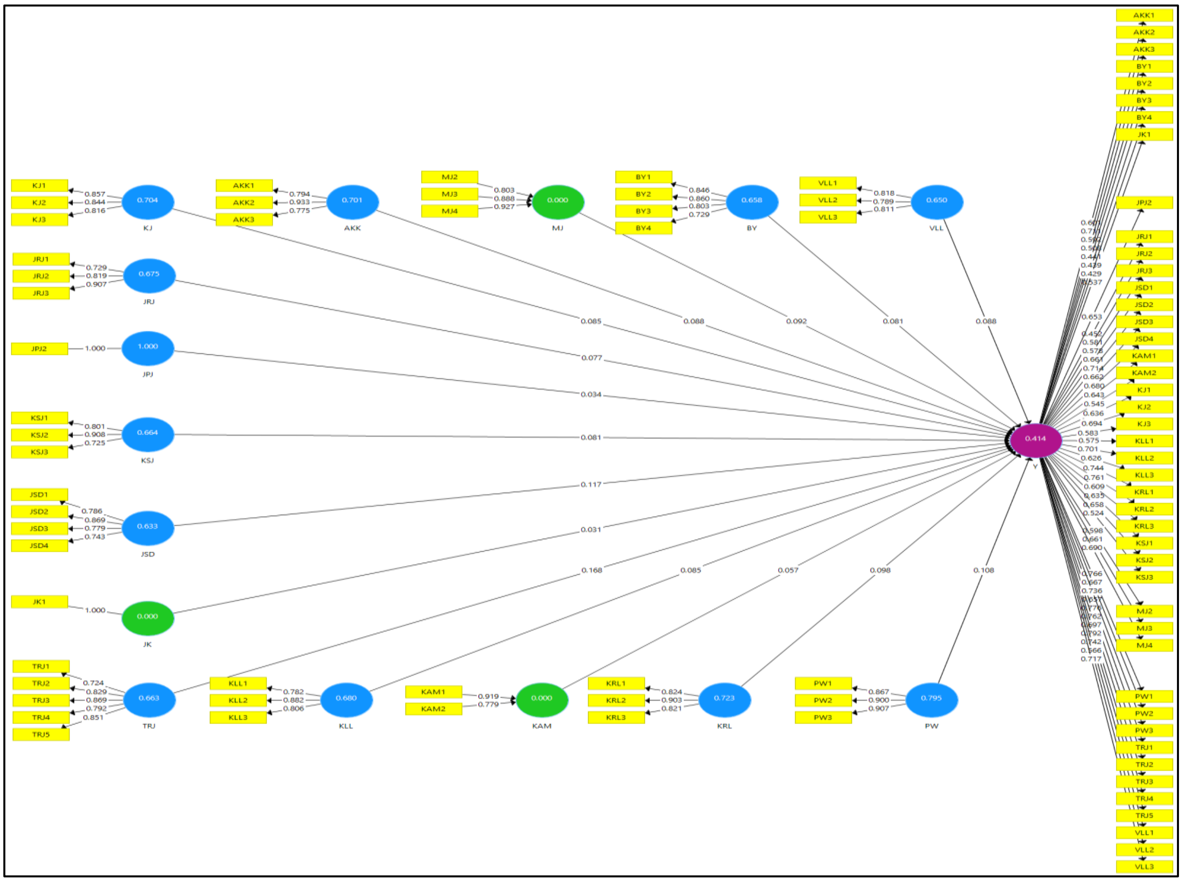

Figure 7. AVE values in Reflective Models

Table 6. AVE Values in Reflective Models

No	Exogenous variables	Code	Average Variance Extracted (AVE)
1	Access to a city or neighborhood	AKK	0.7
2	Cost	BY	0.658
3	Road Surface Type	JPJ	1
4	Types of Road Cracks	JRJ	0.675
5	Types of Supported Facilities	JSD	0.633
6	Road Conditions	KJ	0.704
7	Traffic Performance	KLL	0.68
8	Traffic Criteria	KRL	0.724
9	Roadside Damage	KSJ	0.664
10	Regional Development	PW	0.795
11	Spatial Planning and Road Functions	TRJ	0.663
12	Traffic Volume	VLL	0.65

For AVE values, the limit of values set is 0.5 and all values of exogenous variable test results are above 0.5, so it means that each variable is valid. From the value of composite reliability, Cronbach's Alpha, and AVE values, it can be stated that all 12 reflective variables are reliable and valid.

3.4. Evaluation of Formative Model

For the evaluation of formative models, it was carried out on exogenous variables of road benefits (MJ), type of policy (JK) and intermodal integration (KAM). Two tests were conducted to evaluate the formative model. The first test involved assessing the reliability of indicators through p-value assessment. The second test assessed indicator collinearity by examining the VIF (Variance Inflation Factor) value.

Just like the corrections made to the reflective relationship model, for the formative relationship model, one by one corrections are also made for unqualified p-values. If the resulting indicator value has a p-value of more than 0.05, it is stated that the indicator cannot be used as a predictor or measure of the variable. The final result of the correction in the formative model can be seen in Fig. 8.

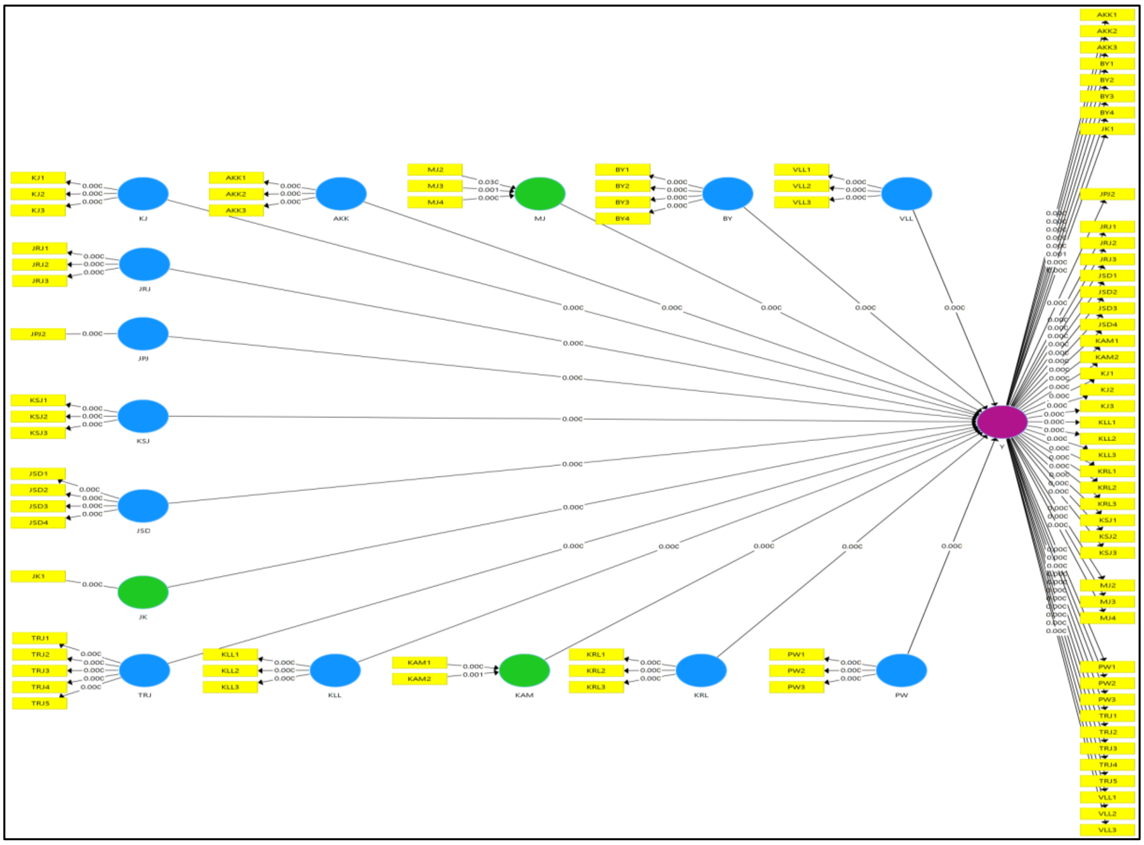

Figure 8. Model diagram after bootstrapping testing

For p-values with a value of 0.000 means that the indicator has a significant effect, the smaller the p-value, the more significant the influence. The p-value that is considered valid or relevant is < 0.05. This means that indicators that meet the values above are considered predictive or can be used as a measure for exogenous variables. The final bootstrapping calculation results can be seen in Table 7.

Table 7. 14 P-Value in Formative Indicators

	Indicators	Relation of Indicator to X	P-Values
1	*Musrembang*	JK1 -> JK	0.000
2	Direct path to the terminal	KAM1 -> KAM	0.000
3	Roads that facilitate intermodal switching	KAM2 -> KAM	0.001
4	Improved relations between regions	MJ2 -> MJ	0.030
5	Smooth traffic	MJ3 -> MJ	0.001
6	Potential development of the territory	MJ4 -> MJ	0.000

The results found that from 11 formative indicators, there were 6 indicators that met the significance value of the variable. From Table 7 it can be concluded that the indicators JK2 (PUPR priority program), JK3 (legislative proposal), MJ1 (ease of access to a place), MJ5 (regional transportation development), and MJ6 (travel time saving) indicators are declared as irrelevant indicators as influential indicators in road handling. Meanwhile, the indicators JK1 (*musrembang*), KAM1 (road directly to the terminal), KAM2 (road that facilitates intermodal change, MJ2 (increased inter-regional connection), MJ3 (smooth traffic), and MJ4 (regional development potential) are stated as relevant indicators as a measure of the variable.

The next step involves assessing the VIF (Variance Inflation Factor) value to identify indications of multicollinearity. This test aims to determine the presence of intercorrelation or collinearity among independent variables within a model. Intercorrelation signifies a linear or robust relationship between one independent or predictor variable and another within the model. The intercorrelation can be seen in Table 8 with the value of VIF or variance inflation factor.

Table 8. VIF Values on Formative Indicators

No.	Indicators	Code	VIF
1	*Musrembang*	JK1	1.000
2	Direct path to the terminal	KAM1	1.279
3	Roads that facilitate intermodal switching	KAM2	1.279
4	Improved relations between regions	MJ2	2.021
5	Smooth traffic	MJ3	2.404
6	Potential development of the territory	MJ4	2.083

The required VIF value in the calculation is < 10. The findings concerning the six indicators in Table 8 indicate an absence of multicollinearity symptoms. This implies that the formative model indicators listed in Table 8 exhibit no correlation among variables.

A recapitulation of the calculation results from all tests carried out can be illustrated in Table 9 and Table 10**.** Of the 54 indicators analyzed by considering convergence, validity, reliability, significance and multicollinearity tests, 43 indicators were declared relevant as gauges in road policy.

Table 9. Recapitulation of Reflective Test Results (continue)

No	Indicator (Reflective)	Code	Loading
1	The presence or number of potholes on the road	KJ1	0.857
2	Percentage of road damage (percentage of heavy, light, moderate, and good damage)	KJ2	0.844
3	Percentage of patch area per road segment	KJ3	0.816
4	Fine cracks	JRJ1	0.729
5	Crocodile crack	JRJ2	0.819
6	Cracks on the roadside	JRJ3	0.907
7	Asphalt road	JPJ1	0.678
8	Concrete road	JPJ2	1
9	Dirt/gravel roads	JPJ3	0.697
10	Impenetrable roads	JPJ4	0.678
11	Road shoulder condition	KSJ1	0.801
12	Side channel condition	KSJ2	0.908
13	Pavement condition	KSJ3	0.725
14	Health facilities (hospitals, health centers, etc.)	JSD1	0.786
15	Educational facilities (schools, *pesantren*, etc.)	JSD2	0.869
16	Agriculture, plantations, fisheries,	JSD3	0.779
17	Tourism	JSD4	0.743
18	Office, residential and market areas	JSD5	0.42
19	Arterial roads	TRJ1	0.724
20	Collector road	TRJ2	0.829
21	Local roads	TRJ3	0.869
22	Neighborhood street	TRJ4	0.792
23	Population	TRJ5	0.851
24	High access	AKK1	0.794
25	Mileage to the city	AKK2	0.933
26	Ease of reaching the residence	AKK3	0.775
27	Cost of Investment / Net Present Value	BY1	0.846
28	Operating costs	BY2	0.86

Table 9. Recapitulation of Reflective Test Results

No	Indicator (Reflective)	Code	Loading
29	Environmental costs	BY3	0.803
30	Cost of carrying out the work	BY4	0.729
31	Light vehicle volume	VLL1	0.818
32	Volume of heavy vehicles	VLL2	0.789
33	Bus volume	VLL3	0.811
34	Motorcycle volume	VLL4	0.585
35	High traffic saturation rate (DS)	KLL1	0.782
36	Low speed	KLL2	0.882
37	Poor ITP score	KLL3	0.806
38	Degree of traffic saturation	KRL1	0.824
39	Traffic flow or volume	KRL2	0.903
40	Road capacity	KRL3	0.821
41	Streets around urban activity centers	PW1	0.867

42	Streets around the suburbs	PW2	0.9
43	Roads for the development of the territory	PW3	0.907

Table 10. Recapitulation of Formative Test Results

No	Indicator (Formative)	Code	p-value
1	*Musrembang*	JK1	0.000
2	District priorities / PUPR programs	JK2	0.052
3	Legislative proposals	JK3	0.929
4	Ease of access to a place	MJ1	0.311
5	Improved relations between regions	MJ2	0.030
6	Smooth traffic	MJ3	0.001
7	Potential for Regional Development	MJ4	0.000
8	Regional transport development	MJ5	0.096
9	Travel time savings	MJ6	0.872
10	Direct path to terminal	KAM1	0.000
11	Roads that facilitate intermodal switching	KAM2	0.001

From Table 9 it can also be seen that for indicators with a significant influence, namely indicators of concrete road type (JPJ2), distance to the city (AKK2), side channel conditions (KSJ2), cracks on the side of the road (JRJ3), and roads for regional development (PW3) are indicators that affect quite significantly in road handling. The loading value rating in the reflective model can be seen in Table 11.

Table 11. Order of Reflective Indicators by Loading Value

No	Indicator (Reflective)	Code	Loading
1	Concrete road	JPJ2	1
2	Mileage to the city	AKK2	0.933
3	Side channel condition	KSJ2	0.908
4	Cracks on the roadside	JRJ3	0.907
5	Roads for the development of the territory	PW3	0.907
6	Traffic flow or volume	KRL2	0.903
7	Streets around the suburbs	PW2	0.9
8	Low speed	KLL2	0.882
9	Educational facilities (schools, *pesantren*, etc.)	JSD2	0.869
10	Local roads	TRJ3	0.869
11	Streets around urban activity centers	PW1	0.867
12	Operating costs	BY2	0.86
13	The presence or number of potholes on the road	KJ1	0.857
14	Population	TRJ5	0.851
15	Cost of investment / net present value	BY1	0.846
16	Percentage of road damage (percentage of heavy, light, moderate,	KJ2	0.844

	and good damage)		
17	Collector road	TRJ2	0.829
18	Degree of traffic saturation	KRL1	0.824
19	Road capacity	KRL3	0.821
20	Crocodile crack	JRJ2	0.819
21	Light vehicle volume	VLL1	0.818
22	Percentage of patch area per road segment	KJ3	0.816
23	Bus volume	VLL3	0.811
24	Poor itp score	KLL3	0.806
25	Environmental costs	BY3	0.803
26	Road shoulder condition	KSJ1	0.801
27	High access	AKK1	0.794
28	Neighborhood street	TRJ4	0.792
29	Volume of heavy vehicles	VLL2	0.789
30	Health facilities (hospitals, health centers, etc.)	JSD1	0.786
31	High traffic saturation rate (ds)	KLL1	0.782
32	Agriculture, plantations, fisheries,	JSD3	0.779
33	Ease of reaching the residence	AKK3	0.775
34	Tourism	JSD4	0.743
35	Fine cracks	JRJ1	0.729
36	Cost of carrying out the work	BY4	0.729
37	Pavement condition	KSJ3	0.725
38	Arterial roads	TRJ1	0.724

For formative indicator models that are quite influential, namely the type of musrembang policy (JK1), regional development potential (MJ4), direct roads to terminals (KAM1), smooth traffic (MJ3), and roads that facilitate intermodal changes (KAM2). For more detailed results of the ranking for formative models can be seen in Table 12.

From the results of the overall analysis of the reflective and formative model, it was also found that several new indicators relevant to road handling in Tapin Regency were indicators (1) low speed (KLL2), (2) poor ITP value (KLL3), (3) roads around the suburbs (PW2) and (4) roads for regional development (PW3). For surface type indicators according to the DD1 format of Regional Roads, only concrete roads (JPJ2) are relevant in this study.

Table 12. Order of Formative Indicators by P-Value

No.	Indicator (Formative)	Code	P-Value	VIF
1	*Musrembang*	JK1	0.000	1.000
2	Potential for Regional Development	MJ4	0.000	2.083
3	Direct path to terminal	KAM1	0.000	1.279
4	Smooth traffic	MJ3	0.001	2.404
5	Roads that facilitate intermodal switching	KAM2	0.001	1.279
6	Improved relations between regions	MJ2	0.030	2.021

For motorcycle volume indicator (VLL4) as seen in [8] research is not relevant on the case for Tapin District. In the policy type variable, indicators of district priority programs (JK2) and legislative proposals (JK3) which are the main sources of preparation of work plans and budgets are also not included in road handling indicators. In research as seen in [9] for road benefit variables obtained in this study that indicators of ease of access to a place (MJ1), regional transportation development (MJ5) and travel time savings (MJ6) are not relevant in the scope of Tapin Regency.

3.5. SWOT Analysis

To find out the dominant indicator, a simple SWOT analysis is carried out by collecting all reflective and formative indicators. The calculation process for SWOT analysis is:

1. The weight is obtained by interpolating the loading value and dividing by the total loading so that the result is obtained a weight value that ranges from 0.02.
2. The rating is given a score based on the assessment of the indicator in question with the suitability of the implementation commonly carried out by the Highways Field.
3. The score is obtained by multiplying between weight and rating, as seen on Table 13 and Table 14.
4. The scores of each section are then summed up to be transferred to the SWOT matrix, as seen on Table 15 and Fig. 9.

Table 13. Analysis of Indicators for S-W

Strength	Weight	Rating	Score
Concrete road	0.059	7	0.413
Traffic flow or volume	0.053	5	0.266
Low speed	0.052	5	0.260
Streets around urban activity centers	0.051	5	0.256
Degree of traffic saturation	0.049	3	0.146
Road capacity	0.048	7	0.339
Light vehicle volume	0.048	7	0.338
Bus volume	0.048	5	0.239
High access	0.047	5	0.234

Ease of reaching the residence	0.046	5	0.229
Musrembang	0.055	9	0.496
Smooth traffic	0.050	5	0.251
			3.468
Weakness	Weight	Rating	Score
Local roads	0.051	9	0.462
Operating costs	0.051	5	0.254
Streets around the suburbs	0.053	7	0.372
Cost of investment / net present value	0.050	7	0.350
Environmental costs	0.047	3	0.142
Volume of heavy vehicles	0.047	7	0.326
Cost of carrying out the work	0.043	9	0.387
Direct path to terminal	0.051	5	0.256
	1		2.548

Table 14. Analysis of Indicators for O-T (continue)

Opportunity	Weight	Rating	Score
Mileage to the city	0.047	3	0.142
Roads for the development of the territory	0.046	5	0.230
Educational facilities (schools, *pesantren*, etc.)	0.044	9	0.397
Collector road	0.042	3	0.126
Neighborhood street	0.040	5	0.201
Health facilities (hospitals, health centers, etc.)	0.040	7	0.279
Agriculture, plantations, fisheries,	0.040	7	0.277
Tourism	0.038	7	0.264
Arterial roads	0.037	1	0.037
Potential for Regional Development	0.046	7	0.320
Roads that facilitate intermodal switching	0.041	3	0.124
Improved relations between regions	0.039	5	0.197
			2.594

Table 14. Analysis of Indicators for O-T

Threats	Weight	Rating	Score
Side channel condition	0.046	7	0.323
Cracks on the roadside	0.046	7	0.322
The presence or number of potholes on the road	0.044	9	0.392
Population	0.043	9	0.389
Percentage of road damage (percentage of heavy, light, moderate, and good damage)	0.043	9	0.386

Crocodile crack	0.042	7	0.291
Percentage of patch area per road segment	0.041	3	0.124
Poor ITP score	0.041	3	0.123
Road shoulder condition	0.041	7	0.285
High traffic saturation rate (DS)	0.040	3	0.119
Fine cracks	0.037	5	0.185
Pavement condition	0.037	3	0.110
			3.049

Table 15. Position of Road Management Strategy in SWOT Analysis

Strength – Weakness	3.468	-	2.548	=	0.92	=	x value
Opportunity – Threats	2.594	-	3.049	=	-0.455	=	y value

From the results of the SWOT analysis, the X and Y values obtained are included in quadrant II as illustrated in Fig. 9, which is dominant in Strength and Threats.

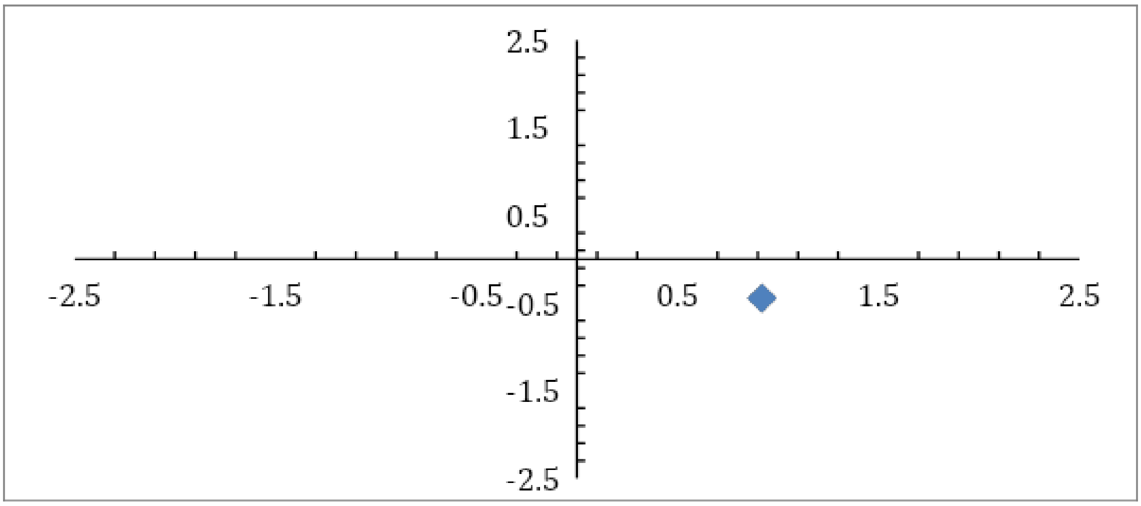

Figure 9. SWOT Analysis Cartesian Diagram

The indicators included in quadrant 2 are (1) concrete roads, (2) flow or volume, (3) low speed, (4) roads around urban areas, (5) degrees of saturation, (6) capacity, (7) volume of light vehicles, (8) volume of buses, (9) high access, (10) ease of reaching residences (11) *Musrembang*, (12) smooth traffic, (13) channel condition, (14) cracks on the roadside, (15) number of potholes, (16) number of inhabitants, (17) damage presentation, (18) crocodile cracks, (19) patch presentation (20) poor ITP scores, (21) road shoulder conditions, (22) high traffic DS, (23) fine cracks, (24) pavement conditions.

4. Conclusions

The research findings show that:

1. From all of the 54 indicators that influence road handling, 44 indicators are relevant and can be stated as measuring indicators that influence road handling, consisting of 38

reflective indicators and 6 formative indicators.

2. To calculate the significant indicators, SWOT analysis was conducted to select 24 indicators that are considered dominating, namely (1) concrete roads, (2) flow or volume, (3) low speed, (4) roads around urban areas, (5) degree of saturation, (6) capacity, (7) light vehicle volume, (8) bus volume, (9) high access, (10) ease of reaching residence (11) *musrembang*, (12) smooth traffic, (13) channel condition, (14) roadside cracks, (15) number of potholes, (16) population, (17) deterioration presentation, (18) alligator cracking, (19) patching presentation (20) poor ITP score, (21) road shoulder condition, (22) high traffic DS, (23) fine cracking, and (24) sidewalk condition.

3. Of the 15 exogenous or independent variables, 12 are reflective and 3 are formative. All 12 reflective variables were declared valid or relevant and reliable as variables of influence in road handling in Tapin Regency.

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