Analysis of the Technocratic and Participatory Approach Models on District Road Maintenance

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Abstract. Compared to national roads, district roads are in very poor condition because most of them are in an unstable condition. This shows that the maintenance of district roads has not run well. One of the problems is budget constraints. For this reason, an evaluation of the current maintenance planning approach is based on a combination of technocratic and participatory models. This article will discuss the factors that have a significant effect on road maintenance so far using Structural Equation Models (SEM). The results showed that the variable community participation was not significantly influential in planning the district road maintenance program. This has a major impact on the condition of district roads where many sections that are severely damaged have never been included in road management programs in each fiscal year. For this reason, the strategy to develop a road maintenance program needs to involve the community.

Keywords: Technocratic, Participatory, District Road, Maintanance

1 Introduction

The age of the road is strongly influenced by the behavior of the road handlers shown from the road maintenance efforts. Planned and systematic road maintenance will guarantee the service life of the road until it reaches an economic life of [1]. Whereas poor road maintenance will increase economic costs for road users [2] [3]. For this reason, it is very important to carry out proper and proper road maintenance.

But in reality, roads in Indonesia, especially roads with district road authority status, are in poor condition. Data shows that nationally, the total length of district roads in Indonesia reaches 436,912 km [4]. Of the total length of the road sections 56.93% in steady conditions, 43.07% in unstable conditions whereas in NTT in 2016, the length of district roads reached 17,310.32 km with 52.23% steady conditions and 47.77% not steady [5]. This condition requires serious attention because when compared to national roads, the condition of district roads is very alarming. One of the causes of the still large number of unstable district road conditions is the lack of a maintenance budget in addition to poor maintenance implementation [6]. Data released by the NTT Provincial Public Works Department shows that the district's road construction budget averages 10 billion per year [7]. The amount is not enough because they have to build new roads while simultaneously maintaining old roads. In Belu District, for example, due to budget constraints, maintenance was carried out in a self-managed manner and received support from CSR funds of several entrepreneurs in the City of Atambua [8].

Based on this fact, it is necessary to approach it in such a way as to provide space for optimal utilization of the limited maintenance budget. One approach used is to prioritize road handling in road maintenance management.

Several studies on road maintenance show a very significant role of government in deciding a maintenance policy even though the proposal is a community proposal submitted through *Musrembang* both at the district and provincial [9] [10]. The role of the government is

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generally represented by relevant technical agencies and the people's representative council as government partners in formulating regional policies.

Meanwhile, in another study, community participation has also been identified in the development of road infrastructure. One of the interesting identification results is that if the community feels that they have little authority in formulating policies, their participation tends to be low, while if the authority is large enough, the greater the level of participation is [11].

This brief description shows that the approach to road infrastructure development can be approached through a structural approach to the bureaucracy which later became known as the technocratic approach or through community participation. This article will examine how the district road maintenance management approach model uses a combination of technocratic and participatory approaches.

Road maintenance is efforts made to maintain the condition of road services so that they can continue to function properly so as to provide security and comfort for road users and consist of routine maintenance, emergency maintenance (repairs), and periodic maintenance (reconstruction) and road conditions can be stated in the IRI (International Roughnes Index), RCI (Road Condition Index) and PCI (Pavement Condition Index) index [12]. Road maintenance covers several aspects, namely improving the pavement function, extending the functional life and structure of the road, improving road safety and its attributes, and keeping the road in good condition [13].

In road maintenance management, as a whole is an activity that includes surveys and investigations, planning, financing, implementation and evaluation. Road maintenance management in many publications is defined as engineering and administrative functions intended to ensure the sustainability of the system and restore conditions to normal so that the road can function properly [3].

Maintenance planning using a technocratic approach is a planning process that is designed based on data and observations of the needs of the community and professional observers and educated community groups even though they do not experience it themselves but armed with the knowledge they have can infer the needs of an item that is not available to produce an academic perspective on development [14] .

Whereas the participatory approach, namely the community as the subject of development in the sense of providing the opportunity for the community to use its political rights to provide input and aspirations in the preparation of development planning [15]. So in this case, as manifested by the Banjarmasin City Balitbang [16] the technocratic approach is characterized by a top-down principle that shows traits such as the formulation of clear issues and problems; the formulation of priority issues according to the urgency, interests, and impact of issues on the welfare of society; formulation of development objectives; alternative strategies and so on. While the participatory approach means that the community as a subject in development is characterized as a bottom up, namely the identification of relevant stakeholders to be involved in the process of formulating a vision and mission; there is equality between government and non-government stakeholders in decision making; there is transparency and accountability in the planning process; adequate representation from all segments of society especially women and marginalized groups; there is consensus or agreement at all important stages of decision making such as the formulation of priority issues and problems, the formulation of objectives, strategies, and policies; and program and other priorities.

Previous research on this topic has been widely discussed, especially with regard to the analysis of priority road handling, cost analysis and analysis of various technologies that can be used in carrying out maintenance activities.

According to Li et al. [17], in road maintenance it is necessary to consider various aspects before making a decision. This consideration refers to the performance of the pavement, the strength of the pavement structure, the traffic load, the age of the pavement, and the level of the road. By using the Analytical Hierarchy Process (AHP) method a decision can be made regarding road maintenance. While from the sensitivity analysis it is known that the cost aspect has a high sensitivity in influencing road performance.

In addition to the technical aspects, the role of government and socioeconomic factors are very influential in decision making. From a study conducted in Aceh after the Tsunami, the local Government, in carrying out road maintenance, was very much controlled by the political and socio-economic aspects of the region when determining the priority of road maintenance pemeliharaan[18]. Other studies related to determining priorities in district road maintenance also only involve decision makers, namely the DPRD, Bappeda and Public Works Office in Berau District, which show a technocratic approach and produce information on road condition factors are the most important factors considered in planning road maintenance programs [19].

Several other studies also discuss the determination of road maintenance priorities using the AHP method and involve elements of the government in making decisions and the factors that influence it [20] [21].

Studies in addition to maintenance planning have also been carried out, which are related to how to measure the successful implementation of road maintenance policies. Research results from [22] show that by using the George C. Edward III Policy Implementation Model theory with indicators: communication, resources, disposition, bureaucratic structure, there are still obstacles in the implementation of district road maintenance program policies in Karawang Regency that have not been fully implemented because there are still roads with poor conditions due to inadequate quantity and quality of apparatus resources, lack of effective communication and coordination, as well as weak supervision conducted by the Public Works and Spatial Planning Office of the private sector as a Technical Team or Implementation Team in implementing road maintenance programs districts.

While related to participation in road maintenance, the community does not yet know the extent of their authority in carrying out road maintenance. Using a qualitative approach, in Karanganyar Village, Jember Regency, it was found that the community did not realize the importance of maintaining village roads because no prior socialization had been conducted to the community [23].

According to Setiawan [24], the criteria that can be used to identify community involvement are at the planning stage include: (1) the degree of volunteerism; (2) ways of involvement; (3) intensity and frequency in activities; (4) effectiveness; (5) who is involved; and (6) the style of participation and the stages of implementation / development include (1) thoughts; (2) power; (3) goods assistance; and (4) financial assistance. Whereas the type of participation consists of: mind (psychological participation), energy (physical participation), mind and energy (psychological and physical participation), expertise (participation with skill), goods / material (material participation), money (money participation). While the forms of participation in the maintenance and management phases consist of: (1) Attendance at meetings; and (2) Willingness to pay contributions. These forms of participation are analyzed in each stage of development from planning, implementation, and maintenance. Evaluation of each stage is carried out by measuring indicators of Nabeel Hamdi's level of assessment consisting of: Indirect, Consultative, Shared Control, and Full Control.

From the description above can be formulated several variables that will be tested in the model. The approach used in preparing this model is a technocratic and participatory approach. Variables technocratic approach related to aspects of the preparation of frameworks,

management models, budgeting and other related aspects which are compiled based on empirical data with analysis to obtain a solution for handling. For this reason, in this study technocratic variables used in the model are technical, institutional, and policy variables. Whereas the community participation variable is used in the model to measure whether there is influence of community involvement in the maintenance of district roads. From these variables, indicators will then be identified to be used to measure the variables. The details are presented in Table 1.

Table 1. Variable and Indicator

No	Variable & Indicator	Variabel Type
X_1	Technical	
X_{11}	District road maintenance is carried out based on a realistic and factual approach	Formative
X_{12}	Maintenance of district roads is carried out rationally and logically?	
X_{13}	District road maintenance is carried out comprehensively and comprehensively	
X_2	Community Participation	
X_{21}	The community is involved in preparing district road maintenance plans	Reflektive
X_{22}	The community is involved in implementing regency road maintenance	
X_{23}	The community is involved in evaluating the maintenance of district roads	
Y_1	Institutional	
Y_{11}	Determination of the type of road maintenance is the task of the authorized agency / government	Formative
Y_{12}	Determination of district road maintenance budget is the duty and responsibility of the district government	
Y_{13}	Determination of the road sections that will be included in maintenance activities in the current fiscal year is the duty and responsibility of the district government	
Y_2	Road Conditions	
Y_{21}	The condition of district roads is always in good and stable condition	Refektive
Y_{22}	Regency roads are always maintained regularly and periodically	
Y_3	Policy	
Y_{31}	Budgeting for district road maintenance is appropriately budgeted every year	Reflektive
Y_{32}	Alignments in the road maintenance program are in accordance with applicable regulations	
Y_{33}	Strategy for Achieving Target of district road services has been well and precisely arranged.	

2 Method

This research is a descriptive study with a quantitative approach in describing the phenomena that occur. As a regional sample, this study was conducted in Belu District. The method used in analyzing the model is the Structural Equation Model (SEM). SEM is a multivariate analysis, characterized by the number of variables that have different units and have varying moments. In this study using the SEM WarpPLS approach. Analysis with WarpPLS can be done if the model constructed is reflective and / or formative and the pattern of the

relationship is recursive and or not recursive with the Latent variable, ie the variable whose value cannot be measured directly [25].

The formed equation model is very dependent on the variables that will be used in formulating the model. In this study, the assessment of the variables to be tested uses a Likert scale of 1-5 scale which states the level of influence from very unaffected (1) to very influential (5).

The sampling technique used to determine respondents was purposive sampling. The consideration is that the respondent is a person who directly and indirectly contributes to the determination of road maintenance handling, namely the policy maker (Echelon II official of the relevant technical service & DPRD members), the element of technical planner, the element of technical implementer, the element of society.

The basic formula in forming the model is as follows:

$$Y_1 = \beta_{01} + \beta_1 X + ...+ \beta_n X + \varepsilon_1 \quad (1)$$

$$Y_2 = \beta_{02} + \beta_2 X + \beta_3 Y_1 + ...+ \beta_n Y_n + \varepsilon_2 \quad (2)$$

$$Y_n = \beta_{0n} + \beta_n X + \beta_{n+1} Y_1 + \beta_{n+2} Y_2 .....+ \beta_{n+...} Y_n + \varepsilon_3 \quad (3)$$

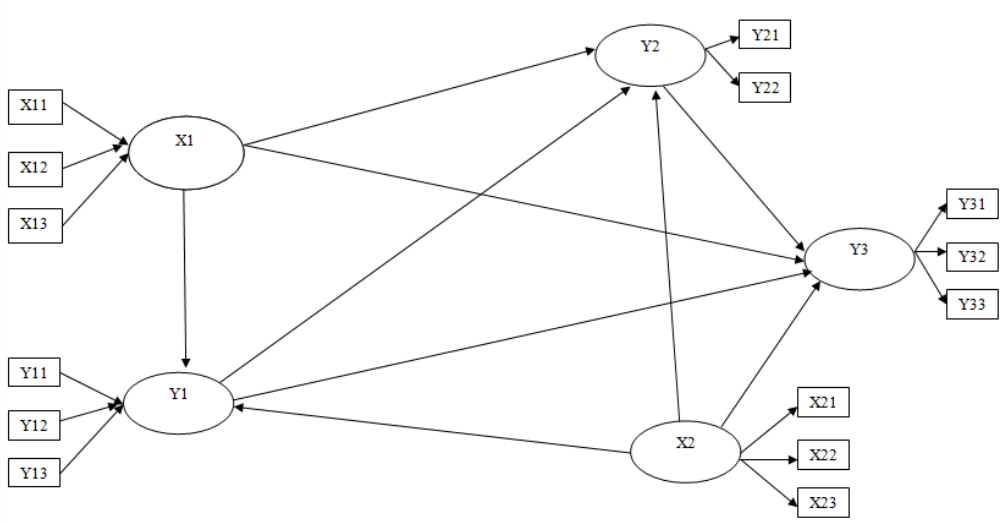

Figure 1. Hypothesis Design in SEM

From Figure 1, the Hypothesis to be tested is as follows:

1. H0: Variable X_1 has no significant direct effect on the Y1 variable. H1: Variable X_1 has a significant direct effect on the Y_1. variable.
2. H0: Variable X_1 has no significant direct effect on the Y_2 variable. H1: Variable X_1 has a significant direct effect on the Y_2.
3. H0: Variable X_1 has no significant direct effect on Y_3. H1: Variable X_1 has a significant direct effect on the Y_3.

4. H0: Variable X_2 has no significant direct effect on the variable Y_1. H1: Variable X_2 has a significant direct effect on the Y_1.
5. H0: Variable X_2 has no significant direct effect on the Y2 variable. H1: Variable X_2 has a significant direct effect on the Y2 variable
6. H0: Variable X_2 has no significant direct effect on the Y3 variable. H1: Variable X_2 has a significant direct effect on the Y3.
7. H0: Variable Y_1 does not have a significant direct effect on the Y_2 variable. H1: Variable Y_1 has a significant direct effect on the Y_2.
8. H0: The Y_1 variable does not significantly influence the Y_3 variable directly. H1: Variable Y_1 has a significant direct effect on the Y_3
9. H0: The Y_2 variable does not have a significant direct effect on the Y_3 variable. H1: Variable X1 has a significant direct effect on the Y_3

3 Result and Discussion

3.1 Roads Condition

Roads with the status of district roads in Belu, NTT up to now have reached 353,015 km spread throughout the Regency, and connecting between regions within the district, while in the city of Atambua, there are 36,980 km. On roads in the city, generally in the form of flexible pavement type HRS except on 4 roads using Lapen. Of the 16 surveyed roads, the condition of existing roads ranging from good to heavily damaged. Figure 1 shows the number of road sections based on the condition of each road section. The results show that of the 16 road segments surveyed, 50% were severely damaged and only 19% were in good condition. This shows that the surveyed road sections have not been properly handled. Names of roads and types of damage are presented in Table 2.

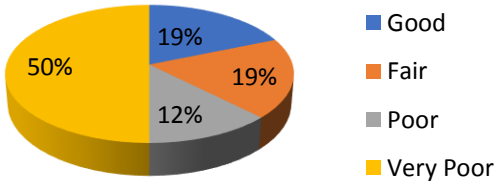

Figure 2. Percentage of road based on road conditions

Table 2. Name and Road Condition

No.	Name of Road Section	Length of road section	Distress Type									Pavement Index	Pavement Condition Rating
			1	2	3	4	5	6	7	8	9		
1	Paulus Moruk	0,273	x	x	x	x		x		x	x	3	Verry poor
2	Hayam wuruk	0,29	x	x								5	Fair
3	Gajah Mada	0,424	x	x								5	Fair
4	Ahmad Yani Yosep	1,3	x	x								6	Baik
5	Andrada Cut Nya	0,3	x	x	x	x	x	x	x	x	x	2	Verry poor
6	Dhien	0,877	x	x								6	Good
7	A.J. Beremau	2,329			x	x	x	x		x	x	3	Verry poor
8	MT. Haryono	0,95	x	x				x		x		5	Fair
9	IJ. Kasimo	1,417			x	x	x					3	Verry poor
10	Proklamasi	0,816	x	x				x	x			6	Poor
11	Vetor Lidak WJ.	0,332	x	x				x				6	Poor
12	Lalamentik Moruk	0,368	x	x								7	Good
13	Pasundan	0,563	x	x								7	Good
14	Fatubenao-Debubot	8		x	x	x	x	x	x	x	x	3	Verry poor
15	Nenuk - Lookeu	12	x	x	x	x			x	x	x	3	Verry poor
16	Weluli - Fulur	7,2			x	x	x	x	x	x	x	3	Verry poor

Note. 1. Crack; 2. Waves 3. Potholes; 4. Lack of binding to the lower course.; 5. Ruting; 6. Bleeding; 7. Drainage; 8. thinning of the road surface course; 9. Roadside

3.2 Outer Model Test

The purpose of this test is to determine the extent of the validity and reliability of the variables so that they can be continued to be analyzed in the model. In SEM analysis with WarpPLS, validity and reliability are measured from the Loading factor and Cross Loading values, where if loading factor> 0.5 and p value <0.001 it can be said to be valid. Furthermore the variable is declared reliable if the AVE value is met where the AVE value on the main diagonal is greater than the other AVE values.

Table 3 Combined Loadings dan Cross Loadings

Indikator	Variabel					Type	SE	P value
	X_1	X_2	Y_1	Y_2	Y_3			
X_{11}	**0,588**	-0.261	-0.036	-0.109	0.039	Formati	0,071	<0.001
X_{12}	**0,599**	0,197	-0.026	-0.060	0.020	Formati	0,071	<0.001
X_{13}	**0,508**	-0.033	0.072	0,137	-0.069	Formati	0,074	<0.001
X_{21}	0.064	**0,522**	-0.062	0,118	-0.268	Reflect	0,074	<0.001
X_{22}	-0.144	**0,541**	0,172	-0.146	0,088	Reflect	0,073	<0.001
X_{23}	0.090	**0,500**	-0.205	-0.020	0,100	Reflect	0,075	<0.001
Y_{11}	-0.069	0.071	**0,619**	-0.056	-0.092	Formati	0,069	<0.001
Y_{12}	0.093	-0.038	**0,594**	-0.231	0,140	Formati	0,071	<0.001
Y_{13}	-0.020	-0.034	**0,638**	0,187	-0.098	Formati	0.099	<0.001
Y_{21}	0.038	0.042	0,110	**0,637**	-0.155	Reflect	0.099	<0.001
Y_{22}	-0.038	-0.042	-0.159	**0,637**	0,108	Reflect	0.099	<0.001
Y_{31}	-0.190	0.083	0,119	0,098	**0,576**	Reflect	0,072	<0.001
Y_{32}	0.044	-0.043	-0.050	-0.046	**0,630**	Reflect	0,069	<0.001
Y_{33}	0,094	-0.034	-0.112	-0.086	**0,603**	Reflect	0,070	<0.001

Table 3 shows the combined loadings value > 0.5 and p < 0.001 which means that all variables are declared to meet the requirements of convergent validity. Whereas if it is seen the value of loadings > cross loading value, the variable is declared to meet the discriminant validity requirements. For example the variable X_{11} has a loadings factor of 0.588 > 0.5 and p <0.001, so the variable fulfills convergent validity. Furthermore, variable X_{11} has a loadings factor of 0.588 greater than the value of cross loadings (-0.261, -0.036, -0.109, 0.039) or the Y_{11} variable has a loadings factor of 0.619 > (-0.069, 0.071, -0.092), according to the terms discriminant validity. Table 3 shows that all variables have a loadings factor greater than 0.5 and also a cross loading value so that it is in accordance with the terms of convergent and discriminant validity. Other requirements that must be met for discriminant validity are the AVE value and the correlation coefficient as shown in Table 4.

Tabel 4. Correlations among l.vs. with sq. rts. of AVEs

	X_1	X_2	Y_1	Y_2	Y_3
X_1	**0,57**	0,29	-0.106	-0.127	0,10
X_2	0,29	**0,52**	-0.247	-0.079	0,11
Y_1	-0.106	-0.247	**0,62**	0,26	0,09
Y_2	-0.127	-0.079	0,26	**0,64**	0,36
Y_3	0,10	0,11	0,09	0,36	**0,60**

From Table 4 it can be seen that the root value of AVE on the main diagonal is greater than the correlation variable that is related to other variables so that it meets discriminant validity. For example the variable X1, the AVE value of 0.57 is greater than the correlation with other variables namely 0.29, -0.106, -0.127, 0.1.

Table 5. Fit Model and Quality Indices

Fit Model and Quality Indices	Criterion	Result	Evaluation
Average path coefficient (APC)	p < 0.5	P = 0.018	Good
Average R-squared (ARS)	p < 0.5	P = 0.009	Good
Average adjusted R-squared (AARS)	p < 0.5	P = 0.022	Good
Average block VIF (AVIF)	acceptable if <= 5, ideally <= 3.3	1.254,00	Good
Average full collinearity VIF (AFVIF)	acceptable if <= 5, ideally <= 3.3	1.394,00	Good
Tenenhaus GoF (GoF)	small >= 0.1, medium >= 0.25, large >= 0.36	0,31	Good
Sympson's paradox ratio (SPR)=	acceptable if >= 0.7, ideally = 1	0,62	Intermediate
R-squared contribution ratio (RSCR)	acceptable if >= 0.9, ideally = 1	0,69	Intermediate
Statistical suppression ratio (SSR)	acceptable if >= 0.7	1.000,00	Good
Nonlinear bivariate causality direction ratio (NLBCDR)	acceptable if >= 0.7	0,58	Intermediate

Evaluation of the model based on the criteria in Table 5 shows that in general the model developed in this study is good. Although the SPR, RSCR and NLBCDR values have not met, the values are > 0.5 so that this model can be said to be good in explaining the problem being examined. For this reason, it can also be seen from how the assessment of each variable is related to the loadings factor to see how strong the average value of each variable.

From Figure 3 it can be seen that the loadings factor value of all variables and indicators is more than 0.5 which indicates the strength of the indicator. The greater the value of the loadings factor, the stronger the indicator means the more important the indicator. Likewise, the average value is above 2.5, which indicates quite well the indicators used in the model.

3.4 Hypothesis Testing

In this hypothesis test the guidelines for the hypothesis of the hypothesis is *p-value* < 0.10, then it is said weakly significant, if *p value* < 0.05 is said to be significant and if p value < 0.01, it is said to be highly significant.

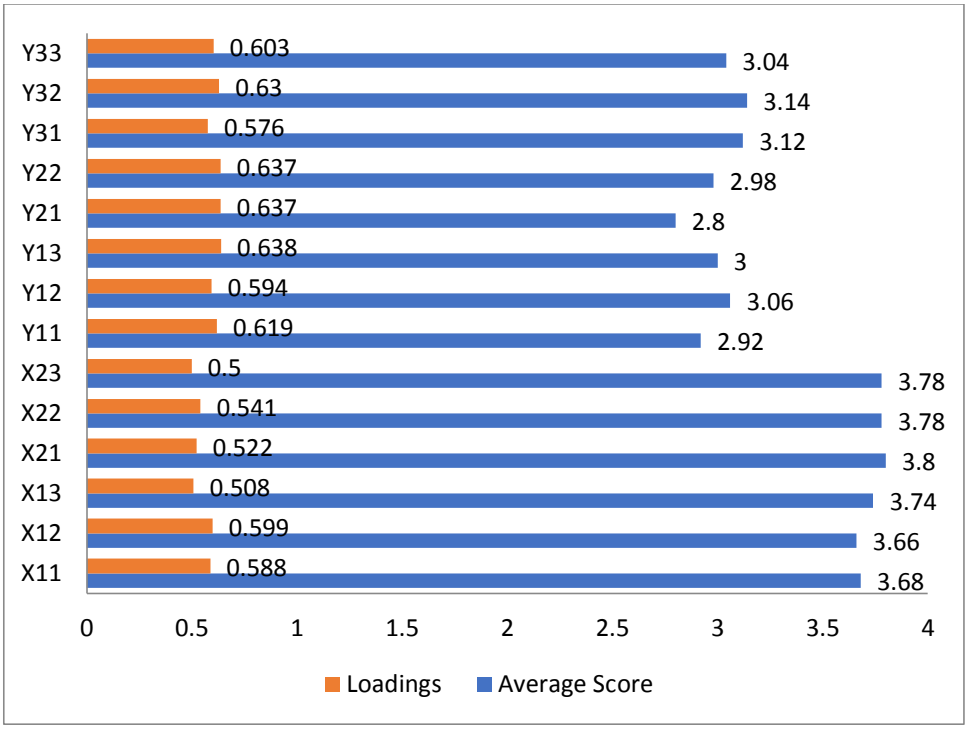

Figure 3. Average Scoore and Factor Loadings

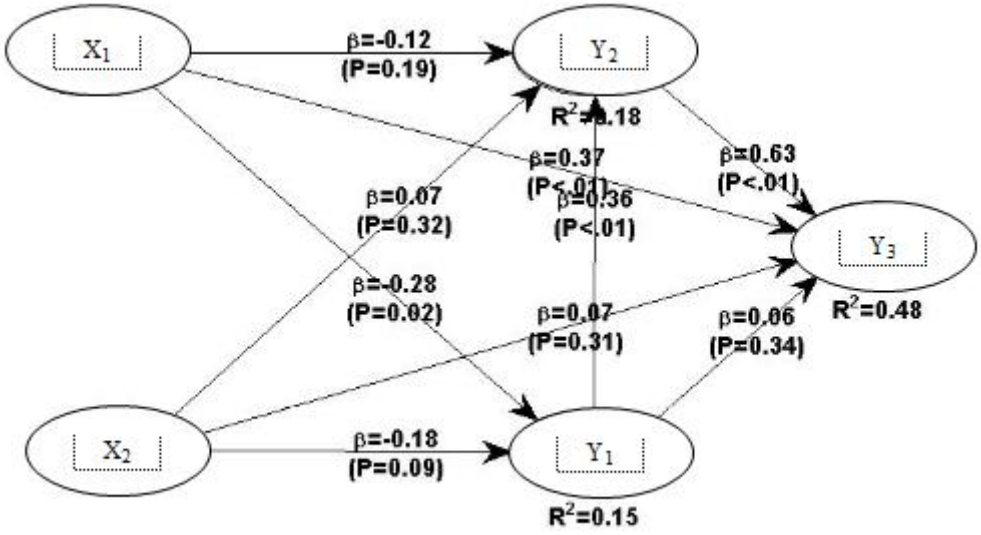

Figure 4. Output Model of Hasil analisis SEM

The output of the SEM Model results in Figure 4 shows the degree of influence of various variables in the model. On the relationship of Technical Variables (X_1) with institutional variables (Y_1) *p value* = 0.02 < 0.05, which means that rejecting H0 so that it can be said to have a significant effect. The relationship between variables X_1 and Y_2 shows the value of *p value* > 0.1 so that it can be said to accept Ho ie there is no significant relationship between the two variables. While the relationship between variables X_1 and Y_3 *p value* < 0.01 so that it rejects Ho which means that there is a highly significant influence.

Furthermore, the influence of the variable X_2 (community participation) on the variable Y_1 is shown from the value of p value = 0.09 < 0.1 so that the decline Ho which means to have a weakly significant influence. In addition, to the Y_2 variable *p value* = 0.32 > 0.1 so accept Ho which means there is no influence between the two variables and the relationship with the Y3 variable, *p value* 0.32 > 0.1 which means there is no significant effect between X_1 and Y_3. Likewise, the influence of the variable Y_1 on the Y_2 variable can also be shown to be a highly significant effect where *p value* < 0.01 and there is an insignificant influence on the Y_3 variable. Whereas the Y_2 variable has a significant influence on the Y_3 variable (policy) (*p value* < 0.01.

3.5 Discussion

The results of this study show that so far the technocratic aspect has more influence in road maintenance. This is indicated by the significant influence between the technical aspects with policies, institutional aspects and the determination of road conditions. This is in line with previous studies that the technocratic approach is the main approach in road maintenance [19].

Public participation has not been clearly seen to influence road maintenance, especially in the aspects of policy and road condition determination. While the institutional aspect has little effect. This is in line with the facts found in the field that in every damaged road section no effort was made by the community to carry out emergency response.

From the results of this study it is also known that institutional variables have no significant effect on policy. This certainly can be concluded that the institutional structure does not affect road maintenance policies.

4. Conclusion

This article discusses the technocratic approach and community participation in maintaining district roads. The focus of the discussion is on policy making. The variables included in the model show that community participation has no influence in determining road maintenance policies and evaluating road conditions.

Therefore more in-depth studies are needed that can produce road maintenance policy strategies that involve the wider community. It is hoped that by including community participation it can increase the age of road use or at least assist the government in carrying out emergency response in the event of road damage.

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