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An Environment Management Model for Road Maintenance Operation Involving the Community Participation

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Abstract

Road management prioritizes maintaining, treating and examining the road periodically to maintain the road's service level and to develop it in order to improve the road performance. Central Java people's expectation is very high to the fulfillment of need particularly for road infrastructures included in many of their complaints and expectation in *tweeter, short mail message* (SMS), e-mail, and community's report in various mass media; *Dinas Bina Marga* (Office of Highways) of Central Java Province requires the development of environment management in road routine organization by involving the community participation in the form of fulfilling the representative road condition, that can cater to the road users securely and comfortably.

This research employed a survey method with SEM analysis with Latent Independent Variable (X) including: Community Participation in regulating, building, developing and supervising road (PSM); Community Behavior in utilizing road (PMJ); Provincial Road Service (PJP); work safety in Provincial Road (KJP); and Integrated Management System (SMT), and the latent dependent variable (Y) including: routine maintenance of provincial road integrated into Environment Management Model and involving community

participation (MML). The result of data analysis showed that the condition of provincial road routine maintenance in Central Java had not applied yet the environment management by involving community participation currently. Therefore, an environment management model was developed with the following outputs (results). H1: Community participation (PSM) affected positively the Environment Management Model (MML); H2: Community Behavior in Utilizing Road (PMJ) affected positively the Environment Management Model (MML); H3: Provincial Road Utilization (PJP) affected positively the Environment Management Model (MML); H4: Work safety in Provincial Road (KJP) affected positively the Environment Management Model (MML); H5: Integrated Management System (SMT) affected positively the Environment Management Model (MML). From the analysis of research, a model formulation describing the relationship/the effect of independent variables (PSM, PMJ, PJP, KJP, and SMT) on dependent variable (MMT) was obtained as follows:

MML = 0.13 PSM + 0.07 PMJ + 0.09 PJP + 0.19 KJP + 0.48 SMT + e

Keywords: Environment Management, routine maintenance, community participation

INTRODUCTION

The provincial road organization program in Central Java included road regulation, building, and supervision was organized by the Central Java Province's Office of Highways. Road Organization prioritizes the periodically maintenance, treatment, and examination of road to maintain road service level corresponding to the specified minimum standard service. The availability of fund, human resource, tools and changing legislation becomes an interesting challenge to be developed more in order to improve the performance of road. The Central Java Province's Office of Highways as a government institution with main duty and function of managing the road in the improvement, periodical maintenance and routine maintenance program. It has been described that in 2015, the road dealt with by the Office of Highways is 2,565.621 Km in length, 85.09% (2,183.15 Km) with routine maintenance and 14.91% with rehabilitation, periodical maintenance and improvement programs. The bridge dealt with is 26,086.0 M, 97.37 % with routine maintenance program and 2.63 % with rehabilitation, and bridge replacement program. The Javanese people's expectation is very high to the fulfillment of need particularly for road infrastructures included in many of their complaints and expectation in *tweeter, short mail message* (SMS), e-mail, and community's report in various mass media; *Dinas Bina Marga* (Office of

Highways) of Central Java Province requires the development of environment management in road routine organization by involving the community participation in the form of fulfilling the representative road condition, that can cater to the road users securely and comfortably.

The implementation of road maintenance is highly affected by weather, geographic, and land condition in individual internodes. Recalling that nearly all internodes of provincial road undertake routine maintenance, in which an environmental protection is needed in individual internodes physically, sustainable culture should be created in organization and society, and moral values and mutual trust among the elements of organization in the Central Java's Office of Highways should be implanted, the good environment management should be applied.

METHOD

This research employed survey method, that was, the research method would use data to generalize the population of research and the data needed in this research included primary and secondary data. This research started with specifying a model based on theory. Individual variables in the model were conceptualized as the latent ones and measured with some indicators. Some indicators were developed for individual models. The factor analysis was used to determine the indicators to be used to measure the relevant latent variables and represented by some factors.

The collected and qualified data with adequate validity and reliability was analyzed using tabulation calculation system corresponding to individual variables used in this research. Data processing was carried out using Structural Equation Model (SEM) based on Variance and Component-Based SEM with Smart PLS software.

RESULT AND DISCUSSION

The research variable is the measurable abstract concept (observed variable). However, there is also the immeasurable abstract concept (unobserved variable). This dissertation research is intended to examine the multidimensionality of construct consisting of six variables:

1. Latent Independent Variable

a. The first latent independent variable is Community Participation in governing, building, developing and supervising road (PSM) (X_1), constituting the variable affecting other variable, and in this research, the latent independent variable consisting of 5 indicator variables ($X_{1\text{-}1}$,$X_{1\text{-}2}$, $X_{1\text{-}3}$, $X_{1\text{-}4}$, $X_{1\text{-}5}$): $X_{1\text{-}1}$ is the Level of Community participation in the activities in road area; $X_{1\text{-}2}$ is the form of

Community participation in the activities in road area, X_{1-3} is the Community's need for road function, X_{1-4} is the community's readiness in active participation; and X_{1-5} is local wisdom.

b. The second latent independent variable is Community behavior in utilizing road (PMJ) (X_2), constituting the variable affecting other variables, and in this research the latent independent variable consisting of 5 indicator variables (X_{2-1},X_{2-2}, X_{2-3}, X_{2-4}, X_{2-5}): X_{2-1} is the Community's knowledge on legislation pertaining to road, X_{2-2} is the Community's compliance with the legislation pertaining to road, X_{2-3} is the Discipline of maintaining the road performance, X_{2-4} is the Community's compliance with the payment of road retribution, and X_{2-5} is the care about the problems pertaining to the road surrounding.

c. The third latent independent variable is the Provincial Road Service (PJP) (X_3) is the variable affecting other variables, and in this research the latent independent variable consisting of 5 indicator variables X_{3-1},X_{3-2}, X_{3-3}, X_{3-4}, X_{3-5}): X_{3-1} is The development of provincial road maintenance, X_{3-2} is the implementation of routinely provincial road maintenance, X_{3-3} is the supervision over provincial road maintenance, X_{3-4} is the quick handling of provincial road damage, and X_{3-5} is the evaluation on the sustainable implementation.

d. The fourth latent independent variable is work safety in Provincial road (KJP) (X_4), constituting the variable affecting other variable, and in this research the latent independent variable consisting of 5 indicator variables (X_{4-1},X_{4-2}, X_{4-3}, X_{4-4}, X_{4-5}): X_{4-1} is the readiness of wok security cost, X_{4-2} is the management plan in work safety, X_{4-3} is the availability of personnel in supporting work safety, X_{4-4} is the availability of work safety-supporting tool, and X_{4-5} is the follow-up of work safety program.

e. The fifth latent independent variable is Integrated Management Sistem (SMT) (X_5), constituting the variable affecting other variable, and in this research the latent independent variable consisting of 5 indicator variables (X_{5-1},X_{5-2}, X_{5-3}, X_{5-4}, X_{5-5}): X_{5-1} is the study of planning, X_{5-2} is the study of implementation, X_{5-3} is the study of examination and evaluation, X_{5-4} is the study of improvement measure, and X_{5-5} is the study of SKPD's commitment.

2. Latent Dependent Variable (Y)

The variable affected by other research in this research was routinely provincial road maintenance integrated into environment management system and involving community participation.

3. Convergent Validity Test

This convergent validity test was intended to test whether or not the indicators used is fairly valid and representative in measuring its construct. The criteria used in this validity test are:

a. P value < 0.05
b. Loading factor> 0.7 (valid);
c. Loading factor = 0.4 s/d <0.7 (remaining to be maintained as long as it does not raise the AVE value and the composite value is reliable above its threshold);
d. Loading factor < 0.4 (indicator should be dropped out of the model).
e. From the SEM PLS analysis, the factor loading value result was obtained of 0.4 for each of variables, so that those indicators are fairly relevant in measuring PSM, PMJ, PJP, KJP, SMT and MML

4. Discriminant Validity Test

This validity test was intended to examine whether or not the indicators used is fairly valid in contributing to R^2. The criteria used in this validity test are: root value AVE > correlational value between constructs in the same column:

a. Root value of AVE for PSM variable: 0.642 > correlational values between constructs in the same column.
b. Root value of AVE for PMJ variable: 0.668 > correlational values between constructs in the same column.
c. Root value of AVE for PJP variable: 0.688 > correlational values between constructs in the same column.
d. Root value of AVE for KJP variable: 0.683 > correlational values between constructs in the same column.
e. Root value of AVE for SMT variable: 0.717 > correlational values between constructs in the same column.
f. Root value of AVE for MML variable: 0.703 > correlational values between constructs in the same column.

Thus the indicators of variable belong to *valid* category in discriminant way.

5. Construct Reliability Test

This test is intended to test the reliability of instrument/indicator creating a construct. The criteria used in this test are:

a. Composite reliability > 0,7
b. Cronbach's alpha > 0.7

The composite reliability and cronbach's alpha values can be seen in the table below.

Table 1: Latent Variable Coefficient

Composite reliability coefficients					
PSM	PMJ	PJP	KJP	SMT	MML
0.844	0.863	0.863	0.897	0.927	0.886
Cronbach's alpha coefficients					
PSM	PMJ	PJP	KJP	SMT	MML
0.786	0.816	0.814	0.872	0.914	0.853

From the table above, it can be interpreted as follows:

a. The composite reliability values for PSM, PMJ, PJP, KJP, SMT and MML constructs are: 0.863; 0.863; 0.897; 0.927 and 0.886, respectively, all of which are higher than 0.7;
b. The cronbach's alpha values for PSM, PMJ, PJP, KJP, SMT and MML constructs are: 0.816; 0.814; 0.872; 0.914 and 0.853, respectively, all of which are higher than 0.7. Thus it can be concluded that all variables in this research ((PSM, PMJ, PJP, KJP, SMT and MML) are **reliable**.

6. Hypothesis Testing

The hypothesis to be tested includes:

a. H1: Community Participation (PSM) affects positively the Environment Management Model (MML)
b. H2: Community behavior in utilizing road (PMJ) affects positively the Environment Management Model (MML)
c. H3: Provincial Road Service (PJP) affects positively the Environment Management Model (MML)
d. H4: Work Safety in Provincial Road (KJP) affects positively the Environment Management Model (MML)
e. H5: Integrated Management System (SMT) affects positively the Environment Management Model (MML)

From the analysis using SEM-PLS 3.0, the path analysis diagram is obtained as follows:

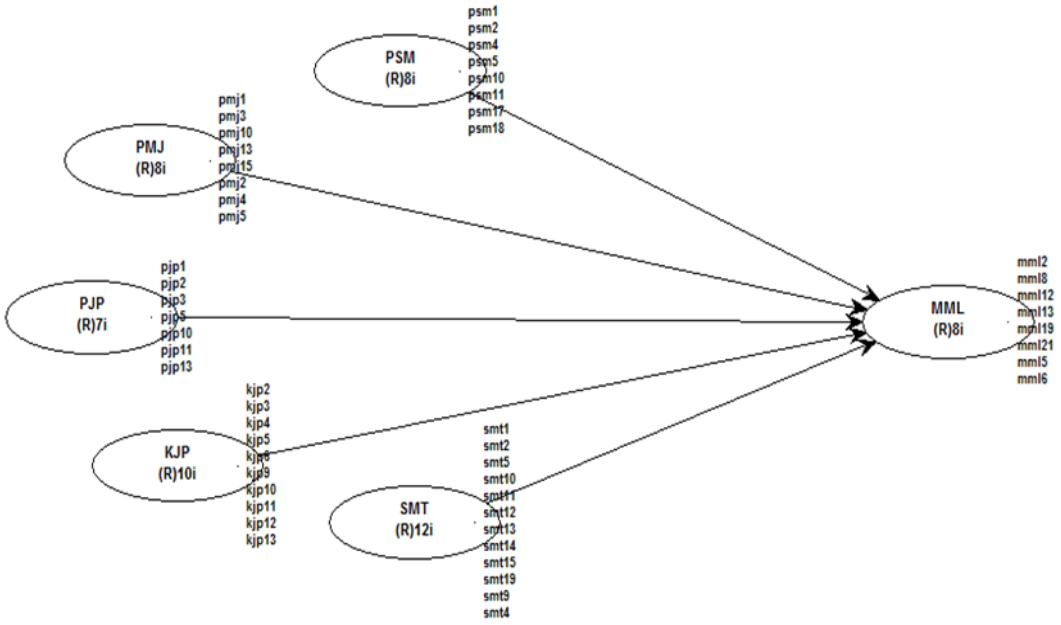

Figure 1: Path diagram (without parameter value)

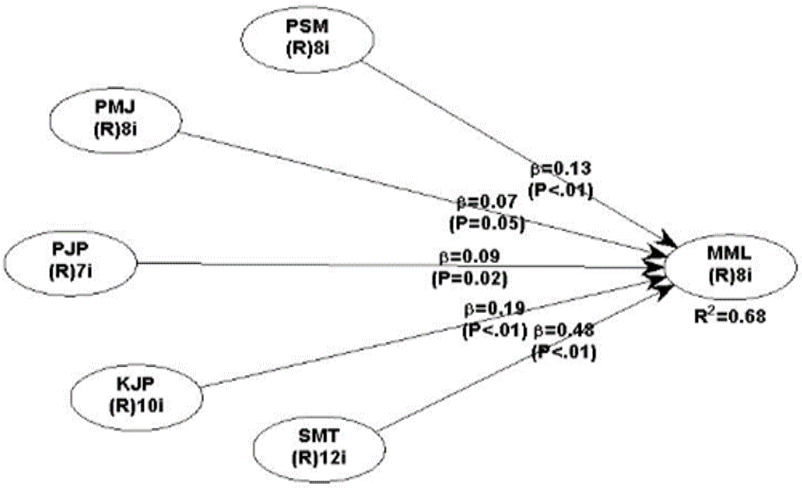

Figure 2: SEM Analysis Completed (with its variable values)

Model Fit Indices and P Value

APC=0.194. P<0.001

ARS=0.760. P<0.001

AVIF=2.728. Good Ir< 5

From the chart and model fit indices and value, it can be interpreted as follows:

a. Model and coefficient values contained in the chart is fit (APC = 0.194 with p < 0.001 , ARS = 0.68 and p < 0.001 and AVIF = 2.299 < 5);
b. Predictor variable variation (PSM, PMJ, PJP, KJP, SMT) explains the 68% of criterion variable variation MML, including in the criterion of explaining overall (large);
c. Hypothesis 1 stating that PSM affects positively MML is supported (p=0.01< 0.05)
d. Hypothesis 2 stating that PMJ affects positively MML is supported (p=0.02< 0.05)
e. Hypothesis 3 stating that PJP affects positively MML is supported (p=0.02< 0.05)
f. Hypothesis 4 stating that KJP affects positively MML is supported (p=0.01< 0.05)
g. Hypothesis 5 stating that SMT affects positively MML is supported (p=0.01< 0.05)

CONCLUSION

1. There is an environment management model in organizing the routinely provincial maintenance by involving community participation obtained using SEM analysis with the following indicators:

a. H1: Community Participation (PSM) affects positively the Environment Management Model (MML);
b. H2: Community behavior in utilizing road (PMJ) affects positively the Environment Management Model (MML);
c. H3: Provincial Road Service (PJP) affects positively the Environment Management Model (MML);
d. H4: Work Safety in Provincial Road (KJP) affects positively the Environment Management Model (MML);
e. H5: Integrated Management System (SMT) affects positively the Environment Management Model (MML);

2. From the analysis, the model formulation is obtained describing the relationship/effect of independent variables including PSM, PMJ, PJP, KJP, and SMT on the dependent one, MML, as explained below:

MML = 0.13 PSM + 0.07 PMJ + 0.09 PJP + 0.19 KJP + 0.48 SMT + e

R^2 = 0.68 at significance level and Effect Size as follows:

Table 2 : The Analysis of SEM Result

	PSM	PMJ	PJP	KJP	SMT
β	0,13	0,07	0,09	0,19	0,48
Sign	<0.01	0.05	0.02	<0.01	<0.01
Effect Size (ES)	0.072	0.042	0.060	0.127	0.377

a. The variation/change of PSM, PMJ, PJP, KJP, and SMT variables explains 68% of MML variable variation, while the rest of 32% is affected by other variable excluded from the model.
b. PSM variable affects significantly the MML variable (*sign:*<0.01 < 0.05) with low effect level category (ES: 0.072), 0.02 < ES < 0.15;
c. PMJ variable affects significantly the MML variable (*sign:*0.05 = 0.05) with low effect level category (ES: 0.042), 0.02 < ES < 0.15;
d. PJP variable affects significantly the MML variable (*sign:* 0.02 < 0.05) with low effect level category (ES: 0.06), 0.02 < ES < 0.15;
e. KJP variable affects significantly the MML variable (*sign:*<0.01 < 0.05) with low effect level category (ES: 0.127), 0.02 < ES < 0.15;
f. SMT variable affects significantly the MML variable (*sign:*<0.01 <0.05) with low effect level category (ES: 0.377), 0.02 < ES < 0.15;

3. To get the better result, further researches is recommended to find the value = 32% of effect of other variables excluded from this model.

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